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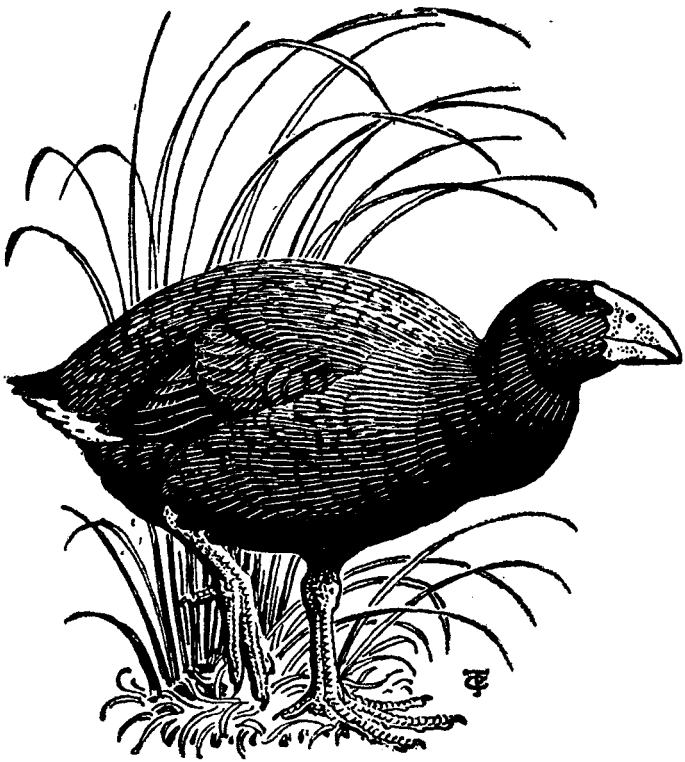

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1. Atkinson, I. A. E., 1964: Feeding stations and food of the North Island Saddleback in August. Notornis 11, 2, 93-97.

2. Buller, W. L., 1888: A History of the Birds of New Zealand (2nd ed.) 2 vols., the author, London.

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NOTORNIS

In continuation of New Zealand Bird Notes

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Contents of Vol. 16, No. 2: June, 1969

KERMADEC ISLANDS EXPEDITION REPORTS

THE WHITE-CAPPED NODDY *(Anous tenuirostris minutus)*

By M. F. SOPER

As Merton (1968) has already reported, Raoul proved a disappointing bird island, so that life history studies had in most cases to be pursued on Meyer, which proved difficult to get to. Opportunities, often widely separated, had to be seized as they occurrred and this resulted in much loss of continuity of data, particularly when dealing with the tropic bird, noddy and ternlet.

White-capped Noddies were breeding in numbers on the two Meyer Islets, but were not recorded from the others of the Herald group. On Raoul small numbers were recorded roosting on coastal boulders at D'Arcy Point and Smith Bluff, and resting on the sand of Denham Bay and North Beach, but breeding was not observed.

Nests were built in trees at the forks of horizontal or near-horizontal limbs. Thus ngaio and pohutukawa were most commonly chosen. Oliver (1955) mentions the use of *Pisonia* (parapara) — now *Heimerliodendron* — stating that most of the nests at the time of his visit (1908) were in trees of this species. Evidently Meyer's vegetation has changed since then, for we were able to find only half-a-dozen parapara on North Meyer; the species being a little more common on South Meyer. On neither islet was this tree being used by nesting noddies as none had suitable branches. Karaka trees were used but here again the general absence of suitable limbs prevented other than their occasional use.

Nests were simply flat platforms of twigs, leaves and litter from the bush floor cemented together with droppings. Occasionally seaweed and fern fronds were incorporated and the structure was often finished off with a single, large, usually green karaka leaf. Building was a leisurely process occupying some weeks. Possibly this is an adaptation to allow a liberal build up of cementing droppings between each layer of debris. The height of the nests ranged from about 3 to 15 feet above ground and they were aggregated in loose colonies mainly on the western faces of both islands.

Both courtship feeding (with regurgitated matter) and copulation were seen to occur at the nest site.

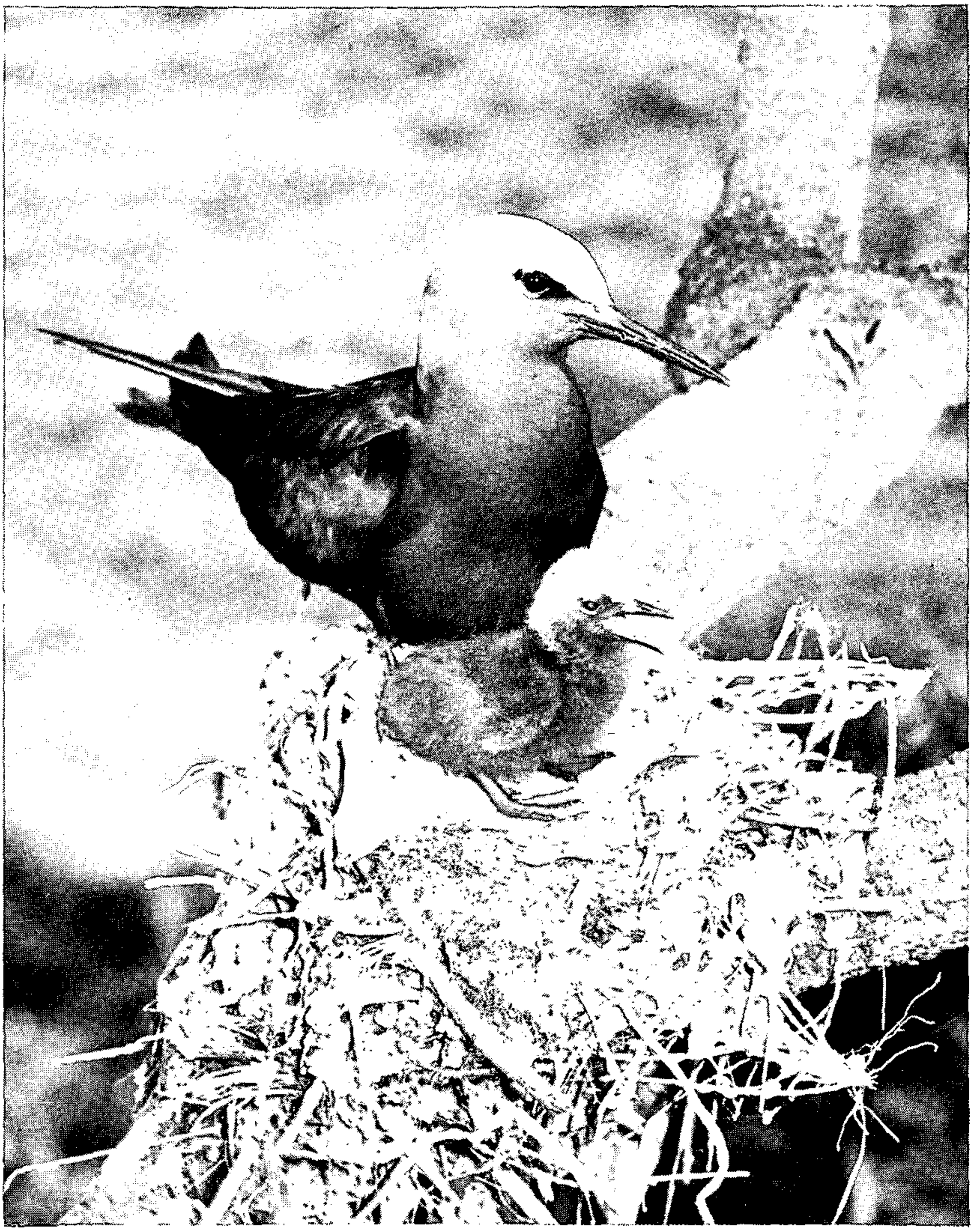
A survey of nests on the mid-western slopes of North Meyer on 22/11/66 revealed two with newly hatched chicks and thirty-two with eggs. The majority, however, were still under construction and there were large numbers of birds still learning their flight paths in and out of the trees. On 25/1/67, although most of the nests now contained eggs and in some cases chicks, a number were still being built; so the breeding season is an extended one. We were not, of course, able to ascertain whether this late nest-building was followed by successful breeding.

The clutch was invariably one and the incubation period (one record only) was 36 days. (An egg laid on the morning of 22/11/66 hatched on the morning of 27/12/66).

[M. F. Soper

Plate XXII — A pair of White-capped Noddies at nest.

What impressed me most about the breeding cycle of the White-capped Noddy was its leisurely pace and unpredictable outcome. Particularly noticeable were the number of nests begun that were subsequently abandoned and the number of eggs laid that were subsequently lost. This is one of the aspects on which we were unable to get sufficient data but as an example; of 12 marked nests,



[M. F. Soper

Plate XXIII — White-capped Noddy and downy chick.

5 were deserted during building, 4 eggs were lost, one hatched and the remainder were still being incubated, presumably addled, 6 weeks later.

One chick which hatched on 22/11/66 was kept under observation till it fledged. This chick was brooded continuously for

its first 3 days and during this time was fed on a thin, oily-looking fluid regurgitated by its parent. Feeds were infrequent — about 4-hourly on the occasions I watched — and like the ternlets, the chick dibbled the fluid so rapidly from the very back of the parent's tongue that one had to look closely indeed to see what was being passed. By the 4th day the chick was becoming active and the parent was content to squat at the side of the nest and guard the chick rather than brood it. The guard period, with one or other parent always in attendance, continued for 3 weeks.

At hatching the chick was covered with jet black down and the white cap was startlingly in evidence. At 5 weeks this down was disappearing and the chick, now wandering away from the nest platform, was beginning to resemble an adult. It flew for the first time on 12/1/67 — a fledging period of 52 days. It was still using the nest as a roost four nights later; the last observation made. Throughout the fledging period it was fed on regurgitated material. At first, on the thin oily-looking fluid; later, by gradual change and at lengthening intervals, on a thick salmon coloured paste. No adult was ever seen to carry food in its bill. Regurgitation was always direct with the chick approaching from the side in the manner of a petrel chick. No regurgitated material was examined but the appearances were consistent with the contents being plankton.

Scattered over the island, wherever there were suitable open bare patches of ground, were Noddy "clubs"; one of which was on the small sandy beach in front of the camp. This particular club was in use in a desultory way when we first arrived — mostly by birds sunning themselves and picking up what appeared to be grit as they had done during a brief visit on 20/11/64 (see Edgar, Kinsky & Williams 1965) — but in early December a change was noticed in that the arrival of a bird often prompted soliciting by one of those already present. This usually resulted in one of two things: either a copulation attempt during which other birds would join in till there were 3, 4 or even 5 birds all in a heap; or, alternatively, an obviously half-hearted attempt by a single bird which would be promptly terminated by the instigator who then solicited a number of other birds in turn. So far as I could see none of these mating attempts was successful and the impression gained was that the club was a gathering place of immature birds. On 30/12/66 the club abruptly dispersed though there had been a slight slackening of activity over the previous few days.

Noddies feed at sea in a similar manner to ternlets, except that they do not feed in such dense flocks and forage much further afield. The region of Hutchinson Bluff was a favourite feeding area and throughout our stay a steady stream of birds was to be seen flying to and fro past North Beach. Noddies were only rarely seen on the other side of the island, at Denham Bay.

The stomach contents of two collected on North Beach on 18/12/66 have been examined by F. C. Kinsky, Dominion Museum, Wellington. Just prior to collection these birds were seen to eat what appeared to be grit. D.M. No. 12394, an adult female, contained 12 fragments of white mollusc shell (various shapes and sizes) and 4 small *Nematode* worms, but no food remnants. D.M. No. 12395,

another adult female, possessed 4 small dark pebbles, one small piece of white mollusc shell, and one dark feather, probably swallowed when preening, but no food remnants.

MEASUREMENTS (in Millimetres) OF ADULT NODDIES COLLECTED

(Measurements are those used by the O.S.N.Z.'s Beach Patrol Scheme, and described by Heather (1966).)

Dominion Museum Number	Date Collected	Locality Collected	Sex	BILL Length	BILL Depth	BILL Width	Mid-toe and Claw	Tarsus	Wing	Tail
12394	18/12/66	Nth.Beach Raoul Is.	F	44.5	7.7	11.2	35	20.7	221	110
12395	18/12/66	" " "		41.5	8	12.7	34	20.2	223	114
12396	19/12/66	" " "		41	7.5	11.2	33	20.2	222	113.7
Skeletal Remains	1/12/66	Nth.Meyer	-	42	8	-	33	19	229	102
	20/12/66	" "	-	42.5	8	-	35.5	22	229	119

Of 32 noddy eggs measured on North Meyer Islet their mean was 43.8 x 30.9 mm. They ranged from 40.3 to 47.9 mm. in length (standard deviation 2.1) and 28.9 mm. to 32.6 mm. in width (standard deviation 0.9).

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KERMADEC ISLANDS EXPEDITION REPORTS

THE GREY TERNLET *(Procelsterna cerulea albivitta)*

By M. F. SOPER

Although breeding on all islets of the Herald group and at Smith Bluff, Raoul Island, the two Meyer Islets and Napier Islet (which had a very large population) were the main strongholds of this delightful species. Breeding was well advanced on 19/11/66, which was our first full day on Meyer, and on that date all stages were present from eggs to flying young.

The nests, which were widely dispersed and usually well-hidden, were confined to the coastal strip of the islet. The most favoured sites were cavities, crevices and ledges on cliff faces. A few were placed in the shade of boulders on the beach and others under clumps of vegetation such as grass, *Cyperus* and low growing *Coprosma*

[M. F. Soper

Plate XXIV — Grey Ternlet.

[M. F. Soper

Plate XXV — Grey Ternlet feeding chick outside nesting cavity.

petiolata (a plant very similar to stunted taupata). The common denominator of all sites was all-day-shade from the sun. No nest material was used and the clutch was invariably one.

A tally of nests in the vicinity of the camp on 21/11/66 produced 14 with chicks and 27 with eggs. The majority of these eggs hatched over the next few days. One chick hatched prematurely, with a large yolk sac attached, and 2 others died during hatching. Apart from these there was little loss. Over the whole of my stay I found only 4 addled eggs. C. R. Veitch marked a dozen of the nests that were so placed that the chick, when hatched, would be unable to leave the site until it was able to fly, and from these we subsequently obtained fledging times.

The incubation period was not ascertained.

From first chipping of the egg to hatching took about 3 days. The chick was hatched with its eyes open and was active soon afterwards. It was brooded continuously for the first 3 days; thereafter it was left for increasing periods. At 8 days it was unguarded most of the day. At 17 days it was still downy but pin feathers were showing through. At 25 days it had more feathers than down and when the nest location permitted it was wandering freely. At 31 days it could just fly. At 36 days it was flying frequent short distances, though its wing and tail feathers were still short and there were tufts of down still adhering to various parts of its body. At 42 days it was virtually free of down. Beyond this time there are no data but it appeared that chicks were bing fed by their parents for further considerable periods before becoming fully independent. Towards the end of our stay 5 instances became known of adults regularly feeding both semi-fledged chicks (approx. 21 days old), and, at the same time, birds which appeared to be fully-fledged chicks of the year. The latter had wing and tail feathers of full adult length but had calls which were still definitely juvenile in sound. The probability that Grey Ternlets are double brooded needs to be seriously considered.

Chicks of all ages were fed by regurgitation with the chick approaching from the side in the manner of a petrel. The chick appeared to induce regurgitation by pecking at the parents' legs and feet. The chick pecked, and continued to peck, at the parent's feet till the parent leant forward with wide open gape and lower mandible almost touching the ground; only then did the chick transfer its attention from feet to gape. The regurgitated material was obtained from the very back of the parents' tongue and was taken so rapidly that there was seldom any spillage and we were rarely able to see what was transferred. No adult was ever seen to carry fish or other food in its bill and no bird was seen to regurgitate onto the ground. From examination of stomach contents of two adults collected and of droppings, the conclusion was reached that these ternlets feed mainly, if not exclusively, on plankton. The entire stomach contents of one bird collected (D.M. No. 13296), was made up of debris from surface plankton, mainly small crustacea, possibly small *Euphausia.*

The mode of feeding at sea was frequently observed. The birds worked in flocks in the manner and thoroughness of Starlings.

Plate XXVI — Grey Ternlet. Fledged chick soliciting food. [M. F. Soper

They were often accompanied by Noddies. They hovered and fluttered over the water in the manner of Storm Petrels, repeatedly dipping down to pick up minute objects with their bills. They never alighted and apparently never got their feet wet. They worked up-wind and as they ran out of the patch of food-containing surface-water they veered away to the side, circled round, rejoined the rear of the flock and thence once again worked their way forward.

Two aerial displays were observed. In the first, the birds hovered on the wind and followed the pattern of an extended lazy tongs — weaving a criss-cross pattern in unison across each other's flight paths. In the other, a single bird borne on the wind so as to be directly in front of its incubating mate would hover with its wings and tail elevated to an acute angle (about 45°) and execute a series of dipping U-shaped flights. This display was seldom seen in calm weather and seemed to require a fresh breeze. When conditions were suitable the whole series would be done without losing position relative to the cliff face.

The plumage of the Grey Ternlet is in shades of pale grey; the only relief being a short white line behind the eye and a black line in front of it. So far as I could see the eye markings played no part in display procedures. The webs of the feet are pinkish yellow and it is noted that the chick pecks at the parents' feet when it wishes to be fed. The gape is bright orange and though birds were often seen to gape widely, they never did so in circumstances where the action seemed to be significant.

Adult birds were starting to moult by the middle of January and about this time they were noticed roosting in trees — something they had not been seen doing previously.

Measurements (in millimetres) of Adult Grey Ternlets Collected on North Meyer Islet: (Measurements are those used by the O.S.N.Z.'s Beach Patrol Scheme and described by Heather (1966).)

Dominion Museum Number	Date Collected	Sex	BILL			Mid-toe and Claw	Tarsus	Wing	Tail
			Length	Depth	Width				
13296	20/12/66	M	28.5	7	9.9	34.7	25.2	208	107.5
13297	20/12/66	F	27	6.2	8.7	32.5	23.7	199	107

Of 21 ternlet eggs measured on North Meyer Islet, their mean was 42.9 mm. x 28.9 mm. They ranged from 40.9 mm. to 45.7 mm. in length (standard deviation 1.1) and from 27.1 mm. to 30.2 mm. in width (standard deviation 0.6).

DUSKY MOORHEN ON LAKE HAYES

By MAIDA BARLOW

SUMMARY

A bird seen on Lake Hayes from August to October, 1968, is described, discussed and identified.

INTRODUCTION

On 11/8/68 a party of Southland ornithologists comprising R. R. Sutton, L. E. Henderson, Neil Henderson, O. J. Linscott and the writer saw an unusual bird on Lake Hayes. Good views were obtained from 120 yards with a 20 x telescope in fine, calm, sunny weather, and a detailed description was recorded. The area was visited again on 18/8/68 by the same party, excluding Neil Henderson and including R. F. Smith of Dunedin. This time a small boat was taken as well, and closer views and some photographs were obtained. On 20/8/68 R. R. Sutton went up again with the boat on which he erected a hide; using two anchors and an " endless chain," he was able to haul the boat in close to the lake shore vegetation without emerging from the hide, and he spent several hours watching the bird and taking more photographs.

[R. R. Sutton

Plate XXVII — Dusky Moorhen **(Gallinula tenebrosa)** on Lake Hayes.

DESCRIPTION

The following description is compiled from field notes made on these three visits:

Habitat: Lake shore, with a mixed vegetation of raupo *(Typha muelleri)*, dead and growing willows *(Salix sp.)* with a dense lake bottom growth of elodea *(Anacharis canadensis)*.

Size: Smaller than Coot *(Fulica sp.)*.

Shape and Posture: Differed from Coot in that it looked " lower in the water."

General Plumage: Entirely dusky, except lateral under-tail coverts; a brownish tinge on the back; close views in a good light revealed an iridescent greenish sheen on the upper surface.

Under-tail Coverts: Broad central dark strip, narrower towards vent; very obvious when bird swimming and viewed from the rear. An obvious white patch on either side; these patches extended to right under the tail, and were visible when bird was swimming; when viewed from the side these patches could still be seen and gave the impression that the whole under-tail coverts were white.

Shield: A narrow pear-shaped shield. Not more than half-an-inch wide at widest part, and tapering to a narrow strip above the bill; not prominent.

Bill: Both bill and shield a dark horn colour with a reddish tinge. Bill paler at tip.

Eye: Not conspicuous.

Legs: Inconspicuous dullish grey.

Wariness: Cautious, but not as wary as Pukeko *(Porphyrio melanotus)*.

General: Viewed from 120 yards with 20 x telescope. On later visits seen from 15 yards from hide in boat. On every visit the bird was located in the same stretch of lake shore, approximately 50 yards long, with vegetation as described. The bird shared the habitat with another Moorhen-like bird which is as yet unidentified. The two birds fed near each other, and sometimes together, but generally not in association with other birds except the occasional Scaup *(Aythya novaeseelandiae)*, but at one time two Mallard ducks *(Anas platyrhynchos)* came in close and scavenged food which had been brought to the surface by the bird under discussion. At this time the closeness of the Mallards did not seem to disturb the bird. There were 61 Coots *(Fulica atra)* approximately 100 yards distant, out in the lake. When observers made a noisy approach through raupo, the Moorhens went to cover while other waterfowl and the nearby flock of Coots took to flight. Both reappeared after the disturbance, but went into cover again when approached by a female Mallard.

At no time was the bird under discussion seen to venture further than five yards from the lake-shore vegetation. It was under close observation for a total time of 28 daylight hours, over four days; during most of this time it was not apparently disturbed by the observers' activities, which were undertaken with circumspection.

Observation from the shore side of the reedbeds showed that the bird spent little time on land; when not feeding or swimming at the lake edge it would rest, perched under cover on dead willow branches low over the water. At no time did it perch far enough out from cover to allow close scrutiny of legs and feet.

LATER DEVELOPMENTS

On 9/10/68 R. R. Sutton visited the lake again. In the intervening seven weeks since his last visit the bird had undergone significant bill and shield development. It was found in exactly the same locality and although excellent views were not obtained, there was no doubt in the observer's mind that it was the same bird. The shield was much larger and appeared to be pale orange in colour. The size and shape of the shield appeared similar to that of Coot, but no on-the-spot comparison could be made. The pale colouring on the tip of the bill had extended noticeably further up the bill. As usual, good views of the legs were not obtained, but in the very clear water they appeared a greenish yellow.

DISCUSSION

The bird was identified as a Moorhen (*Gallinula* sp.) on three main counts:

1. *Plumage:* The following authorities indicate that white lateral under-tail coverts are usual in the genus *Gallinula:* Witherby *et al.* 1944; Peterson *et al.* 1964; Rand & Gilliard 1967.

2. *Bill and shield* shape and colour: Witherby *et al.* 1944 describes the bill and shield of the juvenile *G. chloropus* as " greenish brown "; furthermore, he says: " Colouring becomes like adult occasionally as early as October but usually between December and March." Mathews and Iredale 1921 record the bill of the juvenile male *G. tenebrosa* as " mottled green and horn "; and the juvenile female " mottled green and black (lower base green), frontal plate black." The Lake Hayes bird in August was showing a reddish tinge on the horn colour of both bill and shield, and the significant development shown by the October visit confirms that this was a sub-adult bird approaching maturity when first seen.

At no time were the legs seen in adequate light to demonstrate the presence or otherwise of a " garter."

3. *Habits and habitat:* Behaviour, as observed over 28 hours, fell in line with the secretive and un-gregarious habits of the genus. The bird remained for at least nine weeks in a limited area of habitat eminently suitable to this genus.

In the matter of species identification, the field is surprisingly limited. Peters 1934 shows that the genus *Gallinula* comprises only three species: *G. tenebrosa* (three sub-species, occurring in East Indies, New Guinea and Australia); *G. chloropus* (the type-species), fifteen sub-species occurring in Europe, Asia, East Indies, Philippines, Africa and America); and *G. angulata,* occurring only in Africa.

It would seem reasonable to discard the African and American forms, thus leaving the field of choice between *G. tenebrosa* and *G. chloropus.*

Of these, it is more possible that *tenebrosa* could occur as a straggler in New Zealand, than the northern species. A further factor is that Peterson *et al.* 1964 state that a white flank stripe is one of the diagnostic features of *G. chloropus,* in both juvenile and adult forms. The bird in question exhibited no such stripe.

Acting upon the suggestion of Mr. A. Blackburn, a photograph and description of the bird were sent to the Australian ornithologist Mr. K. A. Hindwood, who replied: " Your bird is undoubtedly *tenebrosa.* Possibly sub-adult, though I have found that in the autumn and winter the rich colours of the bill and frontal plate become much duller — that is, in adult birds. However, it would seem from your notes that your bird was at least sub-adult. Immature birds are greyish on the throat and blackish-brown otherwise, with dull greenish bills and darker frontal plates." Mr. Hindwood enclosed a photograph of an adult Dusky Moorhen, with the comment: " It may be of some help in ' confirming ' your observation, but, really, no confirmation is needed."

CONCLUSION

The bird described is identified as belonging to the genus *Gallinula;* it is further identified as a sub-adult of the species *tenebrosa;* sub-specific identification is not attempted.

ACKNOWLEDGEMENTS

I wish to thank the following people for their assistance:

Dr. J. Murray Speirs, Professor of Zoology, Toronto University, who reported to R. R. Sutton the presence on Lake Hayes of the as yet unidentified bird mentioned above, and by drawing attention to the location aided the discovery of the secretive bird here described.

Dr. R. A. Falla, Wellington, who was consulted soon after the initial sighting of the bird, and made helpful suggestions.

Dr. R. F. Smith, Dunedin, who copied long extracts from literature not available to me.

Mr. R. R. Sutton, Invercargill, who spent many hours studying the bird, and made his field-notes and photographs freely available.

Mr. A. Blackburn, Gisborne.

Mr. K. A. Hindwood, Lindfield, N.S.W.

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ESTIMATED POPULATION OF THE RED-BREASTED DOTTEREL

By A. T. EDGAR

During 1966-1969 the writer and a team of helpers counted Red-breasted Dotterel *(Charadrius obscurus)* on Northland beaches. When preparing the results of these counts for publication it seemed appropriate to include a selection of previous records from these and other areas, and so to arrive at an approximate estimate of the Red-breasted Dotterel population. The records from which this estimate is compiled are spread over a number of years. Many of them have appeared in *Notornis,* others have been sent to me as contributions to O.S.N.Z. Recording Scheme or in personal correspondence. References to Classified Summarised Notes or Annual Locality Reports in O.S.N.Z. publications are given in abbreviated form, those from Reports and Bulletins 1939-42 thus (RB:13), and those from New Zealand Bird Notes and its successor *Notornis* thus (6:213). Records previously unpublished include the name of the observer, except when the observation is from my own notebooks. By courtesy of Wildlife Branch, Department of Internal Affairs, I have had access to results of counts carried out on Coromandel Peninsula and some Northland beaches in 1964 and in the area of Kaipara North Head in 1968.

The population estimate naturally suffers somewhat in accuracy from the fact that data have been collected over a period of years but is probably a reasonably close approximation. Although the number of dotterel present in an area may show marked seasonal variation in any given year, the indications are that local resident dotterel populations do not alter greatly within the space of a few years, except in special circumstances. For each locality such records as are available and relevant are listed in some detail, as a basis for future field work. The population figures given in brackets after each locality heading are based, as far as practicable, on the number of birds found present during a breeding season.

If beach counts are to be of value as a means of estimating dotterel population it is important that the count should be made at a time when the breeding season is well advanced and at a suitable state of the tide. It may be appropriate to summarise here some information on breeding cycle and feeding habits.

Red birds guarding territory were reported at Ruakaka as early as the second week in May 1951 (5:94) but this is probably exceptional. Territorial behaviour has been reported in June and frequently in July, but at Waipu birds were still not on territory in 28/9/63. Field work has shown that post-breeding movement away from breeding grounds may be associated with late arrival on territory the following season, and in such case a count in early spring might not include the full potential breeding population of an area.

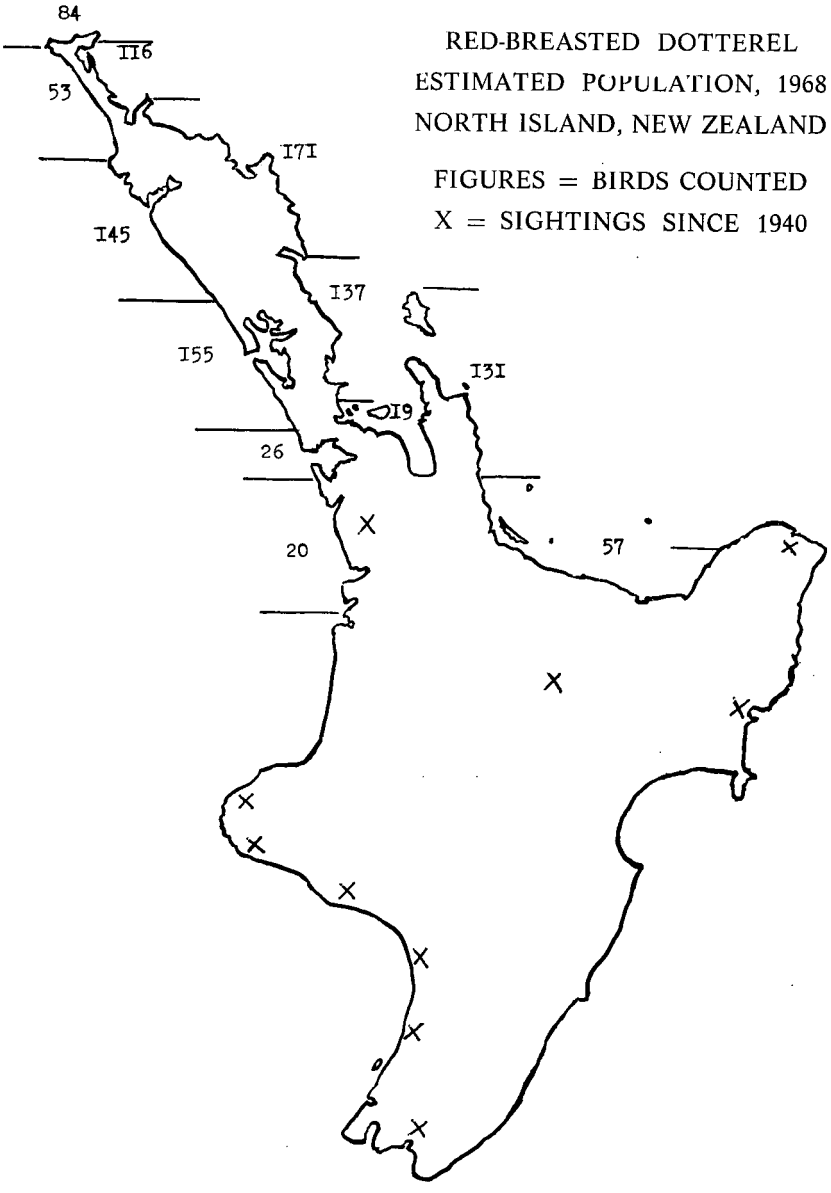
Nine to ten weeks may elapse between taking up territory and laying the first egg, as at Clevedon, birds showing territorial aggression 8/7/50, first egg 9/9/50 (McKenzie, 1952); birds fussing as if territory-minded 17/6/51, first egg 29/8/51 (McKenzie, 1953). On a shellbank

in Kerikeri Inlet a pair showed territorial behaviour on 2/7/68 and through July and August actively chased away other dotterels; copulation was observed on 1/9/68, nest scrapes 6 - 12/9/68; the birds then left the shellbank, perhaps disturbed by constant presence of gulls and Caspian Terns, and probably nested on one of the small offshore islets or reefs.

Eggs have been recorded in late August from South Auckland and in September from Bay of Plenty, South and North Auckland, but the main breeding season in Northland seems to be October - January. Oliver (1955) mentions one February record. The normal clutch is three. Exceptionally four and five eggs have been recorded (McKenzie, M.E., 1967). Incubation period has been recorded as 28-32 days. When the hen is incubating the male bird often stands guard some distance from the nest. Vigorous distraction display serves to draw an intruder away from the eggs or downy chicks; when I was inspecting a nest with eggs near to hatching the female bird flew right up to me; uttering cries of distress it circled round my feet with staggering gait, ruffled plumage, wings trailed or irregularly flapping. In a small Northland bay a picnic party having tea on the beach was approached by both birds of a pair, obviously agitated, advancing a few steps, stopping, and advancing again until they were within a few feet of the intruders. The following day a nest with three eggs was located about 20 yards from where the picnic party had sat on the sand.

The chicks leave the nest soon after hatching and at first remain in the vicinity but when they are a little older the agitated behaviour of parents is no guide to the whereabouts of the young birds, which may be lying quietly some distance away, often on the edge of some cover. The hatching to flying period may vary from under 38 to about 50 days.

Red-breasted Dotterel feed on crustacea, small mollusca and marine organisms which they find between tidemarks, also on insects. One was seen to eat a wriggling cricket and another captured a small moth (10:350). In late summer birds which frequent coastal paddocks at high tide feed busily over the grassland and may be seen tossing aside pieces of dry cowdung. On the coast south of Reef Point I saw a dotterel feeding in a rock pool, but this is probably exceptional. In estuaries dotterel may start feeding as soon as a strip of moderately firm mud is exposed by the falling tide, gradually feeding outwards as the tide recedes. At the turn of the tide the dotterel may fly, or may continue to feed ahead of the rising tide as long as some feeding ground remains uncovered by water. On ocean beaches most of the feeding between tidemarks takes place on a falling tide, places most favoured being where a freshwater stream empties into the sea. When the tide is rising the dotterel tend to move to dry sand or dunes where they find insect food. Beach counts should therefore be made on a falling tide. As an example, on the stretch of 90 Mile Beach between Scott Point and Bluff a casual observer noted 12+ dotterel one day in early November; my journey along the same stretch in mid-November, on a rising tide, failed to produce a single sighting but in mid-December on a falling tide I counted 18, widely scattered, still paired, no sign of flocking.


RED-BREASTED DOTTEREL
ESTIMATED POPULATION, 1968
NORTH ISLAND, NEW ZEALAND
FIGURES = BIRDS COUNTED
X = SIGHTINGS SINCE 1940
84
116
53
171
145
137
155
131
19
26
20
57

LOCALITY COUNTS

1. *North Cape Area.* (84).

This area includes beaches north of a line drawn from Scott Point to Coal Point.

(a) *Western beaches, south of Cape Reinga.*

19/12/67, Te Werahi, 25; Te Kohatu, 2; Twilight Beach, nil; total 27. This tallies fairly closely with a winter count by Alan Wright in June 1964 (20, 2, 2 = 24).

(b) *Northern beaches.*

Taputaputa, 19/12/67, 3; Spirits Bay, 12/11/67, 10; Tom Bowling Bay, 20/12/67, 14; total 27.

A flock of 12 was recorded at Spirits Bay on 10/1/58 (8:71). There is probably some local movement between these beaches. Graham Adams found only 5 at Tom Bowling Bay on 26/12/67, a week after my visit when 14 were counted. At Taputaputa Alan Wright counted 7 in June 1964 and a Houhora resident noted 6 about a month before my 1967 visit.

(c) *Eastern Beaches.*

Between North Cape and Coal Point beaches known locally as Waikuku and Whareana had on 20/12/67 16 and 14 respectively; none on Ngakino, 14/1/68; total 30.

Graham Adams counted 15 at Waikuku on 28/12/67.

2. *Far North, East Coast.* (116).

(a) *Parengarenga harbour.*

In 1947-50 dotterel nested on shellbanks in many places in the harbour, and nests had been found on the hillside of open scrub in Te Kao valley (Watt, 1947) and on the scrubby hill above Paua (Turbott, 1951). There has been vigorous land development in this area of recent years and most of the land around the western side of the harbour is now in grass.

16 (including an albino) were seen near Paua in early September 1953 (5:225). I have not had an opportunity to search the harbour thoroughly for nest sites but such spring and early summer observations as I have been able to make lead me to the conclusion that there may now be about six pairs nesting within the harbour itself (not counting those on the outer beach).

There are a number of records of flocks in and around the harbour in late summer and autumn, e.g. 15/2/50, 35 and 26/3/51, 71 (Turbott, 1951); 100+, sheltering in a hollow in sandhills on 6/4/53 (5:225); on coastal paddocks, used as a high tide resting place by many hundreds of waders in late summer, 32 on 3/2/68, 55 on 4/3/68, 76 on 23/3/69.

(b) *Parengarenga South Head to Houhora North Head.*

11/11/67, Great Exhibition Bay, 30; Rarawa Bay, 4; Henderson Bay, 4; Kowhai Beach, 8; total 46.

(c) *Houhora South Head to Cape Karikari (Rangaunu Bay).*

The long beach from Houhora South Head to and including Kaimaumau gave a count of 24 on two occasions, 25/3/67 and 5/11/67; about three pairs are reported from the sandbank off Kaimaumau, on which terns breed; Rangiputa sandbank, 18/12/67, 10; Karikari Bay, 8/10/67, 18; total 58.

At Kaimaumau 15+ were recorded on 12/1/58, including two pairs with small running young (8:71). On 12/2/61 70, in parties of 6 - 7 birds, were feeding on the exposed sea-grass flats with other waders, As the tide rose the parties of dotterel joined to form flocks which flew towards the harbour heads.

At Karikari Bay on 15/1/67 52 were counted, but 30+ were in a tight flock and most probably were not local birds but had come in from elsewhere.

None were present at Whaturu Bay, south of Cape Karikari, on 8/10/67; J. F. Anton found five birds there on 13/2/68 but I regard these as probably wanderers from Karikari Bay or some other location.

3. *Far North, West Coast.* (53).

Ninety Mile Beach (actually about 57 miles) can be divided into three sections for which 1967 summer counts were —

(a) Scott Point to Bluff 18
(b) Bluff to Beacon 17
(c) Beacon to Ahipara ..... 18 — total, 53.

On (b) I had a count of 24 in August 1962. This section is much frequented by fishermen and toheroa gatherers and there may have been some decline in dotterel population over recent years. From (b) and (c) I had a count of 32 in April 1963; Dr. J. Murray Speirs (Canada) counted 33 on 21/7/68. All the above counts were made from a moving vehicle, on a low tide; 1967 counts included inspection of areas of flat sand behind the beach, on foot. Possibly some birds may have been missed if instead of coming out to the beach they elected to feed round some of the small pools which lie well back from the beach, in the dunes.

Old residents recall a much larger dotterel population, but a May 1940 count on the whole length of the beach was 50 - 60 birds, in small scattered parties (RB:30). It is clear that a considerable number of dotterel remain on this stretch of coast during winter.

4. *Northland, West Coast.* (145).

(a) *Reef Point to Herekino North Head.*

Reef Point to Waikeri, 15/1/68, 32. Mr. J. Morrison, by whose kind help we were able to inspect this beach with the minimum of difficulty, has seen a winter flock of c.25 sheltering in a hollow on the grassy duneland behind the beach. The southern end was covered on 2/2/68, crossing by boat from Owhata; 12 dotterel were counted near Herekino North Head. Total 44.

From Herekino South Head to Whangape the coast is mainly rocky.

(b) *Whangape South Head to Hokianga North Head.*

Whangape South Head to Akaroa Rock, 7/11/67, 24 (Bob Cowan); Akaroa Rock to Mitimiti, 24/9/67, 20 (Bob Cowan); Mitimiti to Hokianga North Head, 12/1/68, 19; total 63.

My only winter count in this area was on about three miles of the centre section on 18/6/65, 8 birds.

(c) *Hokianga South Head to Maunganui Bluff.*

On 11/1/68, 9 birds at the northern (Waimamaku) end and 29 at the southern (Waipoua) end; total 38.

There may also be some birds around the mouth of Waiwhatawhata stream, south of Outer South Head, which I have not visited. S. D. Potter (RB:13) reported in 1937 three pairs at South Hokianga Heads and three miles south; large numbers had bred at Waimamaku. R. B. Sibson (RB:88) reported 15 on 10/5/40 from Waipoua River to Waimamaku River.

5. *Northland, East Coast.* (171)

(a) *Doubtless Bay.*

Small beaches in Matai Bay area have been visited but no dotterel were seen. Tokerau Beach, as far as Aurere, 8/10/67, 12; Taipa Beach, 24/9/67, 2; total 14.

No birds have been found at Cable Bay or Cooper's Beach, both much frequented by holiday makers.

(b) *Ocean Beaches, Berghan Point to Cape Wiwiki.*

Motukakaha Bay, 14/2/68, 2 (J. F. Anton).

Taupo Bay, 18/9/66, 2; 24/9/67, 2; 14/2/68, none (J. F. Anton).

Arrow Island, just outside the entrance to Whangaroa harbour, a pair on 20/12/51 (5:113).

Tauranga Bay, 26/3/53, 5 (5:225); 18/9/66, 5; 24/9/67, 4; 14/2/68, 2 (J. F. Anton).

Matauri Bay, 10/9/66, 4; Feb. 1967, 2; Feb. 1968, 2; 20/7/68, 4.

Takou Bay (includes Takou, Tapauetahi and Taronui Bays), 14/1/67, 22; 16/10/67, 26; 17/2/68, 15.

Mataka (a small beach N.E. of Cape Wiwiki), a breeding pair in January 1965 and subsequently.

Records from Taupo, Tauranga, Matauri and Takou Bays suggest local movement after the breeding season.

Total recorded in most recent breeding seasons, 45.

(c) *Cavalli Islands.*

Sibson (1953) recorded in December 1951 three pairs on Motukawanui and two pairs on Motukawaiti. I have not had an opportunity to check the present position but local information indicates that birds still inhabit these island beaches. Estimated population 10.

(d) *Bay of Islands.*

Island sightings are reported from Motu Arohia, 16/5/60, 5 (9:75), and Waewaetorea, 15/3/64, one; November 1967, a pair (C. W. Devonshire). Odd pairs breed in several locations in and around the Bay and its inlets. The winter flock in Kerikeri Inlet probably provides a reasonable figure for estimate of population, and has risen from 16 in 1963 to 20 on 12/7/68.

(e) *Ocean Beaches, Cape Brett to Bream Head.*

No birds have been found on small beaches north of Bland Bay.

Bland Bay, 23/9/66, 10; 6/8/67, none; 21/10/67, 12.

Mokau Bay, Feb. 1961, 4; 21/2/63, 2 (M. Ross); 9/9/65, 2; 23/9/66, 2.

Oakura and Helena Bays, none seen on several visits.

Mimiwhangata (north and east beaches), 16/6/57, 11 (H. R. McKenzie); 21/8/61, c.10 (9:242); 17/10/66, 19; 4/7/67, 6; 21/10/67, 16.

Whananaki, south of river, 2/1/54, 5 (H. R. McKenzie); 16/9/67, 10.

None found at Sandy, Woolley or Matapouri Bays, 16/9/67.

Ngunguru, January 1937, 4 (RB:13); 18/5/40, 3 (RB:88); no recent records available.

Ocean Beach, 6/12/64, 29, two nests each with three eggs (Wildlife party); 4/2/66, 12 (Mrs. E. Ward).

Seasonal fluctuations in numbers at Bland Bay, Mimiwhangata and Ocean Beach suggest local movement after the breeding season.

Total recorded in recent breeding seasons, 69.

(f) *Whangarei Harbour.*

Whangarei Heads, 1/1/62, 2 (Ruth Trower).

Marsden Bay, 12/1/57, 6 (H. R. McKenzie); 24/11/59, c.20 (9:75); 13/2/66, 2 (Mrs. E. Ward).

Kioreroa, 25/1/69, 9, on sandbanks formed by dredging operations.

Estimated population, based on most recent records, 13.

6. *North Auckland, East Coast.* (137).

(a) *Ruakaka.*

13/2/46, 25+ at estuary (H. R. McKenzie); 13/1/47, c.26 (2:164); 2/2/58, 34 and 7/4/58, 30+ (8:71). The population seems to have declined. Wildlife party on 5/12/64 recorded only 20 from Ruakaka estuary to Marsden Point.

(b) *Waipu.*

Wildlife party, 5/12/64, 26 on river spit, 6 plus two well-grown chicks at estuary, 2 between estuary and Tip Road, total 34 plus two well-grown chicks.

January 1968, 18 on one mile of Spit (G. F. H. Moon); 18/2/68, 14 on the flats behind the Spit (J. F. Anton); 24/3/68, 20 on estuary and spit (Graham Adams).

(c) *Mangawhai, Te Arai, Pakiri.*

Maximum counts recorded prior to 1964 were, Mangawhai, 21/5/40, c. 36 (RB:88); Te Arai, May 1955, 20 (6:204); Pakiri, 2/1/47, 16+ (2:164); total, c. 72.

In December 1964 Wildlife party recorded —

Mangawhai, Spit, 10 plus one fledged young = 11; forestry road to high dunes, 6; total 17.

Te Arai, forestry road to Te Arai stream, 3; Te Arai stream mouth, 10; Te Arai Point to Pakiri north stream, 16; total 29.

Pakiri, north Pakiri stream, 12 plus two one-day-old chicks and a nest with three eggs; Pakiri beach, 4; Pakiri lagoon, 10; total 26. Grand total, 72.

More recent records from Pakiri are 6/1/68, 26 and 28/7/68, 22 (Graham Adams). G. J. H. Moon (pers. comm.) states that the population at the south end of Pakiri has dwindled during 1965-1968 period following extensive planting of marram grass, also the lower end of the beach has become very popular with surfers and there is a camp near the river; Te Arai beach is similarly affected but the northern end still has a good population.

(d) *Kawau.*

Moon (1957) mentions a pair which nested on the shell beach of a small island off Kawau Island, near a colony of White-fronted Terns.

(e) *Whangaparaoa Peninsula (Shakespeare Bay).*

7/1/53, one, perhaps two (5:225); 21/10/66, 4 and 10/5/68, 7 (R. B. Sibson).

(f) *Takapuna, Shoal Bay.*

A pair nested on a shellbank near a Pied Stilt colony in 1967/68 season (G. D. Leitch).

7. *North Auckland, West Coast.* (155).

(a) *Maunganui Bluff to 14 miles south of Glink's Gully.*

10/12/67, no dotterel found on this stretch of coastline, on much of which the beach is narrow, backed by sandstone cliffs.

(b) *Kaipara North Head.*

Entering by Ngatawhiti (formerly Ricky's) road, D. J. Murphy and J. C. Smuts-Kennedy (Wildlife) inspected the area north and east of Kaipara North Head as far as the lighthouse between 30/11/68 and 6/12/68 and recorded 75 dotterel.

(c) *Kaipara Harbour.*

On January 18-20, 1965, O.S.N.Z. survey recorded, Tapora, 26; Jordan's, 5; Poutu, east side, 13; Tauhora river, 5; mid-South Head, 5; upper South Head, 25; total 79 (McKenzie, 1965).

(d) *Muriwai Beach and Waionui Spit.*

Winter 1940 — regular counts on 30 miles of Muriwai Beach reveal few or no birds from February to April, increasing in May and 20 - 30 in June - September (C. A. Fleming, RB:45); 9/6/40, 31 (R. B. Sibson).

North end of beach, 18/7/47, 17 (3:95); 17/1/60, 13 (9:75); Spit, 8/4/50, 30 (4:46).

On 14/7/68 Peter Gross and E. K. Saul inspected the whole coastline from Muriwai township to Waionui Spit, about 34 miles. Miles 1 - 12, no birds; miles 12 - 17, 10; beyond mile 25, 31; total 41.

The sum of 75, 79 and 41 = 195, but some adjustment is needed because of probable overlap between the three counts. Sibson (1967) has shown that the harbour population is increased in autumn and winter by post-nuptial flocking, and many of the birds in these flocks will have come from the outer beaches, but as early as January 18 - 20 1965 the effect of this influx would be relatively small, compared with counts later in the season.

Precise knowledge of how many birds breed within harbour limits is lacking, but we know that a few pairs nest at Tapora and a few pairs round Sandy Island (Sibson, 1967); some nest at upper South Head (6:204); Malcolm Ross recorded 10 at Poutu on 7/7/63 and some probably nest in that area. There may well be other unrecorded nesting sites in so vast a harbour.

If it is assumed that half the birds counted in January 1965 had bred outside harbour limits, an acceptable population estimate would perhaps be 75 (b) plus half of 79 = 39 (c) plus 41 (d) = 155.

8. *Auckland Area.* (26).

Perhaps the most reliable guide to the population of Auckland isthmus is the flock count at Kidd's Bay, Manukau Harbour, which has built up from 8 in March 1962 to 25 on 15/4/67 (26 on 31/3/68, R. B. Sibson, pers. comm.) and is considered to have as likely points of origin Manukau Heads, Waikato estuary and the Wairoa estuary across the isthmus at Clevedon (Sibson, 1967). Six birds were recorded at Turanga estuary, Whitford, on 22/6/58 (8:71) but H. R. McKenzie considers that Whitford birds do not normally stay there after breeding and could well be in the Manukau count. Winter records from Clevedon include 16/5/64, 14; upwards of two present throughout 1964/65, 9 on 16/3/65 (Miss A. Goodwin). H. R. McKenzie comments: " Clevedon birds fluctuate greatly and I am sure go to and from Manukau and Firth of Thames, as banding indicates."

One or two pairs have from time to time been reported breeding at Bethell's beach but generally leave in the autumn, though Miss McIntyre recorded two in May 1963. There are numerous records of birds at Whatipu in 1951 - 1959; in 1960 12 were present in January and 10 in December. Some winter counts are 6/6/60, 11 (9:75); May 1961, 11 (R. B. Sibson); May 1962, 7. If birds still winter at Whatipu they would be additional to Kidd's Bay count and the estimate would require upward revision.

9. *Waikato beaches.* (20).

(a) *Waikato Heads and Port Waikato sandhills.*

Some records are, 7/4/47, 11, flocked (2:164); 24/8/60, 15 (9:75); 3/3/63, 13 (Sibson, 1967). Sibson (pers. comm.) writes that normally at least two pairs nest on the big area of sand on the south bank and probably another pair or two on the sandy island which now nearly blocks the river.

(b) *Waikaretu.*

K. M. Sorby once saw two pairs but when visited in 1951 the area was overgrown with lupins (R. B. Sibson).

(c) *Raglan.*

Te Horea, 20/3/59, one (8:204); may harbour a few pairs (R. B. Sibson).

(d) *Aotea Harbour.*

Ruapuke, a four-egg nest found by J. L. Kendrick (McKenzie, M.E., 1967).

The estimate of 20 birds for this area is perhaps conservative and organised observation might disclose a higher figure.

H. R. McKenzie sends a report of 3 birds seen inland on a farm near Lake Wahi in September or October 1965. It is interesting to speculate where they came from and where they were going.

10. *Firth of Thames.* (19).

Autumn and winter flocks at Miranda, 4/7/65, 17; 6/3/66 to 11/4/66, 18; 28/5/67, 19, are made up partly of local breeding birds and partly from birds drawn from other areas (Sibson, 1967). There is known to be traffic between Manukau and Firth of Thames. H. R. McKenzie considers that birds from Ponui and Waiheke Islands probably winter with the Miranda flock. Records from these islands are — Ponui, 8/1/65, 3, strongly territorial (Miss A. Goodwin); Waiheke, Te Matuka Bay, 10/12/54, 2 (6:204); Owhiti Bay, 1955,

2 (7:81); 2/12/63, one (Mrs. Sewell); Palm Beach, July 1963, 2 (Miss L. J. Bishop).

11. *Coromandel Peninsula, Great Barrier and Mercury Islands.* (131).

(a) *West Coast.*

Manaia and Coromandel harbours, no records.

Cabbage Bay, 30/8/60, 6 (9:75).

In December 1964 Wildlife party found none at Cabbage Bay or Otautu, but 2 at Waiaro and 4 at Port Jackson.

(b) *Waikawau Bay.*

December 1964, 14, one nest with three eggs (Wildlife party).

(c) *Kennedy's Bay.*

December 1964, 7, including a newly fledged young bird (Wildlife party).

(d) *Whangapoua harbour.*

31/12/52, 21, in groups of 11, 5 and 5 (5:225).

December 1964, 14, but there may have been others on shell banks in the harbour which were not covered by the tide at the time of the count (Wildlife party).

R. W. Jackson found 20 at Te Rerenga on 11/3/67; in the same month Peter Howard counted c. 80 on Maturangi (Omaro) Spit, shortly after high tide. This autumn concentration represents over 80% of all birds found on Coromandel Peninsula at December 1964 count.

(e) *Promontory between Whangapoua and Mercury Bay.*

Kuaotunu, 31/8/60, a pair with several scrapes (9:75); 28/11/61, a pair, three large and one small chicks (Mrs. Hamilton); December 1964, 6 (Wildlife party).

Otama beach, 5 plus two chicks; Mahinapoua and Opito Bays, 6, December 1964 (Wildlife party).

R. W. Jackson found about six pairs at Kaoutunu, Otama and Mahinapoua in December 1967.

(f) *Mercury Bay.*

19/9/46, Buffalo, an odd bird; Davis Beach, a pair (2:45); Buffalo and Ohaka beaches, December 1964, one (Wildlife party).

Cook's Beach, 6/1/53, 20 in dunes (5:225); 27/1/54, 6 or 7 (6:97); December 1964, 4 (Wildlife party).

These beaches are now highly developed.

(g) *Hot Water Beach.*

December 1964, 7 (Wildlife Party).

(h) *Tairua.*

10/9/46, a pair (2:45); December 1964, Pawanui beach and spit, at the mouth of the harbour, 9 and one chick (Wildlife party); 24/12/67, 2 at Tairua (R. W. Jackson).

(i) *Opoutere.*

Recorded in 1955 and 1962; 16/6/64, 6 (Mrs. Waters); December 1964, 16 (Wildlife party); June 1967, 12, per Mrs. Waters (Sibson, 1967).

(j) *Great Barrier.*

Whangapoua estuary, June 1957, 8 - 10 pairs; December 1960, 20 - 30 birds including two almost fledged young, all in pale plumage (Bell and Brathwaite, 1964).

Kaitoke beach, 2/11/50, at least 12 (4:184); December 1960, three pairs and a single bird (Bell and Brathwaite, 1964).

(k) *Great Mercury Island.*

White Beach, September 1961; 31/8/62, a pair at Coralie Bay, a pair and a single at White Beach; two pairs, very agitated, on pasture land on the flats, 27/11/62 (Skegg, 1963).

12. *Bay of Plenty.* (57).

(a) *Whangamata,* 2 males and a female in December 1963 (J. Lambert).

(b) *Little Waihi.*

28/5/58, 3 (8:71); 17/7/66, 5 (R. W. Jackson); 8/8/66, 5 (Mrs. McLintock); 3/6/68, 8 on the spit off Bledisloe beach (W. Broun).

(c) *Athenree,* 1966, 6 (R. St.Paul).

(d) *Matakana Island,* 21/5/64, 12 (Mrs. Calvert); Spring 1967, five pairs, a nest with three eggs (P. Densem).

(e) *Tauranga Harbour.*

Panepane, a pair, 11/12/54 (6:204); Otumoetai tidal flats, first record, 6/7/56, 4 (7:81); the late Mr. Hodgkins reported further sightings, up to 4 in May 1958 (8:71); Otumoetai beach, 31/3/59, 3, 13/11/59 to 27/5/60, up to 5 (9:75); 14/7/61, 9, and one at Sulphur Point flats on 27/12/61 (Mrs. McLintock).

(f) *Maketu.*

River mouth, 31/8/55, a pair (6:204); ocean beach, 28/12/62, six pairs, two nests (C. D. Blomfield); 14/5/67, river mouth, 8 (R. W. Jackson).

(g) *Rangitaiki estuary.*

May 1958, 3 (8:71); 23/5/59, a pair (8:204); 14/8/66, a pair in breeding plumage (R. W. Jackson).

(h) *Ohope,* one on 29/3/59 (8:204).

(i) *Hawai River mouth,* 1957, one pair breeding (7:196).

(j) *Whale Island,* recorded in 1955 (R. T. Adams).

(k) *Rurima Rocks.*

January 1967, a pair with a running chick, and a lone adult (Roy Weston); September 1967, 4 birds and a nest with three eggs (G. Anderson); January 1968, a pair with two flying young and another pair probably nesting (Roy Weston).

Summary of estimated population, North Island known breeding area.

1.	North Cape area	84
2.	Far North, East Coast	116
3.	Far North West Coast	53
4.	Northland, West Coast	145
5.	Northland, East Coast	171
6.	North Auckland, East Coast	137
7.	North Auckland, West Coast	155
8.	Auckland area	26
9.	Waikato Beaches	20
10.	Firth of Thames	19
11.	Coromandel Peninsula and offshore islands	131
12.	Bay of Plenty	57
	Total	1114

Recent Occurrences Outside Known Breeding Area
North Island

East Cape.

Te Araroa, 1952, Mr. O. J. McLachlan, resident since 1900, has seen odd ones on rare occasions (5:225).

Gisborne.

Muriwai Lagoon, 21/3/59, one (8:204); 9/12/62, one (A. Blackburn).

Hawke's Bay.

"Formerly present on Portland Island, and recorded by Hamilton (1886) as present in the area between the Tutaekuri and Mohaka Rivers. . . . I know of no recent occurrences anywhere along this coast." (Brathwaite, 1955).

Volcanic Plateau.

From 1914 to 1925 in the area between Karioi and Waiouru 5 - 6000 acres were in oats and large blocks in winter fodder, mainly swedes. New Zealand and Banded Dotterel then frequented this area. There is no cropping now. (E. Dear).

Ohaki, near Broadlands, between Taupo and Rotorua, 5/3/60, one at lake (9:75).

Taranaki.

29/10/67, a bird in red plumage at the mouth of Waiwakaiho River; 10/3/68, a pale bird at the mouth of Pungaereere stream, near Rahotu, south of Cape Egmont (D. G. Medway).

Wanganui.

Waitotara estuary and lagoon, one on 29/10/46, 8/1/47 and 21/2/47 (2:164); one at lagoon, 24/10/47 (3:95); two at estuary, 4/12/48 (3:209).

A bird thought to be this species was seen at Turakina beach in 1966 by a Royal Forest and Bird Society party (M. G. Macdonald).

Manawatu.

Ohau River mouth, south of Levin, 1/3/40 (RB: 88).

Wairarapa.

Very rare; only seen once, Onoke Spit (RB:13).

South Island

Marlborough.

Wairau Bar, 29/12/43, flock of 14 (1:73); two seen by J. L. Kendrick in December 1968, but had moved on by 26/12/68 (B. D. Bell).

Nelson.

Farewell Spit, mid-March 1958, 2 (8:71); 22/1/61, 5 (Bell, McKenzie and Sibson, 1961); May 1962, 5 (Edgar, 1962); 19/9/62, one (Bell and Zumbach, 1963); 6/4/65, 3 (Bell, 1966); June 1966, 6 (B. D. Bell); January 1967, 3 (Andrew, 1967).

West Coast.

Okarito (RB:88); Harihari, 13/11/65, one flushed near outlet of saltwater lagoon (J. Hilton, J. R. Jackson).

Otago.

Two seen near Luggate in Central Otago about 1953 (Williams, 1963).

Southland.

The status of the species in Southland is not yet clear. There may be a small resident population breeding in a location as yet undiscovered, or the frequent sightings at Oreti, Invercargill Estuary, Awarua Bay and Waituna may be birds which have come across from Stewart Island. All sightings which have been published or of which I have a record were in the period January to July, except for 10 birds recorded at Waituna on 1/10/55 by R. M. Royds. Even this comparatively late date is not evidence of breeding, which has been stated to take place about a month later in Stewart Island than in Northern New Zealand.

Stewart Island

Breeds on bare hill tops about 1500 ft. a.s.l., and on sand dunes at Mason Bay. Seen on mudflats, Freshwater River. Largest number probably several hundred, Freshwater Estuary (R. H. Traill). At Old Neck, 23/5/55, 218+ in one flock, few showing colour (6:204).

Freshwater River, 8/1/57, six groups of up to 30 birds (D. E. Crockett).

There are numerous more recent records from coastal areas and elsewhere on the island, but in small numbers.

Post-Breeding Flocking and Local Movement

R. B. Sibson informs me that a flock of 51, the biggest yet recorded for Southland, was seen near Tiwai Point in January 1969. In the absence of proof that dotterel breed on Southland coast it must for the present be assumed that these birds came across Foveaux Strait; there is no evidence that southern birds move further north.

A large proportion of Coromandel dotterel population evidently flocks in Whangapoua harbour. Sibson (1967) gives detailed flocking records from Miranda, Manukau and Kaipara, showing that flocks in these locations reach their maximum size about April. The biggest flocks recorded in Kaipara are, Tapora, 16/4/61, 40 in a flock and 10 scattered; 19/4/65, 40; Jordan's, 39 on 18/2/68, 41 on 17/3/68 (R. B. Sibson, pers. comm.); Mairetahi, 24 in a paddock on 16/3/64 (H. R. McKenzie). The sum of these maxima (40 + 41 + 24) = 105, against a tentative estimate of 155 for the population of Kaipara harbour and beaches to north and south of it. The indication is that in this area the proportion of birds flocking to those which remain near their breeding stations is approximately as 2:1.

Further north it seems that a high percentage of west coast birds may spend the winter near their breeding grounds (see Locality 3, 90 mile Beach and 4(b), Reef Point to Herekino. A flock of 12 in January 1958 at Spirits Bay may have represented that year's population for this area.

On Northland East Coast several flock records have been mentioned — Parengarenga harbour, 55, 71 and 76 in March, 100+ in April; Kaimaumau, 70 in February; Karikari Bay, 30+ in January. The sum of these maxima is c. 200 birds, at first sight an impressive figure compared with an estimated population of 317 from North Cape to Whangarei harbour, of which about 20 are known to winter

in the Bay of Islands; but there is a reasonable probability that the January Karikari Bay flock and the February Kaimaumau flock were on their way further north. As far as is known Parengarenga flocks are at maximum in March and April, and this area may be the final destination of flocking birds seen elsewhere on Northland East Coast earlier in the season. We know that a flock of 100+ was present in April 1953 on the white sand spit between the harbour and the outer beach, an area difficult of access and so extensive that even a large flock sheltering in a hollow could easily be missed. In April 1953 the western shore of the harbour was under scrub, and exceptionally high tides caused waders to concentrate on the sandspit and on beaches at the Heads. Conversion of the scrubland to grass paddocks has now provided an alternative high tide roost; such autumn flock counts as have been made since 1953 have been on these paddocks, but the maximum recorded (76) does not necessarily represent the total number of birds then present in the area, which could only be ascertained by a simultaneous count on paddocks and sandspit.

Records under Locality 5 (b) show that there is post-nuptial movement away from Taupo, Tauranga, Matauri and Takou Bays; September-October counts from these four localities totalled 36 and counts in the following February totalled 19. Under Locality 5 (e), Mimiwhangata records of 19 in October, 6 in July and 16 the following October are fairly conclusive evidence of movement of adults as well as young birds. No valid conclusion can be drawn from Bland Bay figures because of the possibility that birds may have flown from the beach to the mudflats south of the bank, or from Ocean Beach because of the lapse of time between records.

Substantial winter counts from Mangawhai and Te Arai, Locality 6 (c), tend to show that birds in this area may be fairly static.

These admittedly inconclusive paragraphs have been written on the principle that to set down what you do know is the best way to find out what you don't know — a useful guide-line for future field work.

Banding has shown that young birds wander. Chicks banded at Kaiaua on 13/12/53 when about 22 days old were seen several times during March and April 1954 at Karaka, 26 miles overland from the point of banding (Bull, 1954). Two young birds banded at Whitford in November 1967 were seen at the end of February 1968, one at Karaka and one at Miranda (H. R. McKenzie). This observer (in litt.) does not recollect that any one of his banded birds has been known to remain in the same place for a year. Some have come back to the place of banding after being away for some time. At Karaka in the nesting season he has noted that unemployed birds, identifiable by colour and odd features, have changed in one week.

Survival of the Species

Many hazards affect nesting success. Shellbank nests may be washed away by high tides, sand dune nests covered by shifting sand or trodden by wandering stock; development of beaches may deprive dotterel of traditional nesting sites, and of course accentuate the human interference factor; eggs and young may suffer from animal

predators, hawks or Black-backed Gulls. It seems that one egg of the three often fails to hatch or produces a weakling which fails to survive; family parties of two adults and three young birds are seen less often than might be expected.

H. R. McKenzie's close study of Red-breasted Dotterel in Auckland area has added much to our knowledge and suggests that it is a reasonably hardy species. Dotterel are good parents and if the first or even the second clutch fails will nest again, sometimes with good results. He records (1952) that in 1950 two pairs of birds laid three clutches, each of three eggs, from which only four chicks were known to reach flying stage, but that what was almost certainly a single pair had 3 eggs on 2/10/54, later washed out; 3 eggs on 14/11/54, later robbed; 3 eggs on 15/1/55 which hatched, and the young birds were banded on 12/2/55. (6:213).

Evidence that young birds can breed in their first year is provided by his record (pers. comm.) of the female of a pair which, seen at Miranda on 5/11/62 with a week-old chick, carried leg bands showing that it had been banded at Karaka on 7/12/61 when approximately one month old. His record of a bird banded at Karaka in December 1961, seen in May 1966 and again in January 1968, is evidence of long life.

Even in Buller's day the Red-breasted Dotterel was " nowhere very plentiful." Its distribution at that time included Rotorua in North Island, the Central Southern Alps where it bred as high as 4,800 ft. a.s.l., and probably the Spencer Ranges in Nelson district. No longer is it " distributed along the whole of our shores " but the distributional gap between northern and southern populations has narrowed somewhat within the last twenty years. When C. A. Fleming (2:45) found one pair on territory at Tairua on 10/9/46 he noted this as apparently the southernmost record on the east coast of North Island in late years; since then there has been an encouraging number of records from all along Bay of Plenty. Records from Marlborough and Farewell Spit pose the question of whether there may still be a small residual breeding population in the high country of that part of South Island. A slow but steady increase in population is taking place in Auckland area, Kaipara is still a notable stronghold, and on many thinly populated Northland beaches it is difficult to persuade local residents that they are looking at one of the rare birds of the world.

CONCLUSION

I am grateful to Terence Calvert, Dale Calvert and Bob Cowan for many miles of beaches run and for their meticulous tallying of dotterel and other birds seen: to Peter Gross for his Muriwai count; to H. R. McKenzie and R. B. Sibson for much practical assistance; to A. H. Watt and R. H. Michie for helpful discussion; to E. G. Turbott for reading and commenting on the manuscript, and to all those who have contributed items of information.

I am very conscious of the limitations of a population estimate compiled from data gathered over a number of years, but as far as I know no such estimate has previously been attempted and perhaps an estimate on this basis is better than none at all. It is, I think, conservative.

Some of the information on habits, behaviour and distribution has already appeared in print, but spread over many years; I make no apology for presenting it again in summarised form, for the benefit of those who are not fortunate enough to live in areas where these dotterel are easily available for observation. By one's own observations to correct or amplify what has already appeared in print is a most rewarding exercise for a field observer; I hope that many members will take the opportunity to do so, those in "dotterel areas" by gathering additional information on population, flocking, local movement and ecology, those in less favoured localities by keeping a good watch for wandering dotterel or occupation of new breeding areas. All such information which may be gathered should please be recorded, if not in *Notornis*, at least in O.S.N.Z. Recording Scheme.

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SHORT NOTE

BEHAVIOUR OF BLACK-BACKED GULLS

The sight of Black-backed Gulls *(L. dominicanus)* dropping pipis and other bivalves on to hard beach sand and coastal rocks is a common one, and is a type of behaviour probably acquired by learning, as opposed to instinct. By what process, other than reasoning, has the bird acquired the habit of dropping shellfish on to the bitumen surface of roads? I was interested recently to observe four Black-backed Gulls dropping pipis on to the bitumen of Wainui Beach Road, some 200 yards from the source of the food.

— J. W. BAIN

THE PUKEKO (PORPHYRIO MELANOTUS) IN NEW ZEALAND

By A. L. K. CARROLL

HISTORICAL

According to Maori tradition the Pukeko was brought here from Hawaiiki, approximately twenty-four generations ago, in two canoes of the great Fleet — *Aotea* and *Horouta* — and was known as "pukeko" in the former and "pakura" in the latter (Buck 1949). Referring to *Aotea,* Best (1942) wrote that Pukekos " are said to be natives of Rangitahuna or Sunday Island, 600 miles from Auckland, and there is some evidence to show that *Aotea* tarried there awhile when coming hither to Aotearoa."

Whether or not tradition be true, the Pukeko, like many other species now resident in New Zealand, almost certainly arrived here from Australia in comparatively recent times. Fleming (1961) wrote of it as a " young colonist," while Falla (1953), commenting that the Pukeko is still taxonomically indistinguishable from the swamp-hen of eastern Australia, described it as a " non-endemic native " exhibiting " all the vigorous adaptability of a new migrant."

Whatever its origins, that the species was already widely distributed in pre-European times is shown not only by reference in Maori lore but by place-names incorporating the word " pukeko " or one of its variants such as " pukaki " and " pakura," e.g. Kai-pakura Swamp near Balfour translates " to eat swamp-hens " (Beattie 1919) and Pukeko-nui Swamp (*nui* = plentiful) in the Horowhenua dune belt (Adkin 1948). Indication of early wide dispersal also lies in archaeological occurrences of its bones. Trotter (1965) reported three finds in probable moa-hunter deposits (about 500 years old) at Ototara (South Canterbury), Timpendean (Weka Pass, North Canterbury) and Sumner (Christchurch); and one in a late Classic pa site (possibly 200 years old) in Auckland. Hutchinson (1897) found bones in an ancient undated midden at Wainui Beach (Gisborne).

The first European to record his observation of Pukekos was Sir Joseph Banks in 1769 or 1770. Subsequently Crozet (1772) noted " Blue Fowls " at the Bay of Islands and Yate (1835) briefly described their habitat and habits (Oliver 1955). Buller (1877) reported Pukekos abundant throughout the Rotorua-Taupo district especially at Rotomahana, where " several hundreds may be seen in a single flock " and in 1888 he wrote, " A favourite resort of this bird is the swamp at Te Aute." He noted that at Tokaanu the Maoris annually snared thousands during June and July, the birds being then very fat. They were plentiful enough in many areas not only to be an important item of food, but also a nuisance in Maori cultivations. Best wrote of Maoris constructing light fences of reeds, etc., to protect crops from their depredations.

POPULATION CHANGES

Pre-European Pukekos lived in a comparatively stable environment, prospering in favourable habitats, forming large colonies in the extensive swamps of Waikato, Canterbury, Southland and Westland. They had few enemies apart from the Maoris, whose hunting was regulated by strict tribal laws which fostered conservation of all food species and appeared to have no deleterious effect on populations.

Even so, changes inevitably occurred. As Frauca (1967) observed of *Porphyrio melanotus* in eastern Australia, a flock may long remain stationary in an area pro ded the ecological balance is undisturbed, but pressure of increasing numbers would eventually force birds to move elsewhere.

The advent of European settlers brought widespread and rapid changes as a consequence of conversion of wilderness into farmland. Since then, drainage of thousands of acres of swampland has progressively modified and obliterated much Pukeko habitat. Fortunately the birds have proved themselves remarkably adaptable and, exploiting their new environment, flourish in many areas where land development has occurred.

Guthrie-Smith (1953) wrote of birds on his land in 1914, "The Pukeko has gained by every step in the development of the station — by the increase, in fact, of treadable surface. Hundreds run in swamps now drained dry, hundreds explore the hills; cropping, the anathema of many species, is a boon to the breed."

The Pukeko benefits from land settlement only as long as sufficient water and cover remain. Nests can be constructed on reedy margins of drains, and crops and pastures provide easier foraging than swamps. Further development of many areas has resulted in final obliteration of any remaining Pukeko habitat and disappearance of the birds. However, in recent years, the raising of lake levels, the construction of new lakes for hydro-electric purposes, and the increased development of farm ponds and dams has provided new wet areas, many of which support Pukekos.

Since records were first kept, there have been reported fluctuations in their numbers, distinct from seasonal flocking and dispersal and attributed to a variety of causes. Buller received at least three reports of rapid colonization of districts where Pukekos were previously almost unknown, namely Amuri (on the West Coast - Canterbury border) in 1861, Whangarei in 1865 and Lake Hawea at about the same time. Handley (1895) noted a decrease about Picton and Nelson; Kirk (1895) commented that a "marked diminution," following an earlier expansion, might be traced to destruction of eggs by rats; Fulton (1907) mourned, "The Pukeko . . . is fast going — his swamps extensively drained, his nests easily found," but he continued, "he is on the increase at Waimate, Streamlands and Waikaka Valley and is held as common at Ramarama, but elsewhere throughout the Islands he is very scarce." When Guthrie-Smith returned to Tutira in 1919 after an absence of five years, he found the Pukekos, which were abundant when he departed, now reduced to five pairs. There was no obvious cause: the swamp was unchanged; no poisoning or shooting had occurred; depredations by

weasels were unlikely and many other species of birds had increased. He suggested the possibility of emigration, the habitat of Tutira perhaps having become over-stocked. However, by 1962 Pukekos were again plentiful here.

Recently, a 1967 report from Cust, North Canterbury, noted a sudden increase in Pukeko numbers in swampy areas which coincided with markedly declining numbers in adjacent districts where wetlands had been extensively drained.

Although usually fairly sedentary, Pukekos are capable of making long and often arduous journeys, frequently flying high and at night. Douglas wrote in 1893 Pukekos "can cross the main ranges but many must perish on the journey as I have often found them dead on glacier and snowfield."

Unfortunately, banding returns are few. The sixteen most recent are as follows:—

Banding Date	*Recovery Date*	*Distance from Liberation Point*
Feb. 1967	May 1967	0 miles
Dec. 1966	April 1968	0 miles
Sept. 1960	May 1961	¼ mile
June 1960	Sept. 1960	1 mile
Feb. 1963	June 1967	4 miles
Feb. 1967	– 1967	4 miles
July 1963	– 1967	4 miles
June 1960	May 1964	9 miles
Sept. 1966	June 1967	10 miles
June 1960	March 1961	15 miles
July 1967	May 1968	20 miles
July 1967	May 1968	31 miles
July 1967	May 1968	36 miles
July 1963	May 1968	46 miles
Feb. 1967	May 1967	105 miles
Feb. 1967	May 1967	112 miles

The last two birds had travelled from Lake Tuakitoto, one to Otiake, Upper Waitaki, the other to Waikakahi, north of the Waitaki River.

SHOOTERS AND OTHER PREDATORS

Although modification of habitat has undoubtedly effected greatest changes in Pukeko populations, depredations of predatory birds, mammals and shooters have also played a part.

Pukeko nests, constructed on the ground, are especially vulnerable to predation by, for example, rats. However, the extent to which predators influence Pukeko numbers is not known.

As for shooters, until 1900 Pukekos received no legal protection. Native game birds listed in the Animals Protection Act of 1867 excluded Pukekos. The Animals Protection Act of 1900 carried an amendment, "Every third year, commencing on the first day of April, 1901, shall be a close season in which the native pigeon, pukeko and kaka shall not be shot, taken or killed." The Animals Protection and Game Act, 1921-22, declared Pukekos an absolutely protected

species, but in 1923 they were again gazetted as native game and have been so ever since, with seasons at the discretion of the Minister. Before 1958 the daily bag limit varied considerably, there being no limit for several years in the Westland, West Coast, Wanganui, Taranaki, Stratford, Rotorua, Hawkes Bay, Gisborne - East Coast, Hawera and Otago acclimatization districts. In 1958 and subsequently daily bag limits have been imposed on all districts. From 1958-61 these were usually 15 birds. Since 1961 the limit has been reduced to a maximum of 10 per day. Shooters diaries for the 1968 season show 413 Pukekos killed on 75 licences. The total number of diaries so far received is 219, nine of these being from districts where Pukekos are at present protected. Thus the average number of Pukekos shot per diary returned is 1.9 for the season.

Where Pukekos are numerous enough to be a nuisance, residents may apply for, and usually receive, special permits to destroy, these permits being usually limited to a period of one month. Birds thus shot are relatively few. From 1955 to 1967 inclusive, 7,442 were shot on 328 special permits, an average of 22.7 birds per permit. The annual total of birds killed on these permits averaged 572.5, by far the greatest numbers being in South Auckland - Waikato and South Otago - Southland.

Illegal hunting also undoubtedly occurs but to what extent is naturally not known.

Probably shooting usually causes more concealment and dispersal than destruction of birds.

THE REASON FOR THE PRESENT INVESTIGATION

Where numerous, Pukekos frequently are regarded as pests — by farmers for raiding crops and pastures and by sportsmen for their alleged taking of duck eggs and ducklings. From time to time these people have sought the removal of protection from Pukekos, a move vigorously opposed by conservationists, who advocate complete protection as the only safeguard against final extinction. This conflict has caused the Department of Internal Affairs to make a study of the past and present status of Pukekos in New Zealand in the hope of assisting all interested bodies to reach agreement on the future management of the species.

MATERIAL

Material was gathered from all available sources: departmental records, books, journals, reports, letters, shooters' diaries and personal comments. Most was supplied by acclimatization societies, Field Officers of the Wildlife Service and members of the Royal Forest and Bird Protection Society and the Ornithological Society of New Zealand. During 1967 these groups conducted a Pukeko survey throughout the South Island and the resulting reports and bird counts are incorporated in this study.

All verified records that I have found of occurrences have been grouped geographically and arranged chronologically in an attempt to estimate overall trends in population changes. These data are in the possession of the Department of Internal Affairs and may be consulted on request. Their significance is restricted by several factors: the conflicting interests of observers, seasonal variation in flock size and unequal and discontinuous sampling.

With such a widespread and numerous species, no clearly defined result is possible. A project of this kind, however, may yield useful information from a study of locality records and especially valuable are authoritative reports on population trends in counties and districts.

The accompanying grid map shows, in very general terms only, estimated and reported occurrences of Pukekos since 1960. Sight records have been consistently received from most permanent wetland areas and those regions remaining blank roughly coincide with the main mountain systems, where little Pukeko habitat occurs. Some of the blank sectors in low-lying districts may indicate a dearth of observations rather than of Pukekos. Where discrepancies in reporting occurred, I have used my own judgement, based on the origins and numbers of the reports.

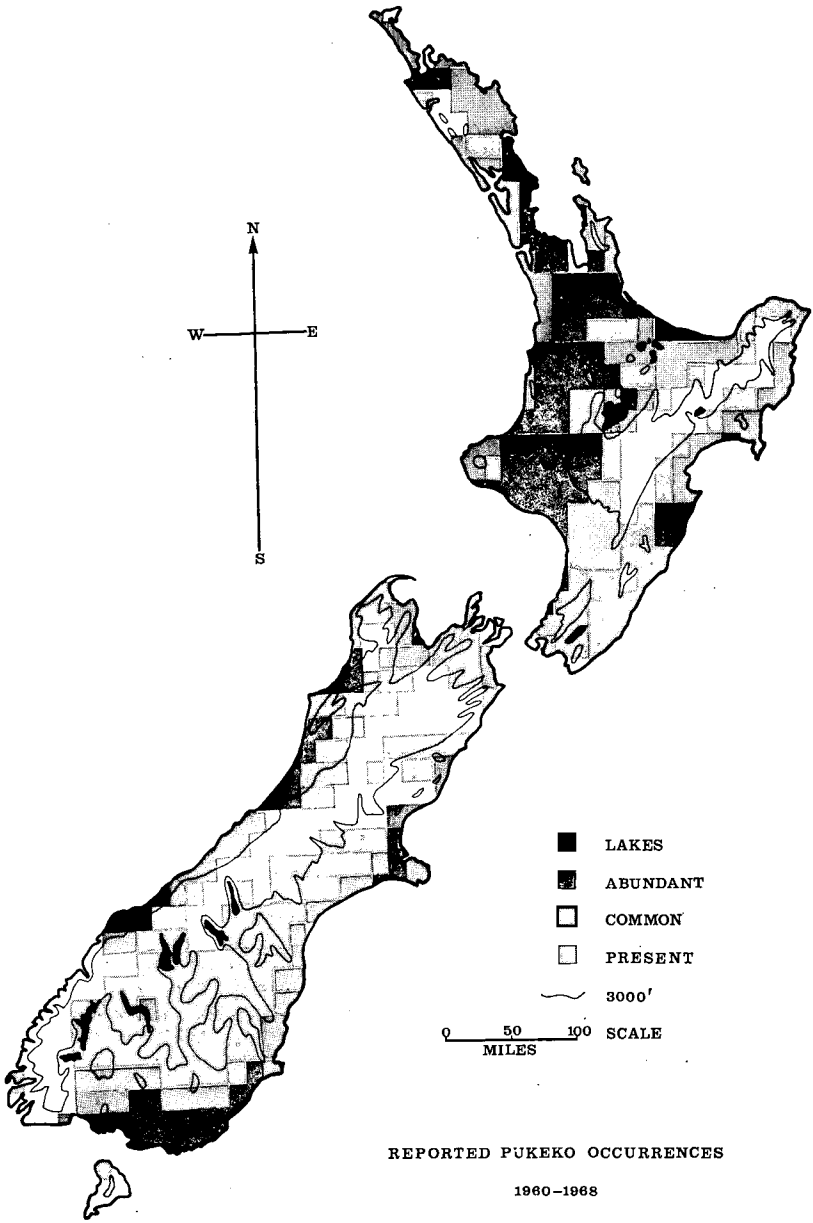
Use of a grid map was considered the best method of using incomplete material, despite the attendant risk of distortion through over-simplification. The New Zealand Zootopographic map has been used, its lines co-incident with those of the New Zealand National grid. Grids were halved longitudinally, making sectors 12.75 miles x 17 miles (216.75 sq. miles), thus allowing for the showing of more detail. Population densities were indicated by shading. The terms used were " abundant," " common " and " present," the last including all references which described the birds as scarce or present only or which gave no indication of numbers.

RESULTS

These are presented in order of districts from north to south. Although they roughly coincide with acclimatization society districts, there is deviation when another arrangement seems geographically more suitable.

North Auckland — Predominantly lowland, this district is characterized by shallow harbours and tidal estuaries backed by extensive wetlands which provide suitable habitat throughout almost the whole area. Earliest sightings of Pukekos in the far north were by Crozet (1772) at the Bay of Islands. I have found no further reports until 1896 when Pycroft described them as common. They have persisted until the present: Edgar (in litt) reported about 20 birds on his property at Kerikeri in 1968 and noted they were increasing.

At Whangarei, Captain Mair informed W. L. Buller (1865) that Pukekos, not seen during the fifteen years preceding 1865, appeared during that year and by 1877 were plentiful in many localities. Subsequent reports include comments on flock movements. At Mata, south of Whangarei Harbour, Sanderson reported they were unknown until 1937, when they arrived in numbers from the south and by 1940 were abundant. Conversely, plentiful and destroying maize at Parua Bay in 1907 (Fulton), Pukekos were very scarce by 1948. Birds remained numerous in the vicinity of Whangarei until the late 1940s, but by 1951 a closed season was requested because the population was then reported seriously depleted by shooting. However, entries in 1968 shooting diaries indicate that birds have again increased here almost to pest proportions. Saul (pers. comm.) confirmed this fluctuation in numbers, noting birds were scarce about Whangarei from 1949 to 1954 but once again very numerous by 1968. He observed no change in habitat during this period.



REPORTED PUKEKO OCCURRENCES

1960–1968

Further south, growing numbers were recorded (Fulton) in 1907 at Streamlands, near Warkworth. As late as 1964 they were plentiful enough to be described as a nuisance in Rodney County, despite the drainage here of at least 1800 acres of swamp during the past fifteen years.

The west-coast wetlands have long supported many Pukekos. They were reported abundant in Ahipara (1942), Hokianga (1946), Dargaville (1954-66) and Kaipara district (1956-63), although Robertson (pers. comm.) in June 1968 saw only one in extensive suitable habitat at Mapiu.

In the farthest north in 1946, well-established but restricted colonies occurred from Parengarenga Harbour to Spirits Bay. In 1961 Stead recorded their presence at many localities between Houhora, Kaitaia and Kawakawa; in 1965-66 he noted that they were common at Kaeo and Kaimaumau and present at Rarewa; in 1963 Ritchie observed them at Te Kao and in October 1966 he remarked on their absence from swamps around Parengarenga.

The North Auckland Acclimatization Society in 1939 reported Pukekos to be generally plentiful in all four of its districts. Despite subsequent extensive land development, large tracts of suitable habitat remain and birds still occur in most localities except perhaps in the west and central areas between Dargaville and Hokianga. They are present from Hokianga to Ahipara and in country south-west of Whangarei Harbour: they are common in most of the far north, in all eastern districts as far south as Whangarei and in country adjacent to Kaipara Harbour; they are also abundant from Kaitaia to Whangaroa Bay and from Whangarei to Warkworth.

Auckland — This district extends from Helensville south to the Waikato River mouth and east to Waihi. As almost the entire area, excepting the Coromandel Range, was originally swamp it is reasonable to assume it was occupied by Pukekos in pre-European times. Evidence for this is afforded by the discovery of bones in an archaeological site, possibly 200 years old, at Taylor's Hill, Auckland (Trotter).

Early written records are surprisingly few, the first of which I am aware was in 1907 when Fulton reported Pukekos as numerous at Ramarama. Reports made between 1930 and 1940 confirm their early abundance in many localities: thus for Tuakau 1937, "there are just as many Pukekos about now as ever" (Collins); at Papatoetoe 1940, "they were present until drainage of lake"; Colville 1939, Pukeko were "decreasing because of drainage, very few now" (Wood). H. R. McKenzie recorded the population of Clevedon as sparse from 1940 to 1952, with usually only a few small parties of birds and occasional chicks. After 1952, numbers rapidly increased and remained high at least until 1964.

Despite the reclamation in this district of approximately 35,000 acres of wetland during the past ten to fifteen years, the numbers of Pukeko appear generally undiminished. In 1962-63 a rapid expansion was reported at Clevedon, Waiuku and Whitford, and at Karaka they were breeding freely along ditches and drains. Applications from many areas for special shooting permits and reports from field officers and shooters confirm their continuing and widespread occurrence except in the far north-east of Coromandel Peninsula. Heaviest

concentrations of birds occur north, east and south of Waitemata and Manukau Harbours and across to the south coast of the Firth of Thames.

South Auckland - Waikato — This district extends from Te Kauwhata southward to Te Kuiti and from the west coast to the eastern mountain ranges and embraces the lower Waikato River system and other extensive wetlands which have long afforded excellent Pukeko habitat.

The earliest European to record Pukekos here was Percy Smith who, travelling through Onaio in 1858, wrote " we heard several in the cultivations, one of which A.S. [A. Standish] shot." Conversion of at least 74,000 acres of swamp into farmland during the past fifteen years has not significantly reduced the population, which remains generally dense. In some localities numbers were, at least until recently, expanding; for example at Te Poi (Matamata) in 1962 " Pukekos appear to have increased rapidly over the last two years." Entries in shooters' diaries for 1968 confirm this trend at Lake Waikare, Whangamarino, Te Awamutu, Arohena and Whakamaru where populations, already large, have increased since 1967.

Waimarino — Extending from Taumarunui to Koriniti, this district is bounded on the west by the Wanganui River and on the east by high country from Waiouru to Tongariro.

An Acclimatization Society report in 1944 stated, " Not more than a dozen birds have been seen in the Waimarino during the whole of the forty years of the Society's existence." A " Forest and Bird " note (August 1962) recorded that Pukekos came into the district about twenty years previously, appearing " almost overnight " and that they were by 1962 in most places, having apparently migrated from both north and south. Applications for special permits to shoot Pukekos were received from Karioi (1958-59) and Raetihi (1960), indicating their presence then in nuisance numbers. One shooter's diary for 1968 recorded Pukekos at Waiouru and Field Officers of the Wildlife Service have reported their presence in many localities.

Taranaki — Extending from Mokau in the north to Waitotara in the south, Taranaki except for the country surrounding Mt. Egmont, lies predominantly between sea-level and an altitude of 1000 ft. and contains extensive areas of Pukeko habitat. It is divided into three acclimatization society districts — Taranaki, Stratford and Hawera.

In 1938 the Stratford society reported Pukekos as common to plentiful throughout its district, and all subsequent reports show them to be remaining so. The Taranaki Society recorded a marked increase in populations generally during 1944-45 and reported, particularly at Uruti in 1946, that Pukekos had " increased to such an extent as to be in droves." Later reports showed them as plentiful in the New Plymouth - Inglewood area. The first report from the Hawera Society (1943) described Pukekos as abundant in the district. Subsequently many special shooting permits have been issued, indicating birds to be still numerous.

Entries in shooters' diaries for 1968 note that more birds were seen than in 1967 at Opunake, Inglewood, Okaiawa, Omata, Te Wera, Lake Ratapiko, Midhurst and Kiore but no change at Mata, Pukengahu and Mangamingi. They had become scarce at Eltham.

During the past fifteen years the only recorded large-scale drainage of wetland in the three districts has been of 1204 acres at Makuri. Excluding Mt. Egmont and its surrounding high country, the Taranaki area appears to support a large Pukeko population, with heaviest concentrations in the north, east and south.

Wanganui — This district encompasses the lower Wanganui River system. It extends from coastal plains in the south to an altitude of 2000 ft. in the north and contains vast wetland areas. Acclimatization society reports in 1943 and 1946 described Pukekos as common to plentiful and subsequent applications for special shooting permits implied their continuing abundance in most localities. In 1963 Macdonald reported them to be " generally abundant but less than five years ago." Entries in shooters' diaries for 1968 record stable populations at Wanganui and Lakes Kohata, Wiritoa and Paurie, and that there were more at Waverley Lake than in the previous year. Field Officers of the Wildlife Service report Pukekos to be numerous throughout the Wanganui district.

Manawatu - Wellington — That part of the Wellington Acclimatisation Society's district lying west of the main watershed, it extends from the Kaimanawa Range south to Wellington. Except for the northern and eastern high country, the area is predominantly alluvial plains which descend to a west-coast dune belt with extensive swamps and numerous small lakes.

Pukekos have long occurred here, the name of Kaipakura Swamp indicating their presence in Horowhenua during Maori times. Buller observed them in the Manawatu district in 1875 - 76, after which date they apparently continued to flourish, as from 1937 to 1942 they were reported plentiful from Bulls to Palmerston North and south through Foxton, Levin and Waikanae to Paekakariki (Andrews, Yerex, Hobbs et.al.). Later reports indicated birds to be prospering at Halcombe, Pohangina Valley, Linton, Rangitikei River, Manawatu Estuary, Otaki, Forest Lakes, Paekakariki and the north shore of Porirua Harbour despite drainage of approximately 14,000 acres of wetland between Bulls and Otaki. Further north, they were a nuisance at Ohingaiti in 1958 (Kersey) and in 1959 nineteen birds were shot there on special licence.

Elsewhere they have been reported less numerous. Fleming (1940) noted Pukekos to be very local in the Manawatu watershed. At Marton in 1941 they were " rare to very rare " (N.L.S.) and in 1962 they were apparently still not numerous as a request for a special shooting permit was refused.

In the vicinity of Wellington City, Edgar observed them at Fitzroy Bay (1960); at Wainuiomata they appeared in 1955 but only after floods (Wellington Acclimatisation Society report) and in 1963 " one seen in the past year or two " in the same area (Nelson).

Most recently, shooters' diaries for 1968 record increased populations at Utiku, Tangimoana, Oroua Downs, in the Horowhenua district and that they had " increased greatly, almost to pest proportions " at Foxton. The general picture in 1968 is of heavy concentrations in coastal places as far south as Paekakariki, and moderate elsewhere except in the far north and south of the district, where they are sparse.

Bay of Plenty — This area extends in a wide belt from Katikati to Cape Runaway. Predominantly low-lying, including mud flats, river estuaries and swampland, it almost certainly supported a large waterfowl population in pre-European times, as it still does now. Pukekos were described as plentiful throughout the district in 1937 (Rod and Gun Club). Further reports of their abundance came from Opotiki (Dickinson 1937-63), Whakatane to Opotiki (Phillipps and Lindsay 1948-50), Matata (Westerskov 1950), Tauranga (Hodgkins 1942-62) and Te Puke (Prior 1945).

Extensive land development during the past hundred years has drained thousands of acres of swamps and lagoons. This appears in some areas to have caused a redistribution or diminution of Pukeko colonies, especially in recent years, for example decreasing populations in swamps near Mt. Edgecumbe and from Pongakawa to Pukehina (1964); Vercoe reported from Tauranga (in litt. 1962) a decline in numbers which he attributed to excessive drainage, but in 1963 the Tauranga Acclimatisation Society noted " more now evident probably due to the wet season." A " Forest and Bird " correspondent wrote in 1963 of birds, once plentiful at Opotiki, becoming rare there although remaining plentiful in the Waiotaki Valley. Two reports in 1968 noted large populations at Te Teko and Te Puke. Shooters' diaries in 1968 have reported numbers unchanged at Te Teko, Onepu and Tarawera River and increased at Otakiri and Edgecumbe.

It is not possible to be certain whether the total population has diminished during the past century; however Pukekos are still common throughout most of the Bay of Plenty and especially numerous from Katikati to Whakatane.

Rotorua - Taupo — This is taken to be that part of the Rotorua Conservancy lying west of the main ranges, including most of the central volcanic plateau. It is traversed by the Upper Waikato River and contains many lakes and extensive swamps.

Despite considerable farming development in the past thirty years, much swampland remains. Raising the level of Lake Taupo and the formation of new hydro-electric storage lakes has provided extensive additional wet areas; however, these may not yet be as attractive to Pukekos as their traditional habitats.

Abundant in the lakes district in the pre-European times, Pukekos were noted by Percy Smith (1858) as very numerous at Lake Rotomahana; Buller (1877) reported similarly and added they were numerous also in the Tokaanu swamps.

Since 1939, records indicate the species to be consistently numerous in most localities. During 1962 Hall noted birds " in problem numbers " at Sulphur Pt., Ohau Channel, Hamurana and Reporoa, but Main (in litt.) reported very few left in the Taupo district, where they were previously plentful. However, subsequent liberations of Pukekos have been successful and several new colonies are now flourishing. Shooters' diaries for 1968 have noted birds to be numerous at Waitahanui Swamp, increased at Tauranga-Taupo River, the same as in 1967 at Motuoapa.

At Kaingaroa (1940-48) Weeks reported them common in swamps adjoining, but absent from those within, the forest. Occasional single birds and small parties were noted along the Rangitaiki River

(Ryder 1950). A shooter's diary for 1968 recorded their presence from Galatea to Horomanga.

At present birds are known to occur in all but the eastern part of the district. They are sparse in forested country south and east of Rotorua, west of Lake Taupo and south of Turangi, but present on Rotoaira in 1968 (Sibson); common to numerous elsewhere, with heavy concentrations along the Waikato River and the southern margin of Lake Taupo.

Gisborne - East Coast — This district extends south from Cape Runaway to Mohaka. Lowland areas are confined to parts of the coast and broad valleys and alluvial plains, especially of the Waiapu, Waipaoa and Wairoa Rivers.

Wetlands north of Gisborne are isolated and generally limited, except for swamps between Ruatoria and Cape Runaway. The Wairoa area in early times provided extensive waterfowl habitat of which a considerable part remains, although it is progressively being diminished by silting and drainage. Since 1950, 10,000 acres have been drained here and more than 2,500 acres from Gisborne northward.

Pukeko reports from this district are few. Bones found in an ancient midden at Wainui Beach, Gisborne (Hutchinson 1897), probably originated from local birds although their transportation here by Maoris as prepared food cannot be discounted.

In 1947 a few birds were reported at Mahia Peninsula in swamps near the sea. Special shooting permits were requested from Waerenga-o-kuri (1956, 1957, 1958), Ruatoria (1961, 1966) and Tolaga Bay (1962). Thus birds were sufficiently numerous to be a nuisance, at least in these areas. In 1964 Blackburn noted " a general decrease through shooting " though in a few places they were flourishing. In others they were common — Rototahi Swamp, Lake Repongaere and Mangaheia. Wildlife Field Officers have reported populations moderate in 1968 in coastal areas, with heavy concentrations around Wairoa. Occasional birds were observed in the foothills country from Tolaga Bay to the Mohaka River but none elsewhere. Shooters' diaries for 1968 record increased numbers at Ruatoria and Tolaga Bay but a decrease at Matokitoki Valley, Gisborne.

Hawkes Bay — This district extends from the Mohaka River to Cape Turnagain. Although predominantly hilly to mountainous in the north and west, it includes extensive alluvial plains, especially south of Napier. In the past these afforded wetland habitat which supported many Pukekos.

In 1880 Guthrie-Smith noted them to be present at Tutira, although limited to marshland. After 1890 they increased their numbers and extended their range, remaining abundant until 1915. By 1919 they had almost disappeared but were again common to plentiful in 1962.

Birds were reported present at Petane in 1885 (Hamilton), Maraetotara in 1887 (Buller) and Napier in 1900 (Hutchinson).

Despite intensive agricultural development, considerable wetland remains and later observations have confirmed the continuing presence of Pukekos in many localities. Applications for special shooting permits from Tangoio (1961), Napier (1964), Haumoana-Clive (1959-66) and Hastings (1960-65) indicate abundance of birds at those times.

In Southern Hawkes Bay, Fleming (1939-40) noted that Pukekos were widely distributed and abundant. Subsequent drainage greatly reduced wetlands especially at Poukawa, Hatuma and Wanstead. In 1963 Russell reported Pukekos at Poukawa and Hatuma to be dying out following partial drainage of the lakes. Although this may be so, some colonies yet remain. Stable populations were reported from the Dannevirke-Waitahora area in 1963 and special shooting permits were requested from Porongahau (1962), Takapau (1961), Woodville (1961 and 1963) and Papatawa (1962).

Birds are at present reported common in lowlands from the Mohaka River to south of Hastings, numerous thence to Porongahau and Takapau, scattered elsewhere except in the western high country. It appears that, despite some local diminution or redistribution of populations, Pukekos are maintaining a satisfactory status in Hawkes Bay.

Wairarapa — Is for the purposes of this paper that part of the Wellington Acclimatisation Society's district east of the main ranges, having its northern boundary from Woodville to Cape Turnagain. Wetlands, although limitied, occur throughout, especially in association with Lakes Wairarapa and Onoke at the Ruamahanga River mouth.

Reports from north of Masterton are few. In 1942 Pukekos were described as abundant locally at Konini (Wodzicki) and " once common but disappeared " at Mt. Bruce (Welch). At Mauriceville-Alfredton they were reported numerous in 1953, considerably diminished by 1963. Applications for special shooting permits, one from Mt. Bruce in 1960 and one from Pahiatua in 1967, indicated birds were then numerous. Shooters' diaries in 1968 recorded them to be abundant at Makakahi (Eketahuna), present at Ngaturi and Pahiatua but absent from Konini.

Mr. R. Stidolph of Masterton considers Pukeko populations have fallen by half here, since his first observations in 1921; and believes that this has been caused by drainage of wetlands and by shooting. He reported birds plentiful in Carter's Bush (1944), Waingawa (1950 and 1953), Taueru (1952), Lake Wairarapa (1942), Lake Onoke (1943) and Gladstone (1948). Recently, many small areas from Pahiatua to Masterton and at least 3000 acres of good waterfowl habitat in South Wairarapa have been drained. In April 1968 he wrote, " The distribution in the Wairarapa Valley from north of Masterton to Palliser Bay would be general in suitable areas, with the greatest population, naturally, around Wairarapa Lake. Moreover, they occur much more sparingly in odd pockets in the East Coast farm country." Wildlife Field Officers' reports confirm this, noting also scattered occurrences as far north as Pahiatua.

Nelson — This district extends from south of the Heaphy River mouth east to Havelock and from Tasman Bay to Lewis Pass. Predominantly mountainous, it descends northward to extensive plains and to a coast characterised by deep bays, swamps and tidal flats. Southward it encompasses the upper Buller River system and Lakes Rotoiti, Rotoroa and Daniells.

Reported by Handley (1895) as diminishing in the Nelson-Picton area, Pukekos still survive and, according to Alack (in litt.), in some localities were " staging a come-back " by 1964.

During 1952-53, M. Small surveyed Pukeko populations in coastal areas from West Wanganui Inlet to Croixelles Harbour and inland to Wakefield, Murchison and Lakes Rotoiti and Rotoroa. Although not seen in many areas of apparently suitable habitat, e.g., Parapara Inlet, Wainui Inlet, Rockville Dam and Kotinga Lagoons (Takaka), birds were generally present although nowhere plentiful. He reported large populations at Bird's Lagoon and Windles' Sanctuary (Takaka), Pederson's Sanctuary (Riwaka) and Pugh's Sanctuary (Brightwater).

In 1963-65 Pukekos were stated to be numerous at Kaiteriteri, very numerous at Totaranui, numerous and increasing at Matakiri, Puramahoe and Riwaka, but decreasing at Motueka.

The 1967 Pukeko survey conducted by D. Zumbach showed birds were still widespread and moderately numerous in coastal areas and river valleys from Whanganui Inlet to Cable Bay. Further south he found them to be numerous at Matakitaki, Mangles and Matiri Valleys and at Murchison and present at Lake Rotoroa, Tutaki, Owen, Glengarry and Maruia. Here, as in the north, Pukekos appear to be maintaining their numbers, although, because of the nature of the country, colonies are more scattered and local than in the coastal region.

West Coast - Westland — This district extends from Karamea to Martin's Bay, the crest of the Southern Alps forming its eastern boundary. Suitable Pukeko habitat occurs throughout the long coastal plains, also in the northern high country where river valleys and lakes provide restricted wet areas.

Early accounts indicate Pukekos were well established in many localities before European settlement. They were reported as present at Okarito in 1878 (Hamilton), common at Martin's Bay from 1876-81, Reefton from 1881-85 (Phillipps 1948), and Lake Brunner in 1888 (Smith). At Amuri the advent of Pukekos in 1861 was reported to Buller by Shrimpton, who noted their arrival " first in small parties then numerous," and that they were " previously a stranger." In 1893 Douglas wrote of snaring Pukekos, of how easily they were tamed and of their fear of hawks. Although he made no comments on distribution, it appears he found them commonplace. Thereafter, in Westland generally, they continued " common in suitable country " (Sibson 1940). This was confirmed by Bell (1947).

Since European settlement, much wetland has been drained, including approximately 10,000 acres in the past ten years. In all areas where correlation of drainage and population data was possible, Pukekos were found to be numerous or increasing. This is the expected consequence of initial land clearance and pasture development in a district still well supplied with water.

During 1953 M. Small conducted a Pukeko survey from Karamea to Okarito. He reported light populations scattered throughout the district although birds were not seen in many apparently suitable habitats, for example, about the lagoon and river mouth at Karamea, Lakes Haupiri and Mudgie, Arahura, Totara and Okarito Lagoons. He found them to be abundant at Omoto Sanctuary (Greymouth), Kaniere Lagoon, Saleyards Lagoon (Kokatahi) and Koiterangi.

Between 1953 and 1967 these populations appeared to be maintained except at Amuri, where birds were reported in 1959 by Harris and Northcote to be dying from disease, although their numbers subsequently regenerated considerably. During the 1967 survey approximately 12,300 Pukekos were counted from Karamea to Taramakau.

Applications for special shooting permits indicated that birds were numerous at Hokitika (1966-67), Kokatahi (1965), Kowhitirangi (1960), Harihari (1962), Whataroa (1960-63) and Tatare (1966). According to shooters' diaries populations were maintained in these localities in 1968, also at Reefton, Ikamatua, Te Kinga, Kumera Dam, Arahura Valley, Mahinapua Creek, Arawata Valley and Tatare. They had increased at Waitaha and Kokatahi Valleys, and diminished at Lake Brunner, Rotomanu and Orangipuku River.

From further south only two reports have been found referring to the period between 1881 and 1965 apart from the general comments of Douglas (1893): Mrs. P. L. Moore in 1945 recorded numerous Pukekos at Haast and in January 1954 Small found them absent from the Cook River Lagoon.

The 1967 survey found colonies scattered from Bruce Bay to Cascade Point. They were large and increasing in the vicinity of Haast township, Okuru and Cascade River; small but growing at Bruce Bay, Waiatoto Swamp, Haast River System and Jackson River; small and apparently stable at Lakes Paringa, Rasselas and Moeraki, Maori Lakes, Dismal Swamp (Lake Nisson), and the lower and middle reaches of the Arawata River.

Throughout the West Coast region Pukekos appear to be maintaining their numbers, but local fluctuations follow land development and weather changes. Wildlife field officers have reported in 1968 especially heavy concentrations from Karamea to Westport, from Fox River to Waitaha River, from Greymouth to Inangahua, and from Haast to Cascade River.

Marlborough — This district, predominantly mountainous, descends in the north and east to alluvial valleys and lowlands of the Marlborough Sounds, the valleys of the Wairau River system and a coastal belt, low-lying and comparatively wide as far south as Waima, narrow thence to Clarence and expanding again at Kaikoura. Suitable Pukeko habitat occurs in all lowland areas, particularly in wetlands associated with the Sounds and lower reaches of the Wairau River.

Despite Handley's report in 1895 of rapid diminution of Nelson-Picton populations, Pukekos still survive in many places.

In 1947, within a ten mile radius of Blenheim, they were reported plentiful, increasing rapidly and becoming a pest. During 1952 M. Small surveyed lowlands from Pelorus River Estuary to Kaikoura. He found small numbers in the vicinity of Havelock except at the Kaituna River Estuary. He reported birds to be numerous at Picton Swamp, present to numerous in the Blenheim district, present at Tarndale Lakes (Upper Wairau). He found none at three dams near Dashwood Pass or Blind River (Seddon), although there were a few at Lake Grassmere and many at Blairich Swamp, Lakes Jasper and Elterwater. At Kaikoura they were present (Leg-o-mutton Lake) to numerous (Lizard Swamp).

There were few other reports until the 1967 survey which recorded Pukekos as not seen at Waikakaho Valley, Wairau Lagoons and Taylor River; present at D'Urville Island and the Sounds area, Opouri Valley, Onamalutu Valley, Langleydale and Redwood Pass; and numerous at Para Swamp (Tuamarina Valley). They were reported as having disappeared from Pukako Valley and Riverlands; decreased at Canvastown, Spring Creek and Blairich Swamp; " still a few " at Pelorus Valley and Marshlands; and " remaining numerous " at Lake Jasper, Lake Elterwater and Kaikoura.

It appears that few notable changes have occurred in Marlborough Pukeko numbers during the past twenty-five years.

Canterbury — Lying between the Waiau and Waitaki Rivers, this district extends eastward from the Southern Alps to the coast.

Pukekos have been present in Canterbury from pre-European times. Ancient occupancy is indicated by the occurrence of bones in moa-hunter deposits at Timpendean (Weka Pass) and Moa-bone Point Cave (Sumner), these being possibly five hundred years old.

In 1882 Potts recorded " 189 shot in eight days in the Canterbury highlands . . . [the Pukeko] is no friend of the farmer." Reischek (1885) reported Pukeko depredations among young grain crops and that Canterbury farmers were offering rewards for their destruction.

Apart from general comments, North Canterbury records before 1967 were as follows: E. Roberts noted that by 1900 Pukekos had already disappeared from the head of the Greta Stream and from the Motunau Stream, being then found only between Scargill and the sea; Rentoul reported from St. Anne's Lagoon (Cheviot) that birds were plentiful from 1924 to 1944 " increasing enormously " between 1940 and 1943; at Waikari township " a few present " before 1960; K. Roberts reported at Scargill in 1962, " all Pukekos gone "; Hampton at Rotheram in 1962 reported " increasing again after almost disappearing "; and at Lake Sumner area in 1964 Bell reported Pukekos present.

Many thousands of acres of wetland have been drained and cleared in North Canterbury, especially during the past fifteen years. In 1967 the Royal Forest and Bird Protection Society reported a significant decline in populations from Cheviot to Rangiora, Eyre and Oxford, excepting at Cust where a sudden increase occurred in swamps, probably an influx of birds from nearby drained areas. They were not seen at Scargill. The report concluded, " we consider that there appears over-all to be no marked change of numbers during the past three years, but considerable movement of birds in some areas caused by land development schemes." One shooter's diary noted fewer birds at Waiau, Leithfield and Amberley in 1968 than in the previous year.

From Rangiora and Kaiapoi to Christchurch Pukekos have remained abundant with especially large populations recorded at Burwood in 1967.

The country between Christchurch and Lake Coleridge has long supported a large number. In 1967 the Royal Forest and Bird Protection Society noted an expansion of colonies there, which they attributed to migration from nearby drained areas. Fluctuations at Lake Coleridge were also noted. These were thought to be caused

by unusually cold weather during which many of the birds died, their numbers increasing again during the following seasons.

In the vicinity of Lake Ellesmere this Society noted during the past thirty years a marked decline at Halswell, Ladbrooks, Lincoln and Ahuriri. Considerable increases were recently observed west and south of Lake Ellesmere. Some permanent movement of birds away from the lake has been claimed and this is ascribed by the Society to changes caused by drainage of approximately 1340 acres of wetland.

Nevertheless, Pukekos remain abundant about Lake Ellesmere, except near the Ellesmere-Lyttleton road, where in 1961 Nelson reported that they had become scarce. During the 1967 survey a total of 3,600 birds was counted at Kaituna, Greenpark, Doyleston, Lakeside, Sedgemere and Taumutu.

Ashburton County reports note a declining population especially in the foothills district near Mayfield and Mt. Somers. However, applications for special shooting permits from Wakanui (1963) and Ashburton (1964, 1966, 1967) indicate the recent presence of birds in nuisance numbers in some localities.

An early report from Fulton (1907) noted Pukekos to be increasing at Waimate and in South Canterbury. They have generally remained numerous despite extensive drainage of wetlands from Clandeboye to Timaru and near Fairlie. However, local variations in populations have occurred; for example, the Forest and Bird Society reported in 1967 that birds had become scarce at Geraldine and had disappeared from Albury, Cave and Hook. In 1967 the South Canterbury Acclimatisation Society reported the presence of Pukekos on all river systems in its district, stating, " where habitat is suitable, reasonable numbers of Pukekos exist. Small isolated groups are scattered over most of the district and any wet areas have one or two birds in the vicinity. Birds can be seen as far back as Lake Alexandrina and Godley Peaks Station."

In 1968 Wildlife Field Officers reported them to be especially abundant from Milford to Timaru, at Wainono Lagoon, and in the lower Waitaki and Hakataramea Valleys.

Otago — This district extends between the Waitaki and Mataura Rivers and from the Southern Alps to the sea.

In North Otago suitable Pukeko habitat occurs along river valleys and coastal lowlands. Central Otago, although semi-arid, includes scattered wetland areas which support numerous colonies. South Otago, predominantly lowland with many lakes and swamps, provides habitat for large, widespread populations.

Pukekos apparently have been long resident in Otago. At Ototara (Teschemakers) bones were found in a moa-hunter midden approximately 500 years old (Trotter). Presumably the birds were of local origin although they may have been carried as food from elsewhere. Gray (1844) wrote, " at Matainekа, South Island, says Mr. P. Earl, it is named Pakura. In the summer months these birds are found in the fresh-water lagoons near the sea." Possibly this referred to a locality between Shag River and Waitaki, the territory in which he made his observations. Tily (1946) reported Pukekos as " quite common at least since 1870 " at Long Beach (north of Dunedin), and Douglas (1893) noted they were becoming a nuisance in parts of Otago and Southland.

Subsequent reports showed birds had remained abundant throughout most of the district. However, the Royal Forest and Bird Protection Society (1967) reported a drastic decline in North Otago populations after 1962, attributable probably to recent drainage schemes, droughts and an " invasion of magpies." Even so, birds were still reported as present or numerous at Duntroon, in the coastal belt from Oamaru to Dunedin, and abundant enough to be a pest in the valleys of the Upper Taieri River system. A shooter's diary recorded increased populations in coastal areas near the Waitaki River in 1968.

The Forest and Bird Society recorded a decline in Central Otago Pukekos, thought to be caused by land development, stock damage and drought. However, in 1964 they were generally common in wetlands and lower reaches of alpine valleys and in 1967 were noted as numerous at Matakanui and Ida Valley, common from Moa Creek to Poolburn and present from Alexandra to Galloway.

In South Otago numerous reports since 1940 have indicated Pukekos to be remaining abundant despite considerable land development and shooting pressure. Between 1960 and 1962 several Pukeko drives were conducted: at Ranfurly (15/7/60 - 15/8/60) 950 were shot, at Mosgiel (17/2/61 - 4/7/62) 98 were shot and at East Taieri (22/8/62 - 22/9/62) 400 were shot.

During 1967 both the Forest and Bird and Acclimatisation Societies reported extremely large populations in most areas. Several localities in which Richdale reported small population in 1940 showed a marked increase in numbers by 1960 - 67, e.g., Dunedin, Taiere Plains, Lake Waihola and Balclutha-Otanomo. The Forest and Bird Society noted a decline at Owaka in 1967, although Acclimatisation Society reports claimed that thousands were still present in the Owaka-Catlins area.

The 1967 survey of South Otago showed Pukekos abundant in the coastal belt from Dunedin to Fortrose especially from Berwick to Clarendon, at Lake Tuakitoto, Clutha River estuary and Catlins. Large numbers were also reported in valleys and plains associated with the Clutha and Mataura River systems.

In Otago generally, except for some local recessions in the north and west, Pukekos appear to be flourishing, with densest populations in lowlands from Dunedin to the Mataura River.

Southland — Like South Otago, this district is predominantly alluvial lowland, rising to high country in the north and west. It contains extensive wetlands including the great Awarua Swamp, which lies along the south coast between the Mataura and Oreti estuaries.

Pukekos have long been resident in this territory. Pre-European occurrence at Balfour is indicated by Maori naming of nearby Kaipakura Swamp. In 1870 birds were numerous enough to be snared for food by Maoris at Menzies Ferry (Beattie 1919). Later, Douglas (1893) found them increasing with civilisation and in places becoming a nuisance.

Their widespread distribution was indicated by scattered reports from 1937-40. Matheson recorded Pukekos as present at Pyramid, Castle Rock, Gore and Waikoura and numerous at Riversdale, Five Rivers, Otautau and Dipton. In 1948 they were present at Balfour

Swamp (Dunedin Field Naturalists Club) and, during May and June 1964, 415 birds were shot on special licence in the vicinity of Invercargill.

In 1967 the Southland Acclimatisation Society reported that the effects of extensive land drainage in the Lorneville area, although partly counteracted by establishment of new ponds, had greatly reduced Pukeko numbers there in recent years. Remaining colonies, although now scattered, appeared still capable of maintaining themselves, despite increased pressure during the shooting season. The Society's report continued that birds were recently numerous at Wallacetown Refuge, Oporo, Lakes Murihiku and Hawkins, with a fair population at Awarua Bay.

European settlement and land development in Southland resulted in extensive early drainage of wetland, e.g., thousands of acres in the upper Waimea Valley by 1900. Drainage schemes both large and small have continued to the present time and during the past twenty years more than 22,000 acres have been affected. Nevertheless, ample Pukeko habitat still remains. Wildlife Field Officers report birds generally present, with heavy concentrations on the plains between the Mataura Valley and Te Waewae Bay, and there appears little likelihood of the species becoming rare in this part of New Zealand.

Southern Lakes District — This extends south from Haast Pass to Te Waewae Bay. Its western boundary skirts the crests of the Southern Alps, turns westward at Mt. Aspiring and meets the coast at Martin's Bay. Although mainly mountainous, it contains considerable areas of Pukeko habitat in glacial and river valleys, lake margins and a narrow, discontinuous coastal strip. The earliest reference I have been able to find to Pukekos here is by Shrimpton to Buller (about 1861) noting that at Lake Hawea " they appeared first in small parties and then in considerable force, the bird having been previously quite a stranger to that part of the country. The increase was too rapid to have been the result of natural breeding and must have been occasioned by a sudden migration from the swamps near the coast." Thereafter Pukekos persisted in the area, being reported plentiful near Wanaka in 1907 (Fulton) and present in 1967 (Wright). Two shooters' diaries for 1968 record their presence at Glendhu Lagoon and Cattle Flat.

In 1946 Sinclair described Pukekos as common throughout the Southern Lakes district. At Lake Hayes they were reported plentiful long before 1941 and until 1967 (Yerex, Price et.al.). In 1953 Condon recorded their presence in Eglinton Valley, Kakapo Swamp (Te Anau) and Horseshoe Bend (Waiau River) and in 1964 one was seen at Doubtful Sound (Dorizac per Mrs. M. Barlow).

During the 1967 survey, populations were found, apparently stable but sparse, at Lower Cardrona, Lower Motutapu River Flats, Scaife's Lagoon, Geordie Hill Station (Lindis Valley) and on the Clutha Islands between Lindis and Lowburn; they were in moderate numbers in swamps and river valleys west and south of Lake Te Anau; stable and moderate in the Matukituki River Valley (Wanaka) and numerous in places around Lake Wakatipu. In Makarora Valley no Pukekos were seen until two years ago and the population is now estimated to be seven birds.

In the Southern Lakes district generally it appears that a reasonably stable Pukeko population persists, with moderate numbers in most suitable territory.

Islands

Pukekos have been reported on many inshore islands with established populations at Stewart, Great Barrier, Great Mercury, Ponui and Waiheke Islands and stragglers at Kapiti, Little Barrier, Three Kings, Fanal and Mayor Islands. Merton (pers. comm.) recorded none seen during his visits to Fanal and Mayor Islands in September 1965. Birds are reported as increasing rapidly within the last few years at Great Barrier, Mercury and Ponui Islands.

They occur also on many outlying islands. In the Kermadec group one or more Pukekos were recorded as early as 1887 and in 1967 Merton reported a few at the crater and at Denham Bay swamp on Raoul Island, but none from other islands of this group, which, in any event, are unsuitable habitat. Stragglers have appeared at Campbell Island (Westerskov 1960). In the Chathams, a few were seen at Pitt Island and Bell noted in 1961 an established population throughout the main island except on the southern tableland, but he commented that birds were nowhere numerous by New Zealand standards. In September 1968 Pukekos were reported to be "fairly numerous" in swampy creeks on Pitt Island, especially in the vicinity of Tupurangi Lagoon. Scattered groups were also present on the main island but birds were less abundant than on Pitt Island. The total population appeared to be greater than in 1961 (Bell, pers. comm.).

SUMMARY AND CONCLUSION

Although comparatively recent migrants to New Zealand, Pukekos had achieved a wide distribution before European settlement. Primarily swamp-dwellers, they are adaptable and have survived, even exploited, changes in their environment as long as adequate water remains.

This study has not revealed any general trends in Pukeko population changes, the picture being rather one of local fluctuations. Much original habitat has been obliterated or modified by drainage but new wetlands are being formed by development of hydro-electric storage areas and, less importantly, by construction of farm dams. It appears that dehydration of habitat, either by drought or drainage, is the prime factor causing Pukeko movement from an area. Birds are known to leave localities when conditions become unfavourable and to return when they improve.

Classified as native game, Pukekos are exposed to hunting during the shooting season and may also be shot on special permit at other times when proved or alleged to be a pest to farmers and sportsmen. Shooting, apart from thinning of populations in concentrated drives, usually appears to cause harassment and subsequent seeking after concealment rather than a departure of the birds.

At present Pukeko occur in most parts of the country that are wetlands or well-watered farmlands. They rarely live at high altitudes and are most abundant from 1200 feet to sea level. In the North Island, the greatest concentrations of birds occur from Whangarei, through Auckland, Waikato, Taranaki, Wanganui and Horowhenua districts, with aggregations also at Kaitaia, western Bay

of Plenty, Wairoa and central Hawkes Bay. In the South Island, heaviest populations are on the West Coast, in south Otago and Southland and also near Nelson, north of Christchurch and in the Lake Ellesmere area.

Although subject to a certain amount of redistribution, the Pukeko population of New Zealand appears generally to be prospering. Protection is warranted where local recessions occur, but the species as a whole seems well able to maintain its satisfactory status providing suitable habitat is available.

ACKNOWLEDGEMENTS

I wish to thank all those who have supplied me with information, especially officers of the Wildlife Service and Acclimatisation Societies, also Mr. A. T. Edgar, Mr. M. M. Trotter and Mr. R. H. D. Stidolph. My discussions with many of these people, particularly Mr. R. T. Adams, and with Mr. G. Tunnicliffe have been very helpful. I am grateful to Dr. G. R. Williams and Mr. B. E. Reid for critically reading the manuscript, to Mr. C. J. R. Robertson for preparing the map and to Mr. B. E. Reid for permitting me to use all the Pukeko data that he had collected.

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NOTES ON THE BIRD FAUNA OF OPEN BAY ISLANDS

By IAN STIRLING[1] and P. M. JOHNS
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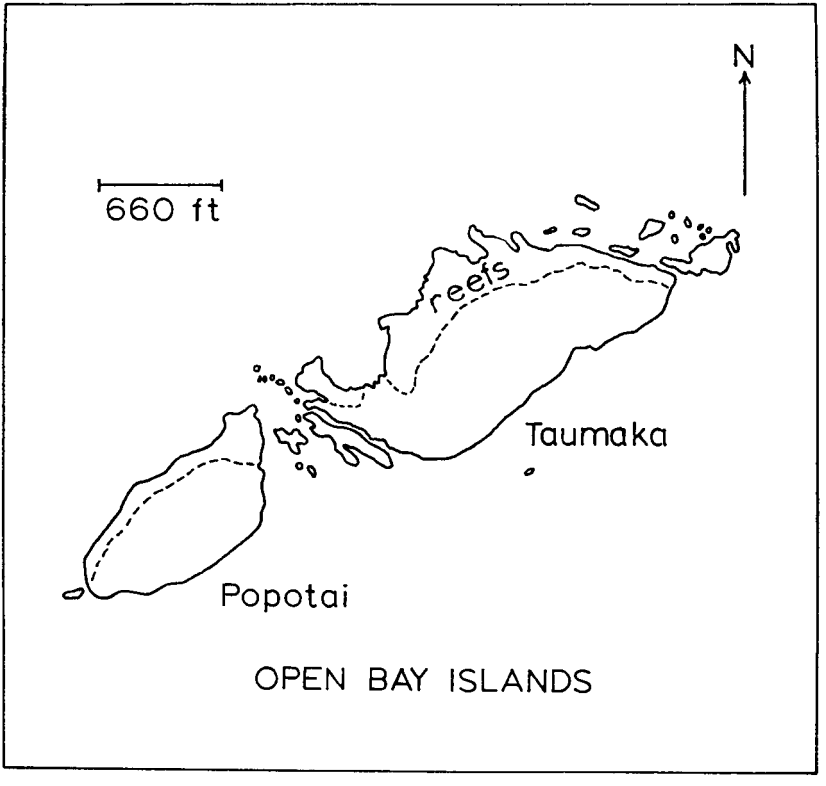
Open Bay Islands lie three miles offshore from the mouth of the Okuru River near Haast, Westland. They are predominantly fine indurated mudstones of Tertiary age covered by a horizontal layer of cemented glacial till and erratics. The soil layer is very shallow, probably less than 12 inches deep over the greater part of the island. Cliffs dominate the southern sides and sloping reefs the northern sides. Figure 1 is a map of the islands.



The vegetation of the island group was first described by Cockayne (1905). Around the edges of Taumaka, and covering the smaller islands is a 3 - 10 foot cover of *Hebe elliptica.* On the smaller islands there are extensive patches of ferns amongst the *Hebe.* The central part of the main islands is covered with a 8 - 10 foot high tangle of Kiekie *(Freycinetia banksii)* (Plate XXVIII).

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[Ian Stirling & P. M. Johns

Plate XXVIII — Kiekie on Taumaka, Open Bay Islands.

[Ian Stirling & P. M. Johns

Plate XXIX — Broken forest on Taumaka.

In two ill-defined valleys, 10 - 20 foot high broken trees of *Schefflera digitata* and *Fuchsia excorticata* supported the Kiekie (Plate XXIX) but no young trees were seen.

On the exposed parts of the island the Kiekie lay on the ground but rotting logs were seen underneath. *Cordyline australis* and *Meuhlenbeckia* were also noted. The area photographed by Cockayne (1905, plate 23) is now bare of peat but covered with *Hebe elliptica* and a thin layer of litter derived from this plant.

Visits were made to Taumaka from 16 - 19 September, 1968, 26 - 30 January, 1969, and 13 - 15 February, 1969. The following bird observations, unless otherwise stated, apply to this island only.

Southern Blue Penguin *(Eudyptula minor)*

In September, five burrows with breeding penguins were located at the base of the glacial till on the N.E. end of the island although there were probably several more. Lice were collected from one individual.

Fiordland Crested Penguin *(Eudyptes pachyrhynchus)*

In September, nests of these penguins were common in the bush just above the lower limit of the bush line on the northern side of the main island. The largest concentration examined consisted of 12 nests in a 30 foot radius. Several were deep under rock overhangs and roots of trees. Of seven nests examined, five had one chick and two had two chicks. The largest chick was about eight inches long. Most penguins seen in January and February were moulting.

Procellariiformes

A few petrel burrows, of three to four inches in diameter, were located in the glacial till on the top of the island but no birds were seen. A search near the camp in September revealed fewer than ten burrows of larger diameter, possibly made by the Sooty Shearwater *(Puffinus griseus)*. Cockayne (1905) records that the soil was " . . . extremely loose, both from its texture and from being honeycombed with the holes of mutton-birds." The peat layer is no longer deep nor loose and the paucity of petrel burrows is probably related to the shallowness of the soil and the hardness of the underlying glacial till.

In January and February, up to a hundred petrels could be seen at dusk returning to burrows in the dense brush above the southern cliffs.

Spotted Shag *(Stictocarbo punctatus)*

In September these shags were abundant and nested along the cliffs on the southern sides of all islands and stacks to the north and south. The total breeding population was not counted but there were over 50 pairs on a 100 foot long section of cliff on the N.W. end of Taumaka. Seven nests examined had two eggs each in them. Only 20 - 30 birds were seen in the same area in January and February.

White-faced Heron *(Ardea novaehollandiae)*

One individual was seen feeding on the northern reefs in February.

White Heron *(Egretta alba)*

One individual was seen standing on a rock on the south side of Taumaka in February.

Weka *(Gallirallus australis)*

The wekas are of the *australis* subspecies and were introduced to the northern island only, possibly twice, between about 1905 and 1912 (B. D. Bell, Wildlife Branch, pers. comm.). They are now abundant on the main island and one was seen on Popotai. We found one shag nest with eggs pillaged by Wekas and suspect they may interfere with penguin eggs as well. They also eat meat from seal carcases. The soil surface is also much disturbed by Wekas; scratched areas and cavities under stones and logs formed by probing with the beak are everywhere in evidence. The ground fauna is noticeably poor and this may bear direct correlation with the Wekas' activities. Land Leeches — Open Bays Islands and the Snares Islands are the only known places in New Zealand where these animals are recorded — were not found; the ground wetas *(Zelandrosandrus)* are rare as are many other arthropods except Amphipoda and Isopoda. Tree dwelling wetas *(Hemideina thoracica)* and slugs are still abundant.

In our opinion, the Wekas are modifying the natural fauna of the island to an extent that would justify their removal.

Black Oystercatcher *(Haematopus unicolor)*

In September, flocks of up to 23 of these birds were seen feeding in the intertidal zone of the northern reefs. Only one of the pied form was seen in September. During February a flock of 25 was seen, of which eight or nine were young of the year. Two of the adults and one of the chicks were pied.

Black-backed Gull *(Larus dominicanus)*

Only 20 - 30 were seen around the northern reefs in September but no evidence of breeding was recorded. However, in January, 50 - 100 chicks were found on the northern reefs.

Red-billed Gull *(Larus scopulinus)*

In September, about 60 - 100 birds occupied a large rock N.E. of the main island. It was a well used roost and appeared to be a breeding colony although it was too early to be able to see any eggs. In January there were several chicks there and over 100 on the northern reefs.

White-fronted Tern *(Sterna striata)*

About 20 birds were seen in September but no evidence of breeding was recorded.

Morepork *(Ninox novaeseelandiae)*

At least one bird was heard calling at night in September but none was seen.

Fantail *(Rhipidura fuliginosa)*

Both the black and pied colour phases of these birds were seen during September and we suspect they breed there although none were seen in January or February.

Fernbird *(Bowdleria punctata)*

These birds were abundant in the bush of the main island.

Silvereye *(Zosterops lateralis)*

One bird was seen in January and about 8 - 9 in a flock during February by R. East.

Starling *(Sturnus vulgaris)*

In September, three birds were seen flying in the vicinity of the shag nests. In February, a flock of 500 - 1,000 was seen at dusk by R. East. Fishermen report this is a regular evening flight from the mainland to roost on the island.

No sign of mice, rats, stoats, or introduced domestic species of mammals were seen.

We are particularly grateful to Mr. A. T. Marley, Dick Marley, and their crews for transporting us to and from the islands; B. D. Bell and R. East for use of unpublished data; and to Carters Consolidated Ltd. for the use of the hut at Jacksons Bay.

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SHORT NOTE

BROWN BOOBY ON SOUTH CANTERBURY COAST

On 29/3/69 at 12.45 p.m. a large bird, first thought to be a Gannet *(Sula bassana serrator)*, was seen flying over the beach at St. Andrews, ten miles south of Timaru. On reaching the beach I quickly located the bird and focused my binoculars (10 x 50) on it.

The body was slightly smaller than a Gannet's, with upperparts, head and chest coloured a rich chocolate brown. There was a clear cut border between the brown chest and the white underparts, while the underwing was pure white with a brown border on each edge. The underwing and line of demarcation on the breast were the most conspicuous parts of the bird's plumage. The bill appeared to be light grey but the feet were not observed.

The bird appeared to be much more at leisure than any Gannets I have seen in the area, and by this time I was without doubt that it was a Brown Booby *(Sula leucogaster)*. It continued, for the next ten minutes, to glide in circles and semicircles and frequently dive into the sea, after which it rested on the water, apparently devouring its prey. Gradually the Booby moved in a northerly direction and further out to sea. The weather had been fine for the last fortnight and on the day of observation was overcast, but the sun was shining through the clouds.

— R. J. PIERCE

[This note records the most southerly sighting of a Brown Booby in New Zealand waters.—Ed.]

WIND AND WADERS
Southland, January, 1969

By PETER MULLER

INTRODUCTION

In January, 1963, a field study course, the second to be held under the auspices of O.S.N.Z., was staged in Southland and attended by 29 persons, 19 full time and 10 part time. For many years before 1963, the large tidal lagoons and estuaries of the Southland coast had tantalized ornithologists because of their largely unknown value as habitat for waders, terns, and gulls. The course was therefore organized with the objects of (a) exploring the coastal area from Te Waewae Bay eastwards to Toetoes Harbour as fully as possible to asses its ornithological value and the best means of studying it in the future, and (b) to extend the experience of local members to include the birds and places seen during the course.

Bad weather severely restricted the activities of those who attended the 1963 course and part of the programme had to be abandoned, but all areas except Awarua Bay and Bluff Harbour were fully covered and one visit was made to Awarua Bay. The course resulted in a better knowledge of where to go and what to look for along the Southland coast, and subsequent studies, isolated and inadequate as they were, were based on information gained in 1963. By 1967 it was felt by Southland members of the Society that an effort should be made to consolidate and extend the knowledge gained in 1963, and at the council meeting held at the time of the annual meeting in Dunedin, a further field study course, to be held in Southland in January, 1969, was authorized. The dates eventually chosen were January 17 to 24.

ORGANIZATION

As headquarters for the 1969 course, the Southland committee, ably led by the Regional Representative, Roger Sutton, was fortunate in obtaining the Southland Children's Holiday Camp at Omaui, 16 miles from Invercargill. The camp was ideally situated on an elevated site overlooking the Oreti River estuary and the long sweep of Oreti Beach from the estuary outlet to Riverton. Behind the beach immediately below the camp was a small lagoon which usually held a cross-section of the common local waders and, to the west, a walk along a rocky shore was possible. The camp was about the centre of the section of coastline being studied and none of the study areas was more than about 30 miles distant. The most rewarding wader areas were within half an hour's drive of the camp, although in some cases a boat trip had then to be undertaken. The main building at the camp was divided into men's and women's dormitories by a central dining hall and, in addition, held a number of private rooms. Cabins attached to the camp were also used. Because of the balance of the sexes, it was possible to convert part of the women's dormitory into a lounge and it was there that discussions and slide evenings were held. A feature of the camp was the cuisine, with such local delicacies as venison, toheroa and flounder prominent on the menu. No one complained of feeling hungry although long walks worked up some

healthy appetites. Both catering and housekeeping were efficiently organized by Mrs. Maida Barlow, and the cooking was in the capable hands of Mrs. Margaret Peterson, enthusiastically assisted by Miss Denise Lobb. That Mrs. Peterson's efforts were specially appreciated was apparent when northern participants in the course clubbed together to make her a presentation on the final evening of the camp.

PROGRAMME

As originally planned, the programme provided for a leisurely first day of familiarization, with a visit to the top of Bluff Hill to view the area as a whole followed by an intensive course in wader identification and number assessment at one of the main roosting areas on the Oreti River estuary. The next day was to be devoted to a comprehensive census of wading birds in the area between Toetoes Harbour and Riverton Harbour. Once the whereabouts of the birds had been established, it was planned to allow those attending the course to visit areas of their own choice as far as possible. A stormy day alternative of an ornithological assessment of an exotic forest at Pebbly Hills, near Mataura, was also scheduled. In the event, the weather forecast for the Southland coastal area for the week-end of January 18 and 19 suggested that it would be wise to put the census forward to the Saturday, and this was done. The wisdom of this course was soon apparent, for Saturday, January 19, proved to be the best day of the week and the census was conducted in perfect weather. On the following day, strong north-westerly winds presaged a cold front which passed over with little rain just before midday. The front was followed by gale-force south-westerlies, and winds from this quarter persisted in varying strength until Wednesday, January 22. The final day of the course, Thursday, January 23, was again fine and calm, and the participants dispersed in perfect weather on the following day.

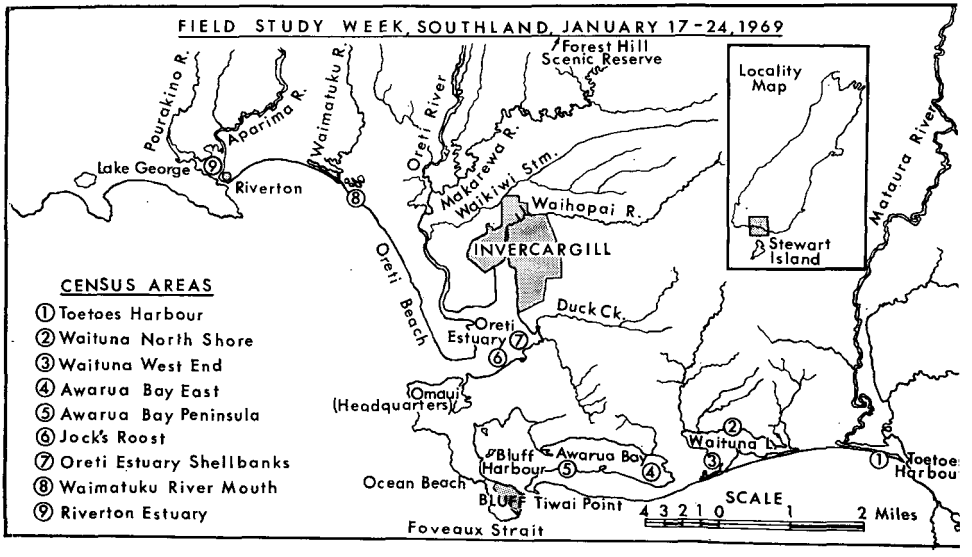
While the programme was disrupted to the extent that the winds prevented the use of boats on all but two or three days, outdoor activity was never brought to a standstill and most people were able to get to all the favoured wader localities. That the stormy day alternative, the exotic forest assessment, was not carried out indicated that conditions on the coast never became impossible, although the high winds on some days made effective use of binoculars and telescopes difficult. On the other hand, in windy weather it was usually possible to approach roosting flocks and individual birds more closely than would have been tolerated by the birds in calm conditions. High winds accompanying high tides (up to 9.3 ft.) also meant that the birds were driven well up on the roosts, making observation easier than during calm weather coupled with smaller tides.

In addition to field trips to the main wader areas covered in the census, a number of other visits were made to places of ornithological interest. The trip to the top of Bluff Hill (860 ft.) was made, although not at the start of the week as planned, but if members did not get a preview of the areas they would later visit, they had the opportunity to view the site for the aluminium smelter to be built on Tiwai Point in Bluff Harbour. Disposal of effluent from this plant is expected to result in some limitation of wader habitat in Awarua Bay, and perhaps further east, but the extent of the modification can be only a matter for speculation at this stage.

Twelve non-Southland members made a day excursion to Stewart Island on Wednesday, January 22, and were rewarded with a good selection of sea birds, bush birds, and waterfowl. A small party visited Lake Hauroko, Fiordland National Park, the same day. An island in this lake is the site of the recently-discovered Maori burial cave. On Tuesday, January 21, all those attending the course visited the aviary of Mr. and Mrs. S. L. Lobb, of Gorge Road, where they were entertained at morning tea. In addition to a colourful array of exotic birds, the aviary contains Keas *(Nestor notabilis)* raised in captivity.

Later that day, a beach patrol was undertaken at Oreti Beach to obtain specimens for subsequent identification. The patrol brought forth a Short-tailed Shearwater *(Puffinus tenuirostris)*, a Sooty Shearwater *(P. griseus)*, a Broad-billed Prion *(Pachyptila vittata)*, a Fairy Prion *(P. turtur)*, a Southern Diving Petrel *(Pelecanoides chathamensis)*, and a Black-browed Mollymawk *(Diomedea melanophris)*. These and other specimens were dealt with by F. C. Kinsky in an evening lecture on the identification of beach patrol specimens. Other evening lectures were given by R. B. Sibson (wader identification), J. Mackintosh (rare flora and fauna of Solomon Island), and Mrs. M. L. Barlow and R. R. Sutton (study of the Spur-winged Plover *(Lobibyx novaehollandiae)* in Southland). In addition one evening was given over to discussion of possible identification of two puzzling birds discovered at Lake Hayes. The discussion was chaired by R. B. Sibson and others taking part were Dr. R. A. Falla, F. C. Kinsky and Dr. R. F. Smith.

During the week two parties visited the Forest Hill Scenic Reserve, 20 miles north of Invercargill, and obtained good views of Brown Creeper *(Finschia novaeseelandiae)* and Rifleman *(Acanthisitta chloris)*. One section of the programme that created more than usual



interest was a demonstration of bird trapping methods. Many of the traps displayed were designed and built by S. L. Lobb, of Gorge Road, and used by him at his banding-station. Mist nets and traps for small passerines, drop and clap traps used in the Spur-winged Plover study (also designed and built by S.L.L.), and an Australian trap for waterfowl used by the Southland Acclimatisation Society were on display.

PERSONNEL

Thirty-eight members took part in the course, 32 of them for the whole of the period. Full time attenders were: Dr. and Mrs. I. G. Andrew (Palmerston North), Mrs. M. L. Barlow (Invercargill), P. Child (Alexandra), Miss J. Coles (Auckland), Dr. R. A. Falla (Wellington), Miss M. M. Davis (Christchurch), J. Drew (Wildlife Branch, Wellington), Miss J. K. Edgar (Christchurch), Mrs. E. L. Fooks (Auckland), R. Gray (Dunedin), L. E. Henderson (Invercargill), H. K. Jukes (Woodlands), W. M. Jukes (Springhills), F. C. Kinsky (Wellington), O. J. Linscott (Thornbury), S. L. Lobb (Gorge Road), Miss M. A. Miller (Invercargill), Mr. and Mrs. P. M. Muller (Invercargill), Miss M. Neil (Wellington), G. Nye (Christchurch), R. Pierce (St. Andrews), Mrs. S. M. Reed (Auckland), R. B. Sibson (Auckland), Dr. R. F. Smith (Dunedin), J. C. Smuts-Kennedy (Wildlife Branch, Wellington), Dr. and Mrs. M. F. Soper (Arrowtown), R. R. Sutton (Invercargill), L. Woods (Te Anau), G. Woodward (Lower Hutt). Part-time attenders were: C. E. Barlow (Invercargill), R. Houston (Gorge Road), C. McKay (Mataura), I. A. Mathieson (Lumsden), Mrs. O. A. B. Smith (Winton), and P. Sutton (Invercargill). In addition, two members of the National Film Unit, G. Foster and D. Pomeroy, attended for four days and gathered some material on waders for a series which is being made in colour for overseas television distribution on New Zealand nature topics.

AREA COVERED

For the census, taken on Saturday, January 18, nine parties were formed, each with an experienced ornithologist and a local guide, and sent to the following areas:

Toetoes Harbour (the estuary of the Mataura River at Fortrose).

Waituna Lagoon (two parties, one of which covered the northern shore and Little Waituna on foot, while the other went by boat to the west end to cover the area of the outlet, Walker Bay, Swan Bay and the remainder of the western shore).

Awarua Bay (two parties, one covering the east end on foot and the other crossing the bay by boat to cover the roosts on the peninsula which juts out from Tiwai Point).

Oreti River estuary (two parties, one covering the eastern shore and the shellbanks, and one the southern shore from the area known as Jock's Roost to Mokomoko Inlet).

Waimatuku River mouth (the river outlet and lagoons adjacent to the beach).

Riverton estuary (the estuary of the Aparima and Pourakino Rivers).

Odd groups of waders are to be found at other areas along the Southland coast but the areas chosen for the census were believed to cover the main concentrations of birds as disclosed by the census taken in 1963 and subsequent observations.

TABLE 1

Species	Toetoes Harbour		Waituna Lagoon		Awarua Bay		Oreti R. Estuary		Waimatuku R. Mouth		Riverton Harbour		Census Totals	
	1969	1963	1969	1963	1969	1963	1969	1963	1969	1963	1969	1963	1969	1963
Black Shag	2	-	12	10	1	2	43	6	13	1	11	22	82	41
Pied Shag	2	2	-	1	-	1	-	-	-	1	5	12	7	17
Little Black Shag	-	-	-	3	-	-	-	-	-	-	-	-	-	3
White-throated Shag	20	2	16	13	17	6	14	11	-	1	35	3	102	36
Stewart Island Shag	-	6	-	1	5	1	3	-	-	-	3	-	11	8
Spotted Shag	-	20	-	-	-	-	-	-	-	-	-	-	-	20
White-faced Heron	27	-	29	35	15	27	226	106	30	2	58	88	385	258
Bittern	-	1	-	2	-	-	-	-	-	-	-	-	-	3
Royal Spoonbill	-	-	1	-	-	-	-	-	-	-	-	-	1	-
Canada Goose	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Black Swan	-	-	302	231	-	3	966	1098	57	42	-	121	1345	1495
Paradise Duck	-	-	-	-	-	-	-	-	4	-	9	-	13	-
Grey Teal	-	-	-	-	-	-	-	-	-	-	3	3	3	3
Grey Duck	19	-	11	98	-	4	-	6	-	3	1	24	31	135
Mallard	1	-	157	57	-	-	-	47	11	-	1	56	170	160
Shoveler	-	-	5	-	-	-	-	-	-	-	-	2	5	2
Pukeko	-	-	-	-	-	-	-	-	4	-	-	-	4	-
S.I.P. Oystercatcher	452	152	78	203	453	204	2150	3768	98	-	1088	630	4319	4957
Black Oystercatcher	10	4	3	8	-	-	-	-	-	-	-	2	13	14
Spur-winged Plover	31	-	50	23	9	13	91	-	124	4	17	9	322	49
Grey Plover	-	-	2	-	-	-	-	-	-	-	-	-	2	-
Golden Plover	-	-	24	18	43	4	45	81	-	-	-	-	112	103
Banded Dotterel	54	31	46	317	77	177	243	557	-	11	-	-	420	1093
Black-fronted Dotterel	-	-	-	-	-	-	-	-	-	1	-	-	-	1
N.Z. Dotterel	-	-	-	-	-	2	3	-	-	-	-	-	3	2
Wrybilled Plover	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Long-billed Curlew	-	-	5	16	-	-	-	-	-	-	-	1	5	17
Bar-tailed Godwit	126	96	106	125	3460	850	3560	2606	-	-	200	231	7452	3918
Hudsonian Godwit	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Greenshank	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Terek Sandpiper	-	-	2	-	-	-	-	-	-	-	-	-	2	-
Turnstone	-	27	260	141	114	93	480	1037	-	-	9	6	863	1304
Knot	-	-	1	51	100	50	87	-	-	-	-	-	188	101
Sharp-tailed Sandpiper	-	-	4	35	10	-	10	3	-	-	-	-	24	38
Curlew Sandpiper	-	-	-	3	-	-	-	-	-	-	-	-	-	3
Red-necked Stint	-	-	14	9	1	-	7	-	-	-	-	-	22	9
Pied Stilt	75	45	230	325	36	94	128	158	58	35	110	230	637	887
Pomarine Skua	-	-	5	-	-	-	-	-	-	-	-	-	5	-
Arctic Skua	-	-	-	-	-	-	-	-	-	-	1	-	1	-
Black-backed Gull	455	250	82	1085	770	100	220	116	500	-	70	135	2097	1686
Red-billed Gull	-	1	-	-	5	-	50	46	10	-	150	300	215	347
Black-billed Gull	400	500	322	456	100	230	1000	123	920	-	2700	217	5442	1526
Black-fronted Tern	4	1	13	7	-	2	-	5	3	-	3	28	23	43
White-winged Black Tern	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Caspian Tern	2	3	5	9	-	2	122	25	-	-	6	4	135	43
Little Tern	-	-	-	5	-	-	-	-	-	-	-	-	-	5
White-fronted Tern	55	64	121	110	-	9	504	80	11	-	79	5	770	268

RESULTS

The census figures (see Table 1) produced few real surprises. The main surprise was to come later in the week when a flock of 51 New Zealand Dotterel *(Charadrius obscurus)* was found in an area of Awarua Bay, near Cow Island, not covered on census day. Earlier beliefs that migratory wading birds were concentrated in three main areas, Waituna, Awarua Bay, and the Oreti River estuary, were confirmed. Census and pre-census observations disclosed two first records for Southland — Grey Plover *(Pluvialis squatarola)* and Terek Sandpiper *(Xenus cinereus)*.

It would be unwise to read too much into any comparison between census figures recorded last January and those recorded in 1963, because in 1963 each area was covered on a different day whereas last January all areas were covered simultaneously. From observations made after the census this year it is obvious that flocks shift fairly frequently, depending on the height of the tide and the wind, and although there was no documented evidence of flocks moving from one census area to another, this undoubtedly happens. Also, there is always the unfortunate possibility of odd flocks or birds being missed, no matter how careful the observations made, because the areas to be covered are so vast.

It was apparent that good high tides are needed for a successful census because the lower tides leave too many roosting areas uncovered and make coverage of the large estuaries and lagoons difficult. The tide on census day was 9.2ft. and on the following day, Sunday, January 19, 9.3ft. It was 9.2ft. again on Monday, January 20, and thereafter the tides became smaller each day to be only 8.0ft. on Thursday, January 23. Although a windy day makes the birds sit tighter, calm weather is needed for a successful census in Southland because of the necessity to use small boats.

Comment on particular species will be found in the species list but, with the reservations mentioned above, some general observations may be of interest. Of particular significance were the figures recorded for White-faced Herons *(Ardea novaehollandiae)* and Spur-winged Plovers, two species known to be on the increase in Southland. The heron tally rose from 258 in 1963 to 385 in 1969, and the Spur-winged Plover count was up from a mere 49 to 322. In neither case would the figures represent a complete count of birds in the particular area because neither bird can be relied upon to occupy high tide roosts and many birds would be scattered over the nearby countryside. The count for Banded Dotterel *(Charadrius bicinctus)* was down sharply from 1093 to 420, but in 1963 a single flock of about 500 birds was seen on the Oreti River estuary and included in the count. No similar concentration of this species has since been recorded.

Of special interest was the dramatic rise in numbers of Bar-tailed Godwit *(Limosa lapponica baueri)* — from just under 4000 to nearly 7500, but the tally of Turnstone *(Arenaria interpres)* was down from 1304 to 863. From the figures it would appear that there have been most satisfactory increases in the numbers of Caspian Terns *(Hydroprogne caspia)* and White-fronted Terns *(Sterna striata)*. The Caspian colony on the Oreti estuary numbered but 10 pairs in 1963, while this year about 50 pairs nested while the White-fronted Tern colony in the same area shows an apparent growth from 40-odd pairs in 1963 to some 250 pairs this year. However, 1962-63 must have been a poor year for terns because there were 29 nests and 110 birds at the Caspian colony on 15/12/63, while on the same date there were 184 pairs of White-fronts. In 1967 the White-front colony numbered 366 pairs.

For Southland members, the most notable result of the study week was the realization that wader areas must be covered much more intensively in the future, and at regular intervals, if valid and valuable comparisons are to be drawn from census figures. The

Awarua Bay - Bluff Harbour area in particular warrants further close study. With limited numbers of active members it is difficult to cover every area adequately and in future it may be as well to concentrate on those areas which the study week has indicated will be most rewarding.

Investigations during the study week also disclosed the need for a comprehensive study of the distribution and breeding of the New Zealand Dotterel in the Awarua Bay region. If observations can be made regularly over the next few years, some indication of whether the species is increasing or declining may be obtained.

SPECIES LIST

The following species list is by no means exhaustive, but birds of special interest outside the immediate scope of the census have been included.

WANDERING ALBATROSS *(Diomedea exulans)*

A single bird was seen by the Stewart Island party from the G.m.v. Wairua in Foveaux Strait on 22/1/69.

ROYAL ALBATROSS *(D. epomophora)*

One seen by the Stewart Island party on the return trip to Bluff on 22/1/69. It belonged to the smaller northern subspecies.

BULLER'S MOLLYMAWK *(D. bulleri)*

Several seen by the Stewart Island party in Foveaux Strait on 22/1/69.

SHY (WHITE-CAPPED MOLLYMAWK *(D. cauta)*

Seen in Foveaux Strait by the Stewart Island party on 22/1/69.

SALVIN'S MOLLYMAWK *(D. cauta salvini)*

Seen by the Stewart Island party in Foveaux Strait on 22/1/69.

GIANT PETREL *(Macronectes giganteus)*

These birds regularly feed near the offal outlet at the Ocean Beach freezing works and were seen by nearly all participants in the course during the week. R.B.S. counted 120 on 21/1/69, many of them close inshore; and there were c. 300 on January 23 (R.B.S., I.G.A.).

CAPE PIGEON *(Daption capensis)*

Seen both inside Bluff Harbour, up to 8, and in Foveaux Strait by the Stewart Island party on 22/1/69.

SOOTY SHEARWATER *(Puffinus griseus)*

Muttonbirds were present in huge numbers in Foveaux Strait throughout the week and were seen by the Stewart Island party and also by parties at Riverton, Oreti Beach, and Waimatuku Mouth. On 20/1/69 the birds were fishing well up the Oreti River estuary opposite Jock's Roost. The " myriads of milling muttonbirds " were subsequently described by R.B.S. as " One of the great bird sights of the world." An experience among the birds is described by R.F.S.: " While proceeding up Riverton estuary on 18/1/69 I noticed an extremely large number of Sooty Shearwaters flying round the mouth of the Aparima River. The birds were obviously feeding on a school of small fish which were within the estuary. We managed to sail into the flock of birds, which were present in incredible numbers. They appeared to be feeding on a small sardine-like fish and were bobbing up all round the boat, some of them actually hitting the

underside of the boat. The flock stretched for many miles and I can only say that there must have been hundreds of thousands of birds."

SOUTHERN DIVING PETREL *(Pelecanoides urinatrix chathamensis)*

A few noted by the Stewart Island party in Foveaux Strait on 22/1/69.

BLACK SHAG *(Phalacrocorax carbo)*

On census day, 82 were counted, the largest number seen by any one party being 23 at Jock's Roost. Regularly seen by most parties on subsequent days. A group of 20 was seen by R.B.S. at Waituna on 23/1/69.

PIED SHAG *(P. varius)*

Only seven were seen on census day, two at Fortrose and five at Riverton.

WHITE-THROATED SHAG (LITTLE SHAG) *(P. melanoleucos brevirostris)*

On census day 102 were counted, the largest concentration being 35 at Riverton. A further 20 were seen at Fortrose.

STEWART ISLAND SHAG *(P. carunculatus chalconotus)*

Only eight were sighted on census day, five at Awarua Bay and three at the Oreti estuary shellbanks. The Stewart Island party on 22/1/69 saw many in both the pied and bronze phases.

SPOTTED SHAG *(P. (Stictocarbo) punctatus)*

Several at Riverton on 19/1/69 (R.B.S.). Twenty were reported from Fortrose in 1963.

WHITE-FACED HERON *(Ardea novaehollandiae)*

A total of 385 were counted on census day, the largest concentrations being in the Oreti estuary, 125 at Jock's Roost and 101 at and about the shellbanks. These figures are conservative and the increase in the population is almost certainly greater than the comparison with the 1963 figure of 318 would suggest. F.C.K. was intrigued by one bird sitting on a telephone wire !

BITTERN *(Botaurus stellaris poiciloptilus)*

None was recorded on census day but one was seen flying across Awarua Bay on 23/1/69. Another single bird was seen at Waituna Lagoon on the same day.

GLOSSY IBIS *(Plegadis falcinellus)*

Five birds were seen at Horseshoe Bay, Stewart Island, on 8/11/68. Two days later a single bird was seen at Invercargill Airport and on 1/12/68 a flock of nine was feeding on lagoons at Sandy Point, near Oreti Beach. Between 19/12/68 and 29/12/68 a single bird was continuously at Waimatuku Mouth. During the study week, on 22/1/69, R.R.S. and R.F.S. checked all likely lagoons but no birds were sighted. It is likely that the ten seen at Lake Taieri in mid-January had been in Southland during November and December.

CANADA GOOSE *(Branta canadensis)*

None was recorded on census day but two were seen on the big lagoon near the mouth of the Waimatuku River on 21/1/69 and again on 22/1/69. Eleven birds (7 + 4) were seen at Waituna Lagoon (R.B.S.) on 23/1/69.

BLACK SWAN *(Cygnus atratus)*

Abundant at both Waituna and the Oreti estuary. Census counts totalled 1345, of which 986 were on the Oreti estuary and 265 at Swan Bay, Waituna. Pairs with young were present at the Big Lagoon, Waimatuku Mouth on 21 - 22/1/69.

PARADISE DUCK *(Tadorna variegata)*

A pair with seven young was seen on Riverton estuary on census day and a further four at Waimatuku Mouth.

GREY TEAL *(Anas gibberifrons gracilis)*

Three were sighted on Riverton estuary on census day and two birds were discovered on a lagoon north of the main entrance to Oreti Beach (R.R.S.) on 22/1/69.

BROWN TEAL *(A. castanea chlorotis)*

An adult and five young were seen at Mill Creek, Stewart Island, by the party which visited the island on 22/1/69.

GREY DUCK *(A. superciliosa)*

Only 31 were certainly identified on census day, 19 at Fortrose, 11 at Waituna and one at Riverton.

MALLARD *(A. platyrhynchos)*

A census count of 170 included 157 at Waituna. The 951 birds recorded under " ducks, unspecified " would probably be largely Mallards and hybrids.

SHOVELER *(A. rhynchotis variegata)*

Of the 35 recorded in the census, 30 were counted on the south-eastern shore of the Oreti estuary.

PUKEKO *(Porphyrio melanotus)*

Four were recorded at Waimatuku Mouth on census day.

SOUTH ISLAND PIED OYSTERCATCHER *(Haematopus ostralegus finschi)*

The census total of 4319 included flocks ot 1088 at Riverton, 2150 at the Oreti estuary, 428 at Awarua Bay peninsula and 452 at Toetoes Harbour. At both Toetoes and Riverton it was the predominant wader. Many birds roosting on paddocks or along river beds would be excluded from the census total, but this oystercatcher is one of the most abundant species in Southland.

BLACK OYSTERCATCHER *(H. unicolor)*

Of the 13 recorded in the census, 10 were at Fortrose and three at the west end of Waituna lagoon. Others were seen on the rocks at Riverton.

SPUR-WINGED PLOVER *(Lobibyx novae-hollandiae)*

Present at all census points, a total of 322 being recorded. The largest group was 124 at the mouth of the Waiamtuku River among sandhills. Many birds remain on the paddocks at this time of the year, either in pairs or small flocks. A few join other waders at typical hightide roosts.

GREY PLOVER *(Pluvialis squatarola)*

Two birds were seen at Waituna Lagoon by R.R.S., S.L.L., and M.L.B. on 4/1/69, prior to the study week. Two birds seen by I.G.A. and party on census day were probably the same birds. One bird was seen by a party which walked from Awarua Bay to Waituna on 20/1/69. These are first records for Southland.

PACIFIC GOLDEN PLOVER *(P. dominica fulva)*

The census total was 112, spread over Waituna, Awarua Bay and Oreti River estuary, making the fourth-largest group of migratory waders. On the Oreti estuary Golden Plovers do not roost with the other waders on spits or shellbanks at high tide. Whether they move on to nearby paddocks has yet to be determined.

BANDED DOTTEREL *(C. bicinctus)*

The largest concentration in the census total of 420 was about 200 on the south-eastern shore of the Oreti estuary and about this number of birds was present there on subsequent days of the week. A late-nesting pair with downy chicks was found at Jock's Roost on 21/1/69 (I.G.A.).

ORIENTAL DOTTEREL *(C. asiaticus)*

A lone bird seen by M.M.D., the writer, and his wife on 21/1/69 may have been of this species but positive identification was not possible before the bird was disturbed, and it was not seen again.]

NEW ZEALAND DOTTEREL *(C. obscurus)*

Only one turned up in the census, on the Oreti estuary, but a flock of 51, many of them showing breast colour, was found near Cow Island in Awarua Bay — an area not covered on census day — on 23/1/69 (R.R.S.). A single bird seen near Jock's Roost by R.A.F. on 21/1/69 was said by him to be more highly coloured on the breast and about the face than the northern birds. The single bird seen at the Oreti estuary shellbanks on census day was identified by R.B.S. as a juvenile. On a subsequent visit to the same area (2/1/69), the writer and his wife saw three birds, two of which were resting together near a clump of spartina grass. One of the pair showed distinct orange patches on the breast while the other was speckled on the sides of the breast. Two birds were seen at Awarua Bay east on 19/1/69 (M.M.D.). Seven were seen by the writer and his wife at Jock's Roost during a follow-up visit on 16/2/69.

LONG-BILLED CURLEW *(Numenius madagascariensis)*

Five were seen at the west end of Waituna lagoon on census day and smaller numbers in the same area later in the week but none was reported from any other area.

ASIATIC WHIMBREL *(Numenius phaeopus variegatus)*

None was recorded on census day but five were seen at Waituna by M.L.B. on 4/1/69 and by R.R.S. on 1/2/69. One was seen at Waituna (R.B.S.) during the study week on 23/1/69.

EASTERN BAR-TAILED GODWIT *(Limosa lapponica baueri)*

The census total was an impressive (by Southland standards) 7452, with the largest flocks c. 3000 at the Oreti estuary shellbanks and 2460 at Awarua Bay peninsula. Odd birds were showing colour on the breast.

HUDSONIAN GODWIT *(L. haemastica)*

A single bird sighted by M.L.B. on 4/12/68 with the main flock at the Oreti estuary shellbanks was still present on census day.

TEREK SANDPIPER *(Xenus cinereus)*

A party led by I.G.A. which covered the north shore of Waituna Lagoon on census day obtained the first record for Southland

of this species. Two birds were seen. A single bird was seen by M.M.D. at Awarua Bay east on 19/1/69.

TURNSTONE *(Arenaria interpres)*

Sizeable flocks were present at the main roosts on census day and the total recorded was 863, with the largest concentration, 400+, at Jock's Roost. Close views of these birds were obtained by most members during the week.

KNOT *(Calidris canutus)*

A total of 188 was recorded on census day, 100 of which were at the east end of Awarua Bay and 70 at the Oreti estuary shellbanks. A flock of 100 was recorded at Awarua Bay east (M.M.D.) on 19/1/69.

SHARP-TAILED SANDPIPER *(C. acuminata)*

A few reach Southland each year but the 24 recorded in the census fell short of the 35 recorded at Little Waituna in 1963. Ten were found at each of Awarua Bay east and the Oreti estuary shellbanks and four along the north shore of Waituna. Five were seen at Awarua Bay east (M.M.D.) on 19/1/69. On 22/1/69 R.R.S. and R.F.S. found two at a lagoon north of the main entrance to Oreti Beach.

AMERICAN PECTORAL SANDPIPER *(C. melanotos)*

A single bird seen by J.C. S-K. and party on census day near a lagoon at the mouth of the Waimatuku River was probably of this species. A few have previously been recorded in Southland.

RED-NECKED STINT *(C. ruficollis)*

During census week flocks seemed to be smaller than in the previous season, when a record 57 were counted at Waituna Lagoon on 2/12/67 (Barlow. 1968, Notornis 15, 3: 219). The census count totalled 22, 14 of which were sighted at the west end of Waituna. However, during a follow up visit to the Oreti estuary on 15/2/69, L.E.H., C.McK., and the writer found a flock of 34 birds feeding on a sandspit from which the tide had just receded. A little further along, six further birds were seen. The birds were feeding voraciously and permitted a close approach and an accurate count. Where were they on census day ?

SANDERLING *(C. alba)*

Two birds were seen at Waituna Lagoon by the party which walked from Awarua Bay to Waituna on 20/1/69, but they were not seen on census day. A single bird was seen near the outlet of Waituna by R.B.S., M.M.D., M.N., and S.L.L., on 23/1/69.

[BROAD-BILLED SANDPIPER *Limicola falcinellus)*

A single bird seen briefly by R.R.S. on census day and again in flight on 23/1/69 was probably of this species.]

PIED STILT *(Himantopus leucocephalus)*

The census count was 637, with the largest group, 212, along the north shore of Waituna. Accurate counts are difficult because only a proportion of the population joins the flocks on the high tide roosts. A late downy chick was found at Jock's Roost on 22/1/69.

POMARINE SKUA *(Stercorarius pomarinus)*

Four were seen by I.G.A. during the census, along the north shore of Waituna. Another was seen by F.C.K. at the west end of Waituna. It chased a Spur-winged Plover.

ARCTIC SKUA *(S. parasiticus)*

A single bird was seen at Riverton estuary on census day by R.F.S.

SOUTHERN BLACK-BACKED GULL *(Larus dominicanus)*

The species was well represented at all census areas except the west end of Waituna and the count totalled 2097. The greatest concentrations of birds, 15000+, however, were at the outlet from the Ocean Beach freezing works and the Invercargill refuse tip, and were not included in the census.

RED-BILLED GULL *(L. scopulinus)*

The largest number counted in the census was 150 at Riverton estuary and the census total was 215.

BLACK-BILLED GULL *(L. bulleri)*

The predominant small gull in Southland. The census total was 5442.

BLACK-FRONTED TERN *(Chlidonias albostriatus)*

A total of 23 turned up in the census, but most of the Southland population would, of course, be inland at the time of the census.

CASPIAN TERN *(Hydroprogne caspia)*

Represented mainly at the breeding colony in the Oreti estuary but recorded also from all other census areas except Awarua Bay and the Waimatuku Mouth, the total being 135. The colony at the Oreti estuary shellbanks was not disturbed for an accurate count on census day because breeding was then at a critical stage. However, an estimate of 120 adult birds was made. An earlier count (29/12/68) showed 47 scrapes, 34 with 2 eggs, five with 3 eggs, two with 1 egg and 1 chick, one with 1 egg and 2 chicks, one with 2 chicks, and four with 2 eggs and 1 chick. On a follow-up visit after the census (1/2/69), the writer found the breeding area deserted but counted 52 juveniles and big chicks being shepherded by adults on a nearby mud-flat.

ARCTIC TERN *(Sterna paradisaea)*

A well-preserved corpse was discovered by I.G.A. under rubbish cast up by a high tide near Jock's Roost in the Oreti estuary. This was also a first record for Southland, if an unsatisfactory one. This is not a locality where storm-cast specimens are normally deposited and this leads to the belief that the bird died after reaching the estuary, either in the estuary waters or ashore.

WHITE-FRONTED TERN *(S. striata)*

Two breeding colonies were in full swing on census day, one at the west end of Waituna Lagoon, with about 60 pairs, and one on the Oreti estuary shellbanks of 200+ pairs in two distinct groups of about 100 each. F.C.K. estimated 5 to 10 per cent double egg clutches in the Waituna colony. The total count for all areas was 770 adult birds. In spite of a storm combined with a high tide on 19/1/69, the Oreti estuary colony survived and on 1/2/69 there were a good number of well-grown juveniles (some flying) in the earlier group and dozens of downy chicks in the later group. However, on 15/2/69, the writer found the breeding area virtually deserted, although about 60 adults and 6 flying young were still in the same general area. Most of the chicks from the earlier colony would have

been flying at that stage, but the majority of chicks in the later colony would not have reached flying age. Their fate is unknown but there was no evidence of the colony's having been washed out as the nest scrapes were still plainly visible. Only one dead chick was found in the nesting areas.

PIGEON *(Hemiphaga novaeseelandiae)*

Three were seen by L.E.H. at Forest Hill on 20/1/69. Plentiful at Stewart Island on 22/1/69. Eleven flying about Bluff Hill on 23/1/69.

SOUTH ISLAND KAKA *(Nestor meridionalis)*

Blue gums at Stewart Island were " alive with Tuis and Kakas " (R.B.S.) on the day of the Stewart Island visit. R.B.S. commented also that northern visitors were impressed with the tameness of the birds (in general).

LONG-TAILED CUCKOO *(Eudynamis taitensis)*

Two were heard calling near the camp at Omaui, were watched by several people from the verandah of the camp, and were seen flying by L.E.H. Also heard at Forest Hill and sighted once.

PASSERINES

No attempt was made at a census of passerines in any particular area but some records noted in passing are interesting.

SOUTH ISLAND RIFLEMAN *(Acanthisitta chloris)*

Small numbers were seen by both parties that visited the Forest Hill Scenic Reserve. L.E.H. on 20/1/69 saw a single bird, a group of four, and a pair. As no recent reports had been received of Riflemen in this isolated patch of native bush, the sightings were specially interesting.

SOUTH ISLAND FANTAIL *(Rhipidura fuliginosa)*

Six were seen at Forest Hill on 20/1/69.

YELLOW-BREASTED TIT *(Petroica macrocephala)*

Three were seen at Forest Hill on 20/1/69 and two on 22/1/69.

BROWN CREEPER *(Finschia novaeselandiae)*

Numerous at Forest Hill. Three flocks, each of about 12, were encountered by L.E.H. and party on 20/1/69 and 20 were seen by J.C.S-K. on 22/1/69. Also present in manuka scrub near Omaui camp — family parties; but males still in good voice.

GREY WARBLER *(Gerygone igata)*

Several sightings at Forest Hill by L.E.H., and 10 seen on 22/1/69, also at Forest Hill, by J.C.S-K.

BELLBIRD *(Anthornis melanura)*

Numerous at Forest Hill. Singing well at Omaui.

TUI *(Prosthemadera novaeseelandiae)*

Seven seen at Forest Hill on 20/1/69. Many seen by Stewart Island party on 22/1/69.

REFERENCES

1 EDGAR, A. T., 1963: Field Study Course, Southland, 18th - 26th January, 1963. Notornis 10, 4: 190-191.

2 HEATHER, B. D., 1963: Unpublished paper on Southland Field Study Course, 1963.

ANNUAL FIELD STUDY WEEK-END
Manawatu, 26th - 28th October, 1968

About thirty-five people met over Labour Day Weekend for an enjoyable few days in the Manawatu. On the evening of Friday, 25th, members assembled in the Deerstalkers' Hall for an informal get-together and supper. Here we were organised into parties for the field-work on Saturday.

Recent rains had raised the levels of local rivers to such an extent as to preclude the proposed censuses, so we concentrated on the coastal lakes and the estuaries on both Saturday and Sunday, meeting in the Deerstalkers' Hall in the evenings to report progress.

Each day we set off in parties, three or four to a party, setting off about 9 a.m. and returning for tea in Palmerston North, before assembling in the hall again at 8 p.m. for the evening meeting — all of us, that is, except for the Manawatu Estuary southern party, who on each day struck unexpected difficulties with the terrain. In all, sixteen lakes were visited, varying in size from Lake Horowhenua to small ponds not more than a few acres in extent. The estuaries visited were Rangitikei, Manawatu and Ohau, Manawatu as usual proving the most popular. We were very grateful for the assistance of Mr. T. F. Robinson with his boat under trying windy conditions at Manawatu Estuary, and to Mrs. Robinson for her hospitality to the party concerned. Boats were used by two or three other parties, but generally conditions were too windy for boating.

The windy conditions that prevailed had lasted for two weeks prior to the course, so a very rich reward was found by parties who patrolled the beaches. Full beach patrols were conducted from Waikanae to just south of Turakina — about 48 miles, with a total of 724 specimens recovered. The most numerous species were *Pachyptila* species (unidentified remains of 391 individual prions), Fairy Prion (130), Short-tailed Shearwater (88), Broad-billed Prion (38), Antarctic Prion (15), and Hutton's Shearwater (15). Sooty Shearwater (7) and Diving Petrel (5) were somewhat low; other petrels, with four or fewer individuals each, were Lesser Broad-billed and Narrow-billed Prions, Cape Pigeon, White-headed Petrel, and White-capped and Salvin's Mollymawks. Four Blue Penguins, three Black-backed Gulls, and a series of landbirds ranging from Long-tailed Cuckoo and Kingfisher to Blackbird and Chaffinch completed the tally.

The estuaries proved more or less predictable. As far as waders were concerned, Rangitikei and Manawatu had most of the arctic migrants, including a number of passage migrants which were on their way further south. Ohau estuary, on the other hand, had the local breeders — Variable Oystercatcher, Banded Dotterel and Pied Stilt. Arctic migrants recorded at the estuaries included Golden Plover (4 at Rangitikei — strangely absent at Manawatu), Long-billed Curlew (1), Bar-tailed Godwit (348), Terek Sandpiper (1), Turnstone (3), Knot (89), Curlew Sandpiper (1), Red-necked Stint (8). Wrybill (2) and S.I. Pied Oystercatcher (16) were the sole South Island visitors (humans excepted). Other birds included the usual shags, herons, gulls and terns, Pukeko, Harrier, etc.

The lake census was considered incomplete, owing to the windy conditions and the presence of a few waters that were not visited, while some species, such as White-faced Heron, Bittern and Welcome Swallow, were necessarily underestimated. Good counts were obtained of some species, however: Dabchick (22), Black Shag (27), Little Black Shag (12), White-throated Shag (57), White-faced Heron (5), Bittern (2), Black Swan (227), Paradise Duck (3), Grey Duck (16), Mallard (250), Shoveler (190), Harrier (30), Pukeko (150), Pied Stilt (60), Welcome Swallow (25). In addition, four suspected Pomarine Skuas and a Little Tern were seen at Lake Koputara on the Monday.

Two pleasant social evenings capped off the strenuous work of the day. On Saturday, Mr. Les Shailer showed us some of his superb colour slides of Royal Spoonbills, Swallows, Coots, Bellbirds and other birds, mostly photographed in the Manawatu. An interesting shot was of Cattle Egrets at Lake Horowhenua. On Sunday evening we were treated to a wine and cheese evening.

Farewells were said on Monday, with some groups again visiting local birding areas — either finishing off the work of the previous days, or looking for bush birds — Bellbird, Tui, Pigeon, Rifleman and Tomtit — in local reserves. Thanks are due to the organisers of the course, headed by the Regional Representative, Mr. Les Shailer, and to those other helpers, who assisted with transport, both car and boat, and in other ways in the kitchen and in the hall.

— I.G.A.

★

THE BEACH PATROL SCHEME

*By M. J. IMBER**

New Zealand lies across thousands of miles of sea from the nearest continents, except Australia, which is just over 1,000 miles away. The Pacific Ocean washes its east coast, Antarctic waters are to the south, and the Tasman Sea to the west with the Indian and South Atlantic Oceans beyond. So it is not surprising that, with their widespread habit of migrating or wandering, seabirds from all southern oceans of the world have been recorded in the New Zealand region. Those who have been fortunate enough to study birds at sea know that certain identification of the species seen is often impossible, particularly with the petrel family. Then how have the rarities been detected ? Very frequently by critical beach patrollers. To them we can attribute the only records for this region of the North Atlantic Shearwater *(Puffinus diomedea)* and Leach's Fork-tailed Petrel *(Oceanodroma leucorhoa)*, both breeding in the North Atlantic Ocean, the latter also in the North Pacific; and the few records of the Antarctic Skua *(Stercorarius maccormicki)*, one of the southernmost breeding birds in the world. Also the Arctic Tern *(Sterna paradisaea)*, one of the northernmost, has been found by beach patrollers on our coast.

* Wildlife Service, Department of Internal Affairs, Wellington

Not only has the finding of dead seabirds on beaches revealed stragglers to New Zealand, but also new species or subspecies have been discovered. Buller's Shearwater *(Puffinus bulleri)* was first described from a beach specimen. A race of Gould's Petrel *(Pterodroma leucoptera)* has been identified in this way, though its breeding place is still not known. Hutton's shearwater *(Puffinus huttoni)* became known to many beach patrollers in New Zealand years before its breeding place was discovered in 1965.

New Zealand's geographic situation has an important influence on the kinds and numbers of seabirds found on its beaches. It lies nearly at right angles to the westerly winds which prevail in these latitudes. Not only this, but also the side obstructing the westerlies is roughly boomerang-shaped. Thus it acts as a huge trap for many seabirds which apparently allow themselves to be carried eastward around Antarctica during the non-breeding season. The wind which seems to cause most casualties on west coast beaches of the North Island comes from between west and south-west, and is at least strong and squally. One can imagine that birds being swept before such a wind would be carried north-eastwards parallel to the South Island west coast and into the waters off the Wellington or Auckland west coasts. This explains why under such typical conditions the greatest numbers of dead seabirds are found on these two North Island coasts. Blown towards the coasts and land, which they try to avoid, the weaker birds succumb to exhaustion and starvation. Most presumably die by drowning but others are sometimes blown inland. The stronger survive or perhaps escape through Cook Strait or around North Cape. The numbers cast ashore are undoubtedly related to the numbers present offshore, and their condition and health when stormy weather strikes. Dead seabirds are washed ashore on other than the westward-facing coasts, of course, the number of wrecks apparently depending on the numbers breeding on nearby islands or migrating along the coast, their condition and the prevalence of onshore winds. For instance, one of the biggest "wrecks" of seabirds in the last decade was of young Sooty Shearwaters *(Puffinus griseus)* along the east coast of the South Island in May 1961. Apparently thousands perished. Emaciated, they were washed ashore or blown inland during a period of rough easterly weather.

Many species of seabirds breed in the New Zealand region and these provide most of the specimens on beaches in most years. We have 4 penguins, 1 albatross, 14 petrels and shearwaters, 1 storm petrel, 1 diving petrel, 1 gannet, 6 shags, 1 skua, 3 gulls and 4 terns breeding on the main islands or those close offshore. Species from subtropical and subantarctic islands in this region almost double the number of breeding species, though several have rarely or never been recorded from the main islands.

As a result of the abundance of seabirds round our coasts, every year thousands die close enough to the shore to be cast onto the beaches. As early as last century some ornithologists were aware of this but records in the literature are mainly limited to the finding of rarer specimens or the occurrence of large 'wrecks.' Since the establishment of the Ornithological Society of New Zealand in 1939, records of seabirds found dead on beaches have steadily increased. The Beach Patrol Scheme was introduced in October 1951, lapsed a

few years later but was revived in 1960. Participants in the scheme entered details of their patrols on cards which were collected by the organiser, indexed and filed at the Dominion Museum. Annual summaries have been published for cards sent in between 1960 and 1963. These record the finding of 1,121 dead birds in 1960, 3,138 in 1961, 1,367 in 1962 and 1,535 in 1963. In addition Bull and Boeson (1961a) report 6,960 specimens recorded as found between 1939 and 1959. There has been a temporary interruption in publication of reports since that for 1963 but many members have been active in the last five years and the backlog of data is being analysed and will be published.

OBJECTIVES

The main objectives of the scheme are (modified from Bull and Boeson 1961a):—

(1) To provide accurate information on the species of seabirds occurring in New Zealand seas, where these are found and at what season of the year.
(2) To increase collections of specimens at Museums.
(3) To record variations in mortality of seabirds; particularly large 'wrecks,' their extent and the species involved, and associated factors (meteorological conditions, condition of birds, etc.).
(4) To increase the chances of recovery of banded birds.

Thus the scheme provides data and material which are, or can be, of use to students of seabird distribution, migration or dispersal, moult, taxonomy, anatomy, population dynamics, food and the relationships between distribution and food supplies.

TECHNIQUES

Basically beach patrolling simply involves traversing a section of beach and recording the date, locality, length of beach covered, the species found dead and the number of each species. Records of finding nothing are as important as positive results.

Patrollers should always remove from the beach all specimens found. This prevents duplication of records. Though many coasts are inspected irregularly one cannot be certain that someone else may not patrol that same beach soon after. Repeated patrols of a defined stretch of coast are often more valuable than random visits and removal of specimens must be done in that case. The best method is to collect the birds in a sack or plastic bag. At the finish of the patrol (or along the way if the bag gets too heavy) the collection can be sorted out, recorded and buried or disposed of well above the highest tideline. Better still, take everything home, record the data at leisure and dispose of unwanted material at a rubbish dump.

The correct identification of all birds found is of utmost importance. "New Zealand Birds" (second edition) by W. R. B. Oliver or "Field-guide to New Zealand Birds" by Falla, Sibson and Turbott are recommended reference books. If in any doubt about the identity of a bird obtain the opinion of an authority or consult the organiser.

Remains found on beaches range from complete birds to wings, tails, feet or just feathers. Patrollers should record remains such as wings, tails and feet. Though it may not be possible to identify the species from such remains, the genus should be recognisable without

difficulty. Prions' wings are frequently found — these may be recorded on the cards thus: Pachyptila spp. (wings) 5.

The Scheme is mainly concerned with seabirds (penguins, albatrosses, petrels, shearwaters, storm-petrels, diving-petrels, gannets, shags, tropic-birds, skuas, gulls and terns), all *dead* specimens of which should be recorded on the beach patrol cards. However, other species will be found, some of which may be quite rare, e.g. Spine-tailed Swift, and it is best if all dead birds found are recorded.

I have recommended above that all specimens be removed from beaches. All seabirds except the Black Shag are protected at present and it is unlawful to retain protected species, dead or alive, without authority. Rare specimens should be donated without delay to the nearest museum or the Dominion Museum, Wellington. However, some museums need specimens of less-rare species, too, and patrollers can be of considerable assistance by asking the nearest museum whether it wants them. If a museum doesn't take your birds, you may want to keep them, in which case you must apply to a museum for a permit. This authorises you to keep specimens, though they are legally the property of the museum.

CARDS

Two types of cards are issued by the organiser to patrollers. The Beach Patrol Card is for recording the results of each patrol. One patrol only is recorded on each card. The Specimen Record Card is used to record birds' measurements, details of sex, age, moult, weight, size of gonads, and details about specimens preserved in a museum or private collection. One card can be used for several specimens provided they are of the same species and collected on the same date. This card is used only where any of these relevant details are recorded. Unfortunately, most patrollers use the Specimen Record Cards very little, but this is understandable as beach patrolling itself is time-consuming and the specimens are usually not in a state that encourages or even permits extensive examination. Even if the specimens are not complete enough to sex, or take measurements, recording the presence or absence of wing and tail moult is very valuable.

Where measurements are taken use calipers or dividers (except for wing) and record them in millimetres:—

Bill length from tip to beginning of feathers on the forehead. Do not measure if the upper bill plates are missing or if any forehead feathering is lost.

Bill width at the widest part, and *Bill depth* at the same point or at beginning of forehead feathers.

Wing to be flattened along a ruler and measured from tip to carpal flexure (first joint) with wing in closed position. Watch that outermost feathers are not missing or in moult, or that wing is not bent through drying out.

Tarsus from the notch at rear of the upper joint to where the mid-toe joins the tarsus at the front; and *Mid-toe and Claw from* that joint to tip of claw with the foot flattened.

Tail, if not in moult, from between bases of central feathers to tip of the longest feather which must not be loose.

Measurements, except of uncommon birds, are best restricted to fairly fresh specimens. If weights are taken, birds must be fresh, intact, dry and well-shaken to free sand.

When completed, cards are sent to the organiser — M. J. Imber (63 Glen Road, Raumati South, Wellington) — who supplies cards and further information. The scheme is open to all members of O.S.N.Z.

The following references are to reports on the scheme:—

BULL, P. C., and B. W. BOESON, 1961a: Preliminary analysis of records of "storm-killed" seabirds from New Zealand, 1939-59. Notornis 9, 6: 185-199.

BULL, P. C., and B. W. BOESON, 1961b: Seabirds found dead in New Zealand in 1960. Notornis 9, 7: 225-230.

BULL, P. C., and B. W. BOESON, 1963: Seabirds found dead in New Zealand in 1961. Notornis 10, 6: 265-277.

BOESON, B. W., 1964: Seabirds found dead in New Zealand in 1962. Notornis 10, 8: 404-411.

BOESON, B. W., 1965: Seabirds found dead in New Zealand in 1963. Notornis 12, 3: 169-175.

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SHORT NOTES

HOOK GRASS KILLS SILVEREYES

While hiking in Westland, near Fox Glacier on 7/2/65, I came across a small stream where a number of Silvereyes *(Zosterops lateralis)* were drinking and bathing. As I approached they dispersed into the canopy, but to my disbelief, two remained, held fast by the seed heads of the sedge *Uncinia uncinata* (Family Cyperaceae). This sedge, better known as Hook Grass or Bastard Grass on account of its tenacious habit of latching on to anything which brushes against it, was growing on the bank of the stream and was apparently being used by the Silvereyes to reach the water.

While attempting to free the two trapped birds, I noticed another three dead in the shallow water still securely held by a number of the hooked seeds. Mortality of this type does not appear to be a common occurrence even though birds are well known pollinators and distributors of seeds and other living material. (Ridley, N.H. (1930); The Dispersal of Plants Throughout the World, Ashford Kent.) One other occurrence has come to my attention where Silvereyes and House Sparrows *(Passer domesticus)* were reported captured by secretions of *Pisonia brunonniana,* also in New Zealand. (Melville, R. (1964). Pollinators and Distributors: Seed Dispersal, A New Dictionary of Birds, p. 654. Edited by A. Landsborough Thompson).

The tenacity of Hook Grass is well known and cursed by many, but its ability to hold small birds, occasionally to their death, seems worthy of documentation. People studying small birds should be on the lookout for similar instances of mortality as well as feathers being contaminated with seeds of this and other species.

Uncinia uncinata is one species of a genus thought to have originated in the Antarctic (Ridley, p. 557) and to have been carried northwards from Tierra Del Fuego into North America and eventually Europe by migrant birds. A related species, *U. microglochin,* owes its dispersion over the north temperate regions to wild cattle and other herbivores (Ridley, p. 558). Owing to the unique hooked rachis of some species of this genus, particularly *U. uncinata,* its ability to "hitch a ride" has been greatly enhanced, even to the point where it has been able to hold small birds until they perish.

Because *U. uncinata* is able to hold on so firmly, preening and grooming must be important mechanisms for dissassociation of this species from its carrier.

In the case of the Silvereyes, it was still early in the growing season and the seed heads were still green and not yet mature. I am not familiar enough with *U. uncinata* to say, but I suspect seed separation from the parent plant is easier at maturity. This period of ripening accurs about the same time as the annual autumn migration in the southern hemisphere at which time small passerines coming in contact with seeds of *U. uncinata* and related species would experience less difficulty in getting away, thus enabling possible dispersal of the sedge over great distances.

— WILLIAM MERILEES

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IMMATURE ROOK AT KAIKOURA

Early in December while observing a flock of White-backed Magpies feeding in a sheep pasture on the Kaikoura peninsula, I noticed amongst them a bird of similar size but with no white markings.

On close examination it became evident that this 'stranger' was an immature Rook *(Corvus frugilegus)*. Its call, 'kaah,' is very distinctive.

It is now over four months since I first noticed its presence here and it still accompanies the same flock of Magpies; both while feeding and while roosting in a small pine plantation.

On 8/12/68, three Red-billed Gulls chased the Rook while it was in flight near the pine plantation. The Rook hurriedly disappeared into the plantation. The gulls immediately broke off the attack.

During late November 1968, Kaikoura experienced strong N.W. winds over a period of several days. Could this perhaps be the reason for its presence here ?

— MICHAEL J. CRIGLINGTON

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REVIEWS

Poisoning Gulls with Alpha-chloralose near a New Zealand Airfield. T. A. Caithness 1968. Jnl. Wildlife Management 32, 2: 279-286.

The airfield at Napier was close to a rubbish dump which attracted Black-backed Gulls and adjacent to a nesting colony of some 1250 pairs: airstrikes being numerous. Extermination was decided on and careful study and preparation was necessary. 422,000 squares of bread were airdropped as pre-baits at the peak of incubation (November 18-24, 1965) and 19,000 poisoned baits were used on the 5th and 7th days (no bait-shyness having developed). When the baits were taken, narcosis showed within ten minutes and apart from some body-twitching the evidence suggested little discomfort to the birds, many dying on their nests in a natural sleeping position. Some birds flew strongly even when narcotized and may have died at sea, but 2,131 were known to have been killed, virtually exterminating the colony. Few other species were poisoned accidentally.

— J.M.C.

Birds and Aircraft: A Problem at Auckland's New International Airport, by E. K. Saul. Jnl. Roy. Aeronautical Soc. v. 71, No. 677: May 1967. Reviewed from Wildlife Pub. 91, Dept. Internal Affairs, Wellington, N.Z.

This paper highlights the problems caused by building an airport right in the middle of the rich feeding areas of anything up to 30,000 godwits, knots, oystercatchers, stilts, dotterels, swans, ducks and gulls. Into the bargain it was near a rubbish dump frequented by thousands of gulls. Control methods aimed at preventing aircraft striking flying birds are discussed: ways of scaring birds away, attempts made to stop people disturbing wader flocks, so that they will not fly over the runway, and the nearest dump has been closed. To prevent birds roosting on the runways at high tide, H. R. McKenzie and R. B. Sibson suggested alternative roosts being provided, and two artificial roosts were built nearby. One is an island of 6 acres, composed of sand, shell, black rock and crushed concrete and was proving highly effective.

Of scaring methods, daily sweeps of the airport by vehicles are made, some shooting having a marked preventive effect. Long grass is recommended to make roosts unattractive, and a model aeroplane designed to look like a hawk has been tested. In this paper (or for that matter any other on the subject I have read) no mention is made of the old-fashioned way of driving birds away with a man and a dog. Perhaps it would not work for long, but one would at least like to know that such an elementary (and cheap) idea has been thought of and tried.

— J.M.C.

★

Ecological Adaptations for Breeding in Birds, by David Lack, Methuen & Co. Ltd. N.Z. Price $11.55.

There are few authors expert or lucky enough to write three important books in a row. Dr. Lack has achieved this hat-trick without depending on luck. The main hypothesis supporting this book is, in his own words:—

> "I consider that all the breeding habits and other features discussed . . . have been evolved through natural selection so that, in the natural habitats where they were evolved the birds concerned produce, on average, the greatest possible number of surviving young."

It is, in every sense of the old phrase, an encyclopaedic work, and for that reason alone is worth possessing. It is also an impressive synthesis, but the extent to which this synthesis carries conviction depends more upon the number of cases about which Dr. Lack argues so plausibly than the extent to which individual ones are convincing in themselves. Thus your acceptance of the main theme tends to increase as the book progresses, though even at the end you are left with the impression of a large number of exceptions to the general theory, a feeling that alternative explanations are frequently possible (as in clutch size in waterfowl and hole-nesting species) and, as a corollary, a suspicion that natural selection operates in a more complicated way than Dr. Lack gives the impression it does. But it is this very combination of conforming and non-conforming cases that makes the book so stimulating and a spur to research.

It is divided into two parts — the first deals with nesting dispersion and the pair-bond and the second with clutch size, size of eggs and growth rate. There is also a large clutch of appendices in which a tremendous amount of detail on a wide variety of subjects is summarised — an excellent idea which saves cluttering the main text and helps to keep it easily readable. Every chapter has its summary and eventually there are summaries of the summaries. Though this involves the reader in some repetition he, at least, cannot claim that the argument is ever obscure.

There are a few specific points which seem to merit criticism:—

1. Conclusions reached on the basis of comparison by means in the absence of any other statistical data, may frequently be unjustified (I was surprised, by the way, at how little elementary statistics appear in this book). It is the very use of means in this way that leads to the saying that there are lies, damned lies and statistics.
2. One gets the impression that *all* variation is regarded as adaptive. Need this be so ?
3. Virtually all the data Dr. Lack uses seem to be regarded by him as equally reliable. Synthesizers of other people's work are always faced with the problem of assessing its reliability. I wonder whether Dr. Lack should, at times, have been more obviously critical.
4. As an off-shoot of this last point, definitions often vary with the expert, Dr. Lack sometimes omits even giving his own, e.g. there is none for incubation time. How is the reader to know, therefore, whether certain data have been properly combined or compared ?
5. When does a natural habitat become unnatural ?

Such reservations as these are minor as far as the work as a whole is concerned, but if they are justified in any way they may have led to at least some errors in deduction.

The very pleasant illustrations are by Robert Gillmor; and, as usual, there is a virtually exhaustive bibliography (O. Hilden's paper on clutch size in waterfowl is a notable omission) and an excellent subject and animal index.

— G.R.W.

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LETTER

A gremlin haunted me when I wrote the paper on "The Occurrence of the Musk Duck *Biziura lobata* (Shaw) in New Zealand." I figured, but did not describe, the right humerus collected by Mr. Russell Price in the creek deposits at Poukawa Swamp, Hawkes Bay, in 1963.

The measurements are, in centimetres:

L	P	M	D
10.2	1.9	0.6	1.215

The bone is very little worn, and appears to be slightly sub-adult.

— R. J. SCARLETT

1969 A.G.M. WEEK-END, AUCKLAND

Auckland members were the hosts for a very successful round of meetings held at the Museum on 16th, 17th and 18th May, 1969.

The Society's Council met on the afternoon and evening of the Friday, and on Saturday morning the annual conference of Regional Representatives was attended by eight R.R.'s and six other officers. Annual Reports from regions were discussed, and the meeting considered means of disseminating news and interesting records. The Council's proposals for a distribution recording scheme were fully explained and discussed.

On Saturday afternoon members met in the Museum hall to hear two papers. Mr. C. J. R. Robertson spoke on the "Cape Kidnappers Gannet Colony," and Mr. J. P. Croxall described "Mixed-flock Feeding in Primary Forest in Sarawak." Following these Mr. Geoff. Moon showed an excellent series of colour slides and a film of Fairy Terns nesting on Northland beaches. A buffet dinner preceded the Annual Meeting and set the scene for a very pleasant social gathering before the formal business.

The President, Dr. G. R. Williams, welcomed 65 members to the Annual General Meeting. Reports from each of the Society's schemes and committees were read and adopted for publication. It was announced that the new edition of the Checklist of New Zealand Birds is in the hands of the printers and should be on sale before the end of the year, at a price estimated to be $2.50. Progress was reported on the review of the Constitution.

The following officers were declared elected unopposed to the Council positions which became vacant at this meeting:

Editor: Mr. R. B. Sibson, Auckland.
Secretary: Mr. B. A. Ellis, Christchurch.
Treasurer: Mr. J. P. C. Watt, Dunedin.
Council Member: Mr. R. R. Sutton, Invercargill.

Members carried with acclamation, a vote of thanks to Mr. B. D. Heather, who retires from the Council after some years of service.

The President announced the award of the prize for the junior member making the most outstanding contribution to the aims of the Society in the year, to Richard Gray, of Dunedin, for his work on the breeding biology of the Rifleman.

Mrs. S. Reed proposed that the Society should publish a calendar of artistic bird photographs. Mr. R. B. Sibson thanked her for her suggestion, but explained that after consideration at the previous day's Council meeting, it was decided that this further venture into publishing did not seem practicable at this time, due to the problems of distribution, etc.

In reply to Mr. A. T. Edgar's question, the President explained that the colour copy of the Kermadec Expedition film had not yet been received, and that the last of the scientific papers were awaited for completion of the book of the expedition.

Supper was served after the meeting, and arrangements were finalised for Sunday's field outings to Mangere ponds and to Karaka. The Mangere party's sighting of a Marsh Sandpiper *(Tringa stagnatilis)*, only the sixth record for New Zealand, was regarded as a fitting conclusion to a week-end which Mrs. Reed and her committee had so excellently organised in every respect.

— B. A. ELLIS

STATEMENT OF ACCOUNTS

For the Year Ended 31st December, 1968

1967			1968
	OUR INCOME WAS EARNED FROM:		
1724	Subscriptions: Ordinary	1818	
	Arrears	47	
	Life Members (Note 1)	152	
38	Donations	21	
651	Profit on Christmas Cards	745	
267	Sale of Back Numbers of "Notornis"	252	
103	Surplus Field Study Course	50	
2783	**TOTAL ORDINARY INCOME**		$3085
	PLUS INVESTMENT INCOME:		
190	Interest	340	
184	Dividends	193	
1724	Royalties	612	
2098	**TOTAL INVESTMENT INCOME**		1145
4881	**TOTAL INCOME**		$4230
	LESS EXPENSES:		
1761	"Notornis" Printing & Distribution	2324	
52	Postages	62	
145	Printing & Stationery	157	
193	General Expenses	81	
29	Annual General Meeting	16	
84	Travelling Expenses	108	
29	Nest Record Scheme	5	
	Recording Scheme	5	
	Royal Society Affiliation	20	
	Library Expenses	64	
	Nett Cost of Kermadec Expedition (Note 2)	80	
82	Bird Study Pamphlet	–	
50	Taxes Paid	–	
	Audit Fee 1967 (Note 3)	125	
	Audit Fee 1968	100	
2425	**TOTAL EXPENSES**	3147	
$2456	**SURPLUS FOR YEAR TRANSFERRED TO ACCUMULATED FUND**		$1083

BALANCE SHEET
As at 31st December, 1968

1967				1968
	CURRENT ASSETS:			
5400	Cash at Bank of N.Z.			5324
66	Sundry Amounts owed to the Society			79
420	Bank of N.Z. Savings Account			515
	Checklist Expenses			104
600	Stocks of "Notornis" (Note 4)			100
	Stocks of "Biology of Birds" (Note 5)			100
1440	Loan to Kermadec Accounts			–
2110	Loan to "Biology of Birds"			–
10036	**TOTAL CURRENT ASSETS**			$6222
	INVESTMENTS AT COST:			
5050	Shares in Public Companies (Note 6)		5134	
1400	Local Body Stocks (Note 7)		4284	
	TOTAL INVESTMENTS			9418
1000	Library at Valuation			1000
$17486	**TOTAL ASSETS**			16640
	LESS LIABILITIES:			
480	Amounts owed by the Society		735	
212	Subscriptions in Advance		177	
	RESERVE FUNDS:			
1520	Life Subscriptions		1512	
300	Minor Expeditions		251	
896	Publication Account		–	
3408	**TOTAL LIABILITIES**			2675
14078	**VALUE OF ACCUMULATED FUNDS AS BELOW**			$13965
	ACCUMULATED FUNDS:			
11622	Balance 1/1/68		14078	
2456	**Plus** Surplus for year		1083	
				15161
	Less Stock of "Notornis" written down		500	
	Loss on "Biology of Birds"		696	
				1196
$14078	**BALANCE 31/12/68 AS ABOVE**			$13965

"BIOLOGY OF BIRDS"

Statement of Receipts and Payments for the Period from June 1966 to December 1968

INCOME:			
			$
Sales of Book			2823
Miscellaneous Income			21
Interest			31
TOTAL INCOME			$2875
LESS EXPENSES:			
Publisher	3861		
Advertising	568		
Stamps & Stationery	177		
Sundry Expenses	65		
TOTAL EXPENSES		4671	
LOSS ON BOOK			$1796
LESS TRANSFER FROM:			
Publication Reserve	1000		
Accumulated Funds	696		
		1696	
BALANCE 31/12/68			$100

NOTE: This balance represents the books on hand unsold.

KERMADEC EXPEDITION ACCOUNT

Cash on Hand 1/1/68			$1430
PLUS INCOME:			
Interest			31
Sale of Equipment			24
			$1485
LESS EXPENSES PAID:			
General Expenses	8		
National Film Unit	117		
		125	
FINAL BALANCE WHEN ACCOUNT CLOSED			$1360
We had advanced to the Expedition Account			1440
And received back as above			1360
LEAVING A NETT LOSS OF			$80

The Society still owns tents which had a book value at 1/1/68 of $100. When and if this is sold the proceeds should offset this loss.

NOTES TO THE ACCOUNTS

Note 1: Life Members transfer 10% of Balance 1/1/68.

Note 2: Nett cost of Kermadecs Expedition is represented by tentage.

Note 3: Audit Fees are actual for 1967 and the estimate for 1968.

Note 4: Stocks of Notornis have been reduced from $600 to $100.

Note 6: Shares in Public Companies cost $5133.60 and had a market value of $4975.52 as at 31/12/68.

Andrews and Beavin	400	$1.00
Farmers Trading Co.	500	$0.50
Alex Harvey	140	$1.00
Plus Bonus	28	$1.00
N.Z. Forest Products	400	$1.00
Wilsons Cement	500	$1.00
General Foods. Notes	168	$0.50
J. Wattie Canneries	509	$0.50

Note 7: Investments in Local Body Stocks:

Otago Harbour Board	$966	maturing 1/9/71	@ $1000
Southland Harbour Board	$953	maturing 30/6/72	@ $1000
Auckland Hospital Board	$965	maturing 17/6/73	@ $1000

Representing part of the Life Subs. Reserve:

Auckland Electric Power Board	$400	maturing 1/4/69
Auckland Electric Power Board	$400	maturing 1/4/70
Auckland Electric Power Board	$600	maturing 15/2/71

Total — $4284

AUDITORS' REPORT TO THE MEMBERS
For the Year Ended 31st December, 1968

We report, that in our opinion, the foregoing accounts of **The Ornithological Society of N.Z. (Inc.)** for the year ended 31st December, 1968 are in agreement with the books and records of the Society and give a true and fair view of the Society's position at that date and of the results of its transactions for the year. The Society has kept proper books and supplied all the information required.

THOMPSON & LANG, Public Accountants,
Auditors

Dunedin, 13th May, 1969

TREASURER'S REPORT
For the Year Ended 31/12/68

PRESENTED AT THE ANNUAL GENERAL MEETING
OF THE O.S.N.Z., AUCKLAND, 17/5/69

I am pleased to report that the Society's finances continue to be in a generally sound state. The surplus for the year of $1083 is most gratifying. However it must be pointed out that contributing to the surplus was $612 from Royalties to the Field Guide together with $745 profit from the sale of Christmas Cards. Without these sources of income a deficit of $274 would be shown.

Investment income apart from Royalties has contributed significantly to the general income. Interest in Local Body Stock returned 5% for the year, dividends from shares in public companies returned 3.76% on their cost price, and interest on money held in the bank returned 3%. Despite the relative buoyancy of the share market at the end of the year the value of our shares had not quite returned to their cost price. However a valuation on 15/5/69 showed them to be $906 above cost price. A schedule of our investments is shown with the Notes to the Accounts.

With regard to the year's expenses I have to report a 20% rise in the price of printing 'Notornis' over the same cost for 1967. This is after allowing for the fact that Vol. 15 (1968) was a larger volume than Vol. 14 (1967) by 48 pages. I have also to report that successful representation has been made to the Inland Revenue Department with the result that the Society is now tax exempt. The recent change to our Constitution has clearly defined the non-profit nature of the Society. This change was a prerequisite to exemption.

Membership during the year showed a net increase of 3.9%. 115 new members joined while 36 left the Society and a further 41 were struck off as unfinancial. Membership at 31/12/68 was:— Ordinary 652, Junior 80, Husband and Wife, 20, Endowment 30, Overseas (including bodies) 77, N.Z. bodies 46, Life 79, Hon. Life 2, Exchanges 46, Complimentary 9, Total 1041. The increase in Junior membership from 56 to 80 is of special interest.

The accounts for the 'Biology of Birds' have been brought to audit. 5000 copies of the book were published and there remains a stock of some 2290 copies. The account as such has now been closed, showing a loss of $1796. Future sales will recoup part of this loss.

The stocks of both the 'Biology of Birds' and back numbers of 'Notornis' have been written down to $100 each. In the long term their value is hopefully greater than this amount. The showing of stock at a nominal value in a balance sheet is accepted practice for non-profit organisations.

The Kermadec Account was closed during the year. Tents to the value of $100 are owned by the Society so the 'loss' of $80 is really only a paper figure.

I wish to thank Jill Hamel, Bob Smith, Robin Gledhill and Peter Schweigman for their assistance at busy times during the year. To A. Blackburn and B. D. Heather I gratefully acknowledge assistance

with the keeping of the Kermadec and Biology of Birds Accounts respectively. My special thanks, too, to all those members who paid their subscriptions promptly and thereby greatly assisted in reducing the paper work. I also wish to record the interest and courtesy shown by Messrs. J. Lang (Auditor) and H. R. Wilson (Sharebroker) in handling the affairs of the Society.

JAMES P. C. WATT,
Hon. Treasurer

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DONATIONS

The following donations of $1.00 or more were received during the year ended 31/12/68. Several donations of amounts less than $1.00 were also received from a number of members, and 30 members contributed an extra dollar through their Endowment subscription. The Society gratefully acknowledges these sources of income which contributed $51 in total last year.

P. J. Quinn ($1.00, E. St. Paul ($2.00), G. W. Yeates ($1.00), G. Wightman ($2.00), I. L. McKeen ($2.00), D. Crockett ($2.00), Miss McDougall ($3.00), A. Todd ($1.00), Dr. M. Pick ($5.00).

REPORT OF THE NEST RECORD SCHEME
For the Year Ended April 30th, 1969

During the year ended April 30th, 1969, 744 nest record cards have been received from 30 contributors. Observations were made for 59 species. The largest contribution by a junior member is that of Raymond Pierce of St. Andrews, South Canterbury, who recorded 142 observations of nesting of 22 species. The most detailed observation of an individual nest was made by Sue Fogarty of Ardmore, Auckland.

Members are reminded that nest record cards can be borrowed for information on breeding behaviour. We would be grateful if those availing themselves of this service could, where practicable, make available to the Society the results of their analyses, as the information would then be available to others on request. This does not apply, of course, to those whose results are published in *Notornis*, or elsewhere.

Colonial cards are being used to a greater extent. 51 colonial cards covering mainly gulls, terns and shags have been included in this year's report.

Species recorded in the scheme for the first time include Cirl Bunting and North Island Rifleman.

Sincere thanks to those who contributed cards during the year and best wishes to those who are planning to participate in the Nest Record Scheme in the future.

— DAVID E. CROCKETT,
Nest Record Organiser

SPECIES LIST OF NEST RECORD CARDS

SPECIES	Previous Total	1968-69	New Total	SPECIES	Previous Total	1968-69	New Total
North Island Kiwi	2	–	2	N.Z. Dotterel	53	–	53
Stewart Island Kiwi	2	1	3	Wrybill Plover	9	–	9
Great Spotted Kiwi	1	–	1	Pied Stilt	201	38	239
Yellow-eyed Penguin	11	–	11	Black Stilt	6	–	6
Little Blue Penguin	57	1	58	Southern Skua	2	–	2
White-flippered Penguin	12	–	12	Black-backed Gull	211	11	222
N.Z. Crested Penguin	2	–	2	Red-billed Gull	96	11	107
Southern Crested Grebe	2	–	2	Black-billed Gull	100	2	102
N.Z. Dabchick	1	–	1	Black-fronted Tern	207	1	208
Wandering Albatross	11	–	11	Caspian Tern	19	19	38
Light-mantled Sooty Albatross	4	–	4	Antarctic Tern	3	–	3
Fairy Prion	16	–	16	Fairy Tern	9	–	9
Flesh-footed Shearwater	1	–	1	White-fronted Tern	45	8	53
Sooty Shearwater	4	–	4	White Tern	1	–	1
Fluttering Shearwater	7	–	7	Grey Ternlet	5	–	5
Allied Shearwater	3	–	3	N.Z. Pigeon	24	4	28
Black Petrel	1	–	1	Rock Pigeon	59	5	64
Grey-faced Petrel	14	–	14	Kaka	9	–	9
Kermadec Petrel	1	–	1	Kea	51	1	52
Pycroft's Petrel	5	–	5	N.Z. Parakeet (Red-crowned)	7	–	7
White-faced Storm Petrel	5	–	5	Yellow-crowned Parakeet	3	–	3
Diving Petrel	51	–	51	Shining Cuckoo	4	–	4
Gannet	4	–	4	Morepork	8	2	10
Black Shag	52	11	63	Little Owl	14	–	14
Pied Shag	19	1	20	Kingfisher	60	5	65
Little Black Shag	1	–	1	South Island Rifleman	44	28	72
White-throated Shag	11	2	13	North Island Rifleman	–	5	5
King Shag	18	–	18	Rock Wren	11	–	11
Spotted Shag	5	–	5	Skylark	93	6	99
Blue Heron	31	–	31	Welcome Swallow	150	12	162
White-faced Heron	12	1	13	Fantail	132	10	142
Bittern	2	–	2	N.I. Fantail	–	21	21
Canada Goose	22	–	22	N.I. Tomtit	14	8	22
Domestic Goose (presumed escaped)	1	1	1	S.I. Tomtit	22	1	23
Mute Swan	9	–	9	N.I. Robin	8	–	8
Black Swan	39	8	47	S.I. Robin	15	–	15
Paradise Duck	7	–	7	N.I. Fernbird	5	2	7
Grey Teal	9	–	9	S.I. Fernbird	9	–	9
Brown Teal	2	–	2	Brown Creeper	2	2	4
Grey Duck	77	7	84	Whitehead	6	–	6
Grey Duck/Mallard Cross	1	1	2	Yellowhead	13	–	13
Mallard	46	12	58	Grey Warbler	82	3	85
Shoveller	11	1	12	Song Thrush	1079	143	1222
Black Teal	6	–	6	Blackbird	937	116	1053
Harrier	48	2	50	Hedge Sparrow	133	12	146
N.Z. Falcon	5	–	5	N.Z. Pipit	30	2	32
Pheasant	18	–	18	Bellbird	17	1	18
Brown Quail	3	1	4	Tui	23	5	28
Californian Quail	18	–	18	White-eye	99	27	126
Chukor	1	–	1	Greenfinch	74	5	79
Banded Rail	4	–	4	Goldfinch	286	48	334
Spotless Crake	2	–	2	Lesser Redpoll	47	14	61
North Island Weka	4	–	4	Chaffinch	153	22	175
South Island Weka	7	1	8	Yellowhammer	27	6	33
Pukeko	95	11	106	Cirl Bunting	–	1	1
Australian Coot	4	–	4	House Sparrow	458	39	497
South Island Pied Oystercatcher	101	2	103	Starling	197	14	211
North Island Pied Oystercatcher	28	2	30	Myna	19	2	21
Black Oystercatcher	31	4	35	White-backed Magpie	16	9	25
Spur-winged Plover	32	–	32	Magpie (Species not indicated)	6	–	6
Banded Dotterel	163	2	165	North Island Saddleback	7	–	7
				TOTALS	6664	744	7408

LIST OF CONTRIBUTORS

I. G. Andrew, Mrs. B. Brown, R. Bushell, Miss J. H. Bysouth, M. W. Bysouth (116), R. Bysouth, J. Cahill, C. N. Challies (47), J. W. Cheyne, J. Cook (11), B. Cowan and B. McKenzie (25), J. A. Cowie, D. G. Dawson (25), P. Dilks (57), A. T. Edgar (10), Miss S. Fogarty (27), R. Gray and M. Howes (31), D. W. Hadden (29), J. E. Hilton (51), J. R. Jackson, E. B. Jones, D. V. Merton, R. Pierce (142), P. M. Sagar (73), W. Salmons, J. Taylor, K. Todd, A. H. Whitaker (35).

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RECORDING SCHEME
Report for 1968/69

23 Species Files have been sent out on request during the year (compare previous annual figures of 4, 3 and 10). It is encouraging to note that more use is being made of the files. Some were used by Officers of Wildlife Branch, some by members working on a thesis, others in preparation of papers published or to be published in *Notornis*. The number of contributors is slightly down; much good information has come in, but I have missed newsletters from Southland and Otago. I am grateful to my regular correspondents and to those new correspondents who have sent valuable notes during the year. The value of the scheme as a reservoir of unpublished information available for members working on individual species depends upon the amount of material provided by R.R.s and members.

The following is a list of contributors:—

Southland — Mrs. Barlow, H. Jukes, R. R. Sutton.
Otago — P. Child, Mrs. Hamel, W. T. Poppelwell, R. Smith.
Canterbury — J. R. Jackson, R. J. Pierce, S. C. Sparrow, G. A. Tunnicliffe.
West Coast — P. Grant.
Marlborough — J. A. Cowie.
Nelson —
Wellington — B. D. Bell, D. V. Merton, R. S. Slack, J. C. Smuts-Kennedy.
Wairarapa —
Manawatu — E. Dear, E. B. Jones, A. A. Savell.
Wanganui — R. W. Macdonald.
Taranaki — D. Medway.
Hawkes Bay — Miss Todd, Mrs. Waters.
Gisborne — A. Blackburn.
Volcanic Plateau — J. Anton, W. Broun, R. Cowan, R. W. Jackson.
Bay of Plenty — H. London, R. Weston.
Waikato — D. W. Hadden.
South Auckland — Mrs. B. Brown, S. Chambers, M. Douglas, D. A. Lawrie, H. R. McKenzie, M. Ross, S. R. Strongman.
Auckland — G. Adams, T. R. Calvert, J. Drew, P. Gross, P. Howard, R. B. Sibson, E. G. Turbott.
Northland — D. Calvert, C. W. Devonshire, R. H. Michie, M. Munro.

E. & O. E. — A. T. EDGAR, Recorder

BEACH PATROL SCHEME, 1968

The number of dead seabirds found in 1968 was the highest yet in one year, even excluding the mortality caused by the cyclone of 10th April, 1968. Mr. Kinsky has already reported in *Notornis* the finding of 588 specimens after that storm. Excluding those found in April, 1968, the total number reported to me is at present 3,950 seabirds. More cards have been promised from Taranaki and Manawatu. Of the 15 coastal zones 6 are not represented by any cards: namely, Bay of Plenty, East Coast of North Island, Wairarapa, North Coast of South Island, Canterbury North and Fiordland. Present totals for zones are: Wellington West, 3,524 birds; Auckland West, 291; Southland, 49; Auckland East, 41; Westland, 17; Canterbury South, 14; Wellington South, 12; Otago, 2.

The Prions, particularly Fairy Prions, were the most abundant; but unfortunately most were in that unidentifiable state — wings only. Greatest numbers by far were collected in October, when there was an exceptional wreck of Short-tailed Shearwaters which continued through November. Among the more interesting totals there were: unidentifiable Prions, 1,473; Fairy Prions, 703; Short-tailed Shearwaters, 747; Hutton's Shearwaters, 88; Blue Petrels, 9. Despite the high grand total for the year the only rarities were one each of Kerguelen Petrel, Black-bellied Storm Petrel, Grey-backed Storm Petrel and a Spine-tailed Swift.

A complete analysis of the returns is now in progress and the final report will soon be in the editor's hands.

— M. J. IMBER, Organiser

CARD COMMITTEE REPORT

The 1968 Christmas card depicted the painting of a Saddleback by John Latham from a " General Synopsis of Birds " published in 1783. It was the third of the historical series used by the Society for its annual Christmas card. The use of part of the original text using the archaic "f" for the letter "s" caused some concern to a few people and some returned their cards. Apart from these few objections the card was very well received and many considered it the best to date.

This year 17,000 cards were printed and 1,361 dozen were sold (1966 sales 1,312 dozen and 1967 1,402 dozen). This produced a net profit of $560.09 for this year. Some difficulty was experienced in keeping up with the orders owing to the work of the Convener and his volunteers demanding their absence from town. This caused some delay in getting orders out and it is hoped that no inconvenience was caused. Previous years' cards are still being held, but some are sold each year and can be disposed of later as mixed packages.

The painting selected for the 1969 cards is the Spotted Shag by John Gould originally published in " The Birds of Australia and New Zealand." One additional reason for selecting the Spotted Shag is to link this year's card to the Cook Bi-Centennial as this species was first collected by Forster in Queen Charlotte Sound during Cook's second voyage.

On the Society's behalf I would like to thank the Turnbull Library, Bryce Francis Limited (Printers), The Royal Forest and Bird Protection Society and the volunteers who assisted with the packaging and despatching of the cards.

— BRIAN D. BELL, Convener

REPORT OF THE SOCIETY'S REPRESENTATIVES ON THE BANDING ADVISORY COMMITTEE

Mr. G. Harrow resigned from the committee but J. M. Cunningham attended the meeting held on 26th March, 1969. Main discussions centred on the mounting administration problems caused by more ringing and more recoveries. For the two years 1966-68 the totals of birds ringed are:

Game Birds:	Wildlife personnel	20000	
	Acclimatisation Societies	18800	
			38800
Non-game Birds:	Wildlife personnel	8200	
	Wildlife scholars and bursars	2200	
	Animal Ecology D.S.I.R.	7200	
	Dominion Museum sponsored	18700	
	University staff and students	4200	
	Other banding operators	22900	
	O.S.N.Z. Expedition	5600	
			69000
			107800

There is considerable delay in processing information and in providing data for analyses as well as producing a ringing report, the last of which was up to 1964. It was pointed out that the Wildlife Service was being blamed for this although to be fair the delay would probably have occurred under any administration because of the sheer volume of work. There is thus some talk of curtailing ringing activities.

Your representative pointed out that because there is so much "official" ringing, if ringing by O.S.N.Z. members were restricted there would not be much overall saving of administrative work. It was generally agreed that members should not be discouraged, possibly turning them from ornithology. It is likely however, that members wishing to ring will have to justify their schemes more fully in the future, as being likely to produce worthwhile results. It simply is not economic or desirable to go on ringing just in the hope that something interesting might arise from it.

Progress is being made with the production of a full ringing report covering the years 1965-69. The Banding Officer may be relinquishing his position at the end of the year but plans to complete the report before then. The Wildlife Service has in fact given a firm assurance that this will be prepared for publication within a year and your representative expressed keen satisfaction at this promise. Opportunity is taken here to record the stirling service given by Mr. C. J. Robertson as Banding Officer.

Restricted ringing permits have been issued to 78 private operators and 19 organisations and general permits to 6 operators (v. *Notornis* 15, 2: pp. 137-139). No applications have been refused and therefore none has been referred to the committee for further consideration.

— J. M. CUNNINGHAM

LIBRARY REPORT
1st January to 31st December, 1968

The past year has been a busy and satisfactory one. Many journals and separates have come in and been catalogued. In all there have been over fifty borrowings.

The inter-loan system has noticeably increased, a great many items being taken by University students doing biology and special studies in ornithology.

Our thanks and appreciation should again be expressed to the Director of the Auckland War Memorial Museum and the Council for the continued housing of the library and to Miss Evans, Museum Librarian, and her staff for friendly helpfulness.

— HETTY McKENZIE, Hon. Librarian

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REGIONAL REPRESENTATIVES

FAR NORTH & NORTHLAND: A. T. Edgar, Inlet Road, Kerikeri

AUCKLAND: Mrs. S. Reed, 4 Mamaku Street, Auckland 5

SOUTH AUCKLAND: H. R. McKenzie, P.O. Box 45, Clevedon

WAIKATO: D. W. Hadden, Waingaro Schoolhouse, Waingaro, R.D.1 Ngaruawahia

BAY OF PLENTY: R. M. Weston, 250 River Road, Kawerau

VOLCANIC PLATEAU: R. W. Jackson, 9 Kenrick Road, Rotorua

GISBORNE/WAIROA: A. Blackburn, 10 Score Road, Gisborne

TARANAKI: D. G. Medway, P.O. Box 476, New Plymouth

WANGANUI: R. W. Macdonald, 127 Ikitara Rd., Wanganui East

MANAWATU: L. C. Shailer, P.O. Box 5, Rongatea

HAWKES BAY: N. B. Mackenzie, Pakowhai, Napier, R.D. 3

WAIRARAPA: B. W. Boeson, P.O. Box 30, Carterton

WELLINGTON: R. Slack, 31 Wyndham Road, Pinehaven ,Upper Hutt

NELSON: F. H. Boyce, 19 Marybank Road, R.D.1, Nelson

MARLBOROUGH: J. A. Cowie, P.O. Box 59, Kaikoura

CANTERBURY: P. Crosier, 43 Cowlishaw St., Christchurch, 6

WEST COAST: P. Grant, 10 Hinton Road, Karoro, Greymouth

OTAGO: Dr. R. F. Smith, Dept. of Chemistry, University of Otago

SOUTHLAND: R. R. Sutton, P.O., Lorneville, Invercargill

NOTICE

By resolution of Council, contributors of papers consisting of 500 words or more are required to supply an abstract, briefly indicating the contents of the paper. Abstracts will be printed in small type at the beginning of the paper.

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LITERATURE AVAILABLE

The following are available on order from Mrs. H. R. McKenzie, Box 45, Clevedon:

Back Numbers of Notornis at 50c each. Large orders for full or part sets at special prices.

O.S.N.Z. Library Catalogue, 70 pp., 50c.

Banding Reports, Nos. 8 to 14, 50c each. Nos. 1 to 7 are incorporated in early issues of 'Notornis.'

Kermadecs Expedition, 1964, by A. T. Edgar. Reprints at 45c.

From all bookshops:

A Field Guide to the Birds of New Zealand, by R. A. Falla, R. B. Sibson and E. G. Turbott. $4.50.

From O.S.N.Z., Box 40-272, Upper Hutt:

A Biology of Birds, by B. D. Heather. $1.33 post free.

From B. A. Ellis, 36 Hartley Avenue, Christchurch 5:

Field Guide to the Waders, by Condon and McGill. Price 65c.