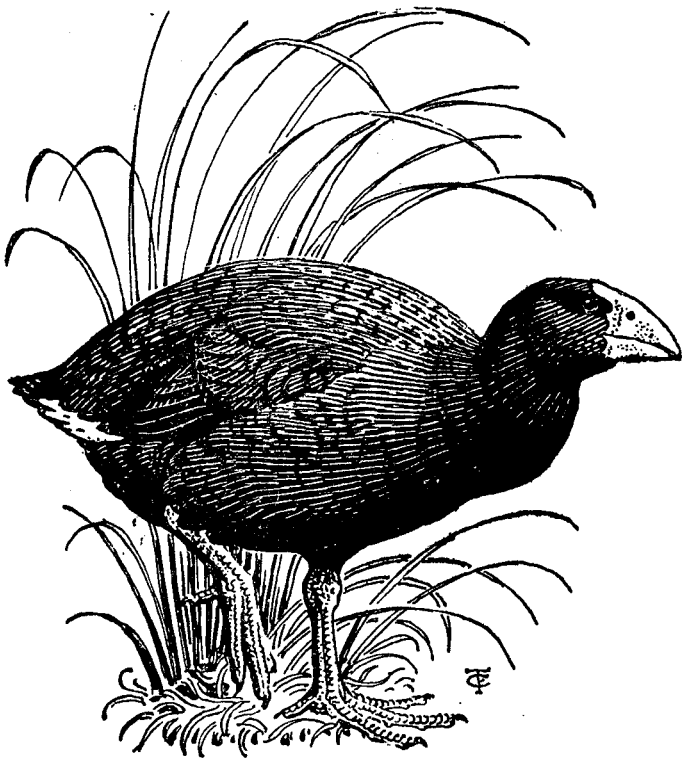
NOTORNIS



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NOTORNIS

In continuation of New Zealand Bird Notes

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Contents of Vol. 10, No. 6: September, 1963

THE GREATER YELLOWLEGS: A NEW ZEALAND SIGHT RECORD

By C. A. FLEMING

Between Porirua and Mana, State Highway No. 1 is constructed on embankments linking successive headlands of the indented shoreline of Porirua Harbour, thus cutting off the embayments as ponds varying in size, depth, and salinity.

Most of the ponds are regularly flushed by sea water, but some are imperfectly drained and tend to be stagnant, though fluctuating in level with the tide. The bird described in this note was observed immediately south of a headland prominent for its kowhai and manuka scrub, on two adjacent shallow ponds supporting a vigorous growth of the alga *Enteromorpha,* which formed a discontinuous cover on all but its deepest parts and covered the shores as a dead and decaying mat up to a former high water level. The ponds are destined for reclamation and have already received some spoil and garbage.

Whilst driving past in the late afternoon of November 11, 1962, I noticed a strange wader feeding actively on the northern pool. Obesrvation was restricted by the evening light and by lack of binoculars. Next morning, in fine weather, observations were continued for some hours with binoculars and 30x telescope. For half an hour I was joined by A. Blackburn, Brian Bell, A. T. Edgar (O.S.N.Z.) and a party of R.A.O.U. visitors, including J. B. Hood, N. Wettenhall and H. R. Officer. A. Blackburn, A. T. Edgar, J. B. Hood and H. R. Officer and C.A.F. (independently) made further inspections on the following day (Nov. 13). I returned for some hours on Nov. 17 and was later joined by Peter Harper and I. G. Andrew, who took the photographs that accompany this article. J. M. Cunningham watched the bird between 6 p.m. and 7 p.m. on Nov. 16 in bright sun fading to twilight and again, with R. A. Falla, in bright sun at midday on Nov. 17, when several rather distant colour photographs were obtained and a close view of fresh foot-prints. Later on the same day I watched the bird for the last time, but could not find it at all during the following week.

I am grateful to all the ornithologists who saw the bird for their notes and comments, which have been used in the following account, to Dr. R. A. Falla and Sir Gilbert Archey for loan of museum skins, to Dr. W. Cottier, D.S.I.R., Nelson, for insect determinations, to Mr. I. G. Andrew for his excellent photographs, and to Dr. Nagahisa Kuroda, Tokyo, for confirmation of the lack of Asiatic records. Dr. Joseph Hickey, University of Wisconsin, was good enough to arrange for comparisons between foot prints of the Porirua bird and the Urner collection housed at the American Museum of Natural History, and Mr. J. Bull of the latter institution kindly carried out the comparisons. Mr. N. A. Beatus produced undistorted natural-scale enlargements from a colour transparency of foot prints.

Although no other birds were present for comparison, all observers agree that the Porirua yellowshank was a long-legged wader, generally grey above, with speckled fore-wings, of medium size, judged appreciably larger than a Turnstone, Knot, or Terek Sandpiper (A.T.E.), but smaller than a female Bar-tailed Godwit or Whimbrel. I.G.A. and C.A.F. thought it somewhat larger than a Tattler, with relatively longer

legs. In retrospect, C.A.F. considers it was as tall as a male Godwit. J.M.C. considered its body plumper and perhaps longer than that of a Stilt. Its yellow legs were conspicuous.

The beak, black with a paler brownish base and a nasal groove extending a third its length from the base, was estimated to be 2¼in. long, and certainly more than 2in. by comparison with a measured stick that the bird walked over (J.M.C.). It was longer and less slender than the drawing of *T. flavipes* in Witherby's Handbook (p. 329) (A.T.E., C.A.F.). To most observers the bill appeared very slightly upturned (G.B.H., A.B., A.T.E., N.W.); on close scrutiny the dorsal profile of the basal half seemed to be concave upwards (C.A.F.).

The head pattern was not as clear-cut as shown in illustrations and specimens of yellowshanks, perhaps owing to fading or youth. The feathering around the base of the beak, both above and at the sides, was whitish, broken by a narrow median stripe of darker feathering expanding backwards over the crown, above a whitish superciliary streak, defined below by a dark stripe running from just above the gape through the eye. The eye itself was black and large, and emphasized by a narrow surrounding ring of white (J.M.C., C.A.F., I.G.A.). The back of the neck seemed less streaked than the crown, and the back (interscapular area) appeared a uniform grey-brown, without conspicuous spots or streaking. The white foreneck and belly were separated by an obscure grey wash across the chest, paler in the middle, formed by grey-streaked feathers. The folded wings had a conspicuously speckled appearance due to white spots on the grey feathers of coverts and secondaries, overlying dark grey-brown primaries. The rump was invisible and the tail inconspicuous when the wings were folded; the latter was ¼in. shorter than the closed wings (J.M.C.). In flight a white rump was conspicuous but did not extend forward between the wings, its anterior boundary with the brown plumage of the back being a straight line between the ends of the scapulars (I.G.A., C.A.F., J.M.C.). as well shown by one of the photographs taken by I.G.A. The spread tail was transversely barred in brown and whitish (J.B.H.). The legs were variously described as very bright yellow, orange yellow, not lemon (C.A.F.), bright ochreous yellow, more orangey than lemon (I.G.A.), a very bright yellow, but slightly muddy, though no greenish tone (J.M.C.), fairly deep yellow, not lemon yellow (A.T.E.), and gamboge yellow (R.A.F.). J. M. C. noted the elevated hind toe but could not discern webbing between the front ones; fresh prints of the toe mark were sketched and photographed (see below).

Generally, the yellowshank fed very actively, moving rapidly in several inches of water or on the surrounding mud, jerking its whole body in an exaggerated "bobbing," frequently darting its bill at insects on the surface of mud or water or on driftwood, but was never seen prodding the mud. The walk was wide-legged, somewhat bandy and awkward-looking in 2-3ins. of water, and twice the bird stumbled and saved its balance by suddenly opening its wings (C.A.F.). Occasionally it raised a leg to scratch its face, and it commonly preened while feeding. In the evening of Nov. 16 it was wary of passing traffic but fed avidly in water up to the belly at times, lunging at insects on the surface, its head often partly submerged, making 47 lunges in 2 minutes, preening repeatedly between lunges, but next morning it fed more leisurely in shallower water or on dry mud, and allowed closer approach (J.M.C.). Not as prone to perch on elevations as the Waikanae Tattler (Andrew,

1926), it nevertheless once perched on a half-submerged drum (C.A.F.).

When alerted, the yellowshank uttered a single abrupt rather loud high note "tleu," and when flushed generally took flight with a single note repeated rapidly in quick succession at least 3 or 4 times (A.T.E., H.R.O.) and often 7 or 8 times, the notes then phrased in groups of 2 to 5, having a melodious labial quality (tleu, tleu, tleu, etc.), and continued to fly silently. Flight was direct and purposeful, feet trailing beyond tail, neck and bill stretched forward, bill held down at a small angle to the flight-line. On landing (sometimes with the repeated call) the bird raised its wings and held them for a moment above the body before closing them.

The bird appeared to be feeding on insects that abounded around the pond: flies (*Ephydrella* cf. *aquaria* and its larvae, Anthomyidae n. det.) and nymphs of a pond skater (*Microvelia* sp.), but seemed to ignore snails (*Ophicardelus*).

The identity of the Porirua bird as one of the two species of Yellowlegs was suspected once its white rump mark was seen in flight, bounded by a transverse line in front and not extending between the wings as in the Greenshank and Marsh Sandpiper; the Wood Sandpiper, with a similar rump, being a much smaller bird. The Greater and Lesser Yellowlegs are closely similar in every way except size and some published accounts of field distinctions are conflicting. Identification as a Greater Yellowlegs or Yellowshank (*Totanus* or *Tringa melanoleuca* (Gm.), and not as a Lesser Yellowlegs (*T. flavipes* (Gm.)) was considered more likely by A.B., N.W., J.B.H., H.R.O., A.T.E., J.M.C., C.A.F., after considerable book-work and some changes of mind (between Greater and Lesser).

The bird is here recorded as a Greater Yellowlegs because the field observations of behaviour and opinions of several observers accustomed to judging the size of waders are consistent with the objective evidence derived from a photographs of tracks. In body size, the Porirua Yellowlegs was compared with a Stilt (13-15in.) and considered certainly larger than a Knot (10-11in.), thus agreeing with the Greater (13-15) rather than the Lesser (9½-11) (Peterson). J.M.C.'s observation on bill length (longer than 2in., i.e. 50mm) confirms this (bill 53-57mm is Greater, 34-40mm is Lesser). Three observers (I.G.A., C.A.F., P.H.) agreed that it fell between the sizes of two unsexed specimens of the Greater from the Dominion Museum that were taken into the field for comparison, and the party on Nov. 13 also found a skin of great assistance in deciding in favour of Greater Yellowlegs (A.B.). Dr. R. A. Falla has emphasised his opinion that the Porirua bird was appreciably smaller than the museum mount of the Greater. In March, 1963, J.M.C. attemped to photograph this mount, a mounted Stilt and a mounted Marsh Sandpiper (*T. stagnatilis,* from Ceylon, wrongly catalogued in Auckland Museum as *T. flavipes*) in the same positions as he had photographed the Yellowlegs, with the same equipment, but a higher water level hindered comparisons. It is quite certain, however, that the Porirua Yellowlegs was somewhat smaller than the rather over-stuffed *T. melanoleuca* (probably a female) and larger than the Marsh Sandpiper. It is thus more likely to have been a male than a female *melanoleuca.* A female skin of *T. flavipes* subsequently received by the Dominion Museum from the American Museum of Natural History is only slightly larger than *T. stagnatilis* and confirms the writer's opinion that the Porirua bird ("larger than Knot or Tattler") was *T. melan-*

oleuca. Dr. R. McNeil, Michigan, who knows the Yellowlegs well in the field, considers the photographs of the Porirua bird resemble the Greater more than the Lesser, from the stoutness of its bill, thus agreeing with field observers who considered the bill more like the sketch of the Greater than that of the Lesser in Witherby (p. 320).

The polysyllabic call of the Greater is contrasted with that of the Lesser, which is rarely more than two syllables (Witherby, Peterson, Pough). From the descriptions of call notes made in the field Mr. J. Bull (American Museum) considered "that the bird sounds like a Greater Yellowlegs." Pough states (p. 231-2) that the legs of the Lesser appear more lemon-yellow than the orange-yellow legs of the Greater, but as Fuertes' illustrations show the reverse, this may be an unreliable distinction. The Greater is more given to plover-like bobbing of head and neck and feeds by snatching, not by probing (Witherby); the Porirua bird bobbed and snatched constantly when feeding.

J. M. Cunningham's oblique photograph of fresh footprints in coherent mud, with a half-crown for scale, provides the most objective data for identification. Three of the four prints are deep ones showing the indentation formed by the elevated hind toe. The bird walked with its weight on the toes, so that the heel is not sharply defined but palmation can be clearly seen between the outer toes. The prints closest to the coin were enlarged to a natural scale and the obliquity of the view was compensated by tilting the printing paper so as to restore the circular outline of the coin from its elipsoidal shape in the original transparency. The prints fall between those illustrated by Hickey (1943, pl. 2) for the Greater and Lesser Yellowlegs, but fall within the range of 18 Greater Yellowlegs footprints (Hickey, 1943, p. 185, table A). Moreover, the "stride" of the Porirua bird (105 to 120mm) is longer than recorded for the Lesser (84-87mm). The individual toe prints are much wider (4-5mm) than those made in plasticine from a Lesser Yellowlegs skin (2-3mm). When the relaxed foot of a female Lesser Yellowlegs (mid toe 33mm, thus near the maximum for the species) is placed over the photograph with its hind toe on the hind toe mark, the tip of the middle toe fails to reach the corresponding tip of the midtoe of the print by about 5mm.

In reply to my enquiry, Dr. J. J. Hickey reported that the C. A. Urner Collection of Shorebird tracks is now in the American Museum of Natural History, where the Porirua photograph was subsequently studied by Mr. J. Bull, who writes as follows: "Your identification of the wader as a Greater Yellowlegs, *Totanus melanoleucus,* appears to be correct on the basis of footprint size. Urner's range of variation in length of middle toe is 37-46mm., while that of the Lesser Yellowlegs, *Totanus flavipes,* is 33-36.5mm. As near as I can determine from your print, the measurement is approximately 41mm, which is well within the range for Greater Yellowlegs, but considerably above maximum for Lesser Yellowlegs. As the heel in the photograph is not sharply defined, the measurement of 41mm. is necessarily approximate."

The Greater Yellowlegs breeds in Southern Alaska and Canada and winters from southern U.S.A. through Central America and South America south to the Straits of Magellan (Peters). It has occurred accidentally in Greenland and in the British Isles, and at Jaluit Atoll in the Marshall Islands in the Pacific (Kuroda, 1934). It is not recorded from Japan, China, Australia or any other west Pacific

countries. Its occurrence in New Zealand thus extends its range by more than 3000 miles, which must be the excuse for the amount of tedious description given above. Field notes have been deposited with the O.S.N.Z. The American Whimbrel and Hudsonian Godwit are two other waders with entirely American breeding range, normally migrating to South America but occasionally reaching New Zealand on the west side of the Pacific.

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THE SATIN FLYCATCHER: A NEW RECORD FOR NEW ZEALAND

By A. BLACKBURN

On 12/6/63 I received a telephone call from Mr. Raeburn Hansen, of Hexton, which is six miles out on the flats from Gisborne, to say that he had noted a strange bird feeding on insects in his orchard. I went out immediately, but on arrival the bird was not to be seen. However, after half an hour of waiting, it appeared, busily feeding on flying insects, and at first closely attended by a pair of Fantails *(Rhipidura fuliginosa placabilis),* one of which briefly attacked it. My immediate reaction was to identify the bird as a female Leaden Flycatcher *(Myiagra rubecula),* a species with which I am fairly familiar, having observed it in various parts of Eastern Australia, the Northern Territory, and New Guinea. The latest occasions on which I had the species under close observation were at Fog's Dam on 2/10/62, and at Borroloola on 8/10/62, both in the Northern Territory. Subsequent events have proved that I was in error, and have shown beyond any doubt that the bird was a female Satin Flycatcher *(M. cyanoleuca).*

The following is a description of the bird according to my field notes at the time of the observation: Throat and breast, bright rust red, the colour sharply defined from the dark head in a straight line from either side of the bill. The colour somewhat intensified on the lower part of the throat, or the upper breast. Head and nape, dark bluish grey, merging to dark brown on the lower back, and on the primary and secondary wing feathers. Underparts, including under tail coverts, dull white, and sharply defined from the colour of the breast. Tail, dark brown with very narrow white outer edges. Eyes black. Legs and feet, black or very dark. Bill, broad and short, barely half an inch long, with typical flycatcher hairs round the base. The feathers at the rear of the crown slightly raised, but not forming a crest. On the Fantail's brief attack, however, these feathers were raised to form a distinct crest. Size, slightly longer than a Fantail (i.e. six inches plus) and noticeably larger in the body.

The bird was under observation for about fifteen minutes, much

of the time too close for 7 x 50 binoculars. It was in perfect plumage and extremely active. When the bird was not in flight there was a constant tremulous movement of the tail, an up-and-down motion through perhaps a quarter of an inch, individual feathers at the same time moving slightly sideways, disclosing light colouring on their edges. At the time I regarded this tail movement as diagnostic of the Leaden Flycatcher, having noted it in that, but not in other species of the *Myiagra* genus. This led to my error in identification. Strangely enough, some authorities available to me (Lucas and LeSouef, and Leach) quote this tail movement as a characteristic of *M. rubecula* and do not mention it as being given by any other members of the *Muscicapidae.*

One book (Hindwood and McGill) states that the females of the Satin and Leaden Flycatchers are scarcely to be distinguished in the field.

Both species are migrants, moving down the east coast of Australia in the spring, the Satin reaching Tasmania in some numbers, but the Leaden occurring there only as a rare straggler. The Satin follows the mountain range, while the Leaden keeps to the lower areas. In "Emu" there is a Lord Howe Island record for the Leaden Flycatcher which is quoted, as it indicates that the species wanders, and, by analogy, the Satin may also wander. The Lord Howe Island record is as follows: "*Submyiagra rubecula* — Leaden Flycatcher. The evidence for the inclusion of this species in the avifauna of Lord Howe Island was considered unsatisfactory as no specimen was available, and it was placed among the doubtful records (1940, p. 79). However, it can now be re-instated as I find the following note in a manuscript diary written by Dr. E. P. Ramsay, and now in the possession of his son, J. S. P. Ramsay. Under date 'October 1887,' is a list of the bird specimens brought back from Lord Howe Island by Etheridge and party, followed by the entry — 'In 1883 (?) I received from Lord Howe Island a specimen in spirits, in a bad state, of *Myiagra plumbea rubecula.* I am not sure I have recorded it before.' "

No published descriptions of either species were available to me in New Zealand, so complete details of the Leaden, as given by Mathews and by North, and of the Satin, as given by North, were kindly supplied by Mr. W. R. Wheeler of the R.A.O.U. For the purposes of comparison with my field notes, North's description of the female Satin Flycatcher is as follows: General colour above, dull slaty-grey, the feathers of the head darker and tipped with glossy greenish-black; lesser and median upper wing coverts like the back, quills and greater wing coverts brown; secondaries narrowly edged externally with ashy-brown; tail brown, the four central feathers having a blackish wash; lores blackish brown; chin, sides of neck, throat and fore-neck orange rufous; remainder of the under surface and tail coverts, white. Total length 6.3 inches.

My field notes were forwarded to Mr. R. P. Cooper of the R.A.O.U., who together with Mr. Alan McEvey, of the National Museum, Melbourne, checked them against a series of skins of both species. Mr. Cooper reached the conclusion (pers. comm.), confirmed by Mr. McEvey, that the bird seen was a female Satin Flycatcher. His comments and reasons are of interest: "The Satin is more reddish on the

throat *and breast* than the Leaden. The straight line of demarcation between the rust red and the dark head is more definite in the Satin than in the Leaden. 'Head and nape dark bluish grey' — more so in the Satin than in the Leaden. 'White underparts sharply defined from the upper breast colour' — more so in the Satin than in the Leaden. 'Tail narrow *white* outer edges' — surprisingly North does not state this marking, which would appear to be white in the field, but is actually a light brown. Tail markings the same in both species. Legs and feet, bill broad and short, hairs round the base of bill — all are the same in both species. The difference in the size of bill would not be apparent in the field. 'Feathers at rear of crown slightly raised' — conspicuous in the Satin skins but not in the Leaden. (But Mr. K. A. Hindwood states (pers. comm.) that the Leaden also has a semi-crest, raised when courting or when excited.) 'Size slightly longer than the Fantail and considerably larger in the body' — this fits the Satin fully. The Leaden is shorter, and the body size is certainly no larger — in most skins it appears to be smaller. There is a slight sheen on the head and nape of the Leaden, but it would only be seen in full sunlight with the head held at a reflecting angle."

At this stage Mr. Cooper was unable to advise regarding the tremulous movement of the tail, but felt certain that it would apply to both species. In a subsequent communication, he said that Mr. Hindwood had confirmed this opinion, and had stated that the tail tremor is a generic characteristic, and not confined to only the one species.

The distribution of the Satin Flycatcher is given by Cayley as Eastern Australia and Tasmania. As already stated, it is an interstate migrant, arriving in south-eastern Australia and Tasmania during September, and departing in February, or later. Iredale states that it is also supposed that some Australian members of the species migrate to New Guinea, but that this remains to be proved. One can only speculate on the movements of the individual which I observed in that part of New Zealand most remote from Australia. The bird showed no signs of being weather-worn or tired, and seemed to be quite at home in its surroundings. It is possible that it arrived on the west coast of the South Island, after having wandered during the southward migration last spring, perhaps after leaving the Victorian coast for Tasmania, and with the onset of colder weather, had been working its way northward and eastward; but perhaps it is more likely that it reached New Zealand in autumn after being carried across the Tasman Sea as it was setting out on its northward migration.

The day of the observation was dull, cold and misty, so that some minor details of plumage were not recorded. Nor did the bird make any sound, its usual call being a loud, piping whistle "Chee-ee, Chee-ee," and also a short rasping note is uttered.

ACKNOWLEDGEMENTS

I am indebted to Mr. Roy Cooper for his help in identification, and to Mr. Alan McEvey for making a series of skins available for comparison with my notes. Thanks are also extended to Mr. Roy Wheeler for supplying references, and to Messrs. Keith Hindwood and Roy Cooper for checking the draft of this paper and making a number of helpful suggestions for alterations and additions to the text.

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[The possibility of an 'aided' passage across the Tasman Sea should not be ruled out. Sharland (Tasmanian Birds p. 114) mentions that the Satin Flycatcher has been seen crossing Bass Strait at the widest part; and adds, "It occasionally comes to rest on ships at sea.—Ed.]

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SEA BIRDS FOUND DEAD IN NEW ZEALAND IN 1961

By P. C. BULL and B. W. BOESON*

ABSTRACT

Beach Patrols in New Zealand during 1961 covered a total distance of 857 miles and yielded 3138 birds (57 species), a record. Species are tabulated by month of occurrence and by the coastal zones in which they were found; unusual species include *Eudyptes pachyrhynchus, Procellaria cinerea, P. westlandica, Pterodroma pycrofti, P. leucoptera, P. longirostris* (first record), and *Garrodia nereis.* Major wrecks of *Puffinus griseus* in May and of *Pachyptila vittata* in July are described in detail and were probably associated with food shortage. The numbers of birds and the relative importance of different species varied from one part of the coast to another, probably in relation to wind direction and the distribution of birds at sea.

INTRODUCTION

This account corrects and expands the brief interim report already published (Bull 1962). It differs from the 1960 report (Bull and Boeson 1961b) in that records of dead birds are separated into 18 geographic zones that together cover the entire coastlines of the North and South Islands (Fig. 1); this should assist in determining more accurately the ranges of the various species.

Forty-one members took part in the year's work and sent in a total of 312 fully-completed cards for patrols covering 857 miles of beach. The cards record the finding of 3138 birds (57 species) and a further 145 were found on small islands or by people not doing patrols. Records from islands where petrels breed, though valuable, are not strictly comparable with those from normal patrols of open beaches.

The number of cards received, the length of beach examined, the number of specimens and of species found, and the number of people who helped in the work were all substantially greater than in 1960. The year 1961 was also characterised by two major "wrecks" of sea birds, discussed in a subsequent section, and by the finding of a few species that are new or very rare in New Zealand (Falla 1962).

RESULTS

Distribution of Patrols

The length of beach patrolled each month is shown in Table 1

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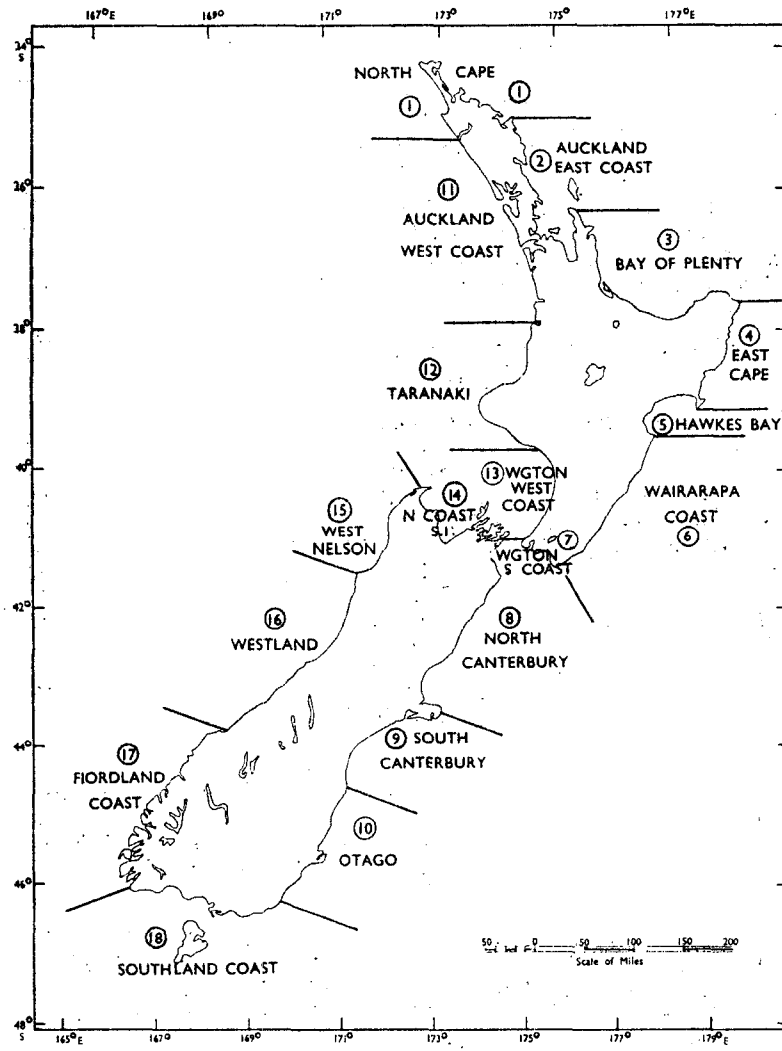

Fig. 1 — Map Showing Coastal Zones into which Beach Patrols were grouped

for each of the 10 zones in which total patrols for the year exceeded 12 miles. Patrols in two other zones have been combined under the heading "miscellaneous"; these are Westland where no birds were found on one mile of beach in February, and South Canterbury which had no birds on one mile of beach in March, but 101 birds (all but one were *Puffinus griseus*) over a similar distance in May. No patrols were reported from any of the remaining zones; namely: East Cape, Hawke's Bay, Wairarapa, West Nelson, Fiordland and Southland (Fig. 1). Patrols from Brothers and Motunau Islands (North Coast South Island

TABLE 1: Miles Patrolled and Birds Found on Different Coasts

Coastline			Number of Miles Patrolled Each Month — January-December												Total Miles	† Birds per Mile
Name (Fig. 1)	Code No.	Code Letters	J	F	M	A	M	J	J	A	S	O	N	D		
North Cape	1	NC	13											*	13	0.7
Auckland East	2	AE	15							1			9	3	28	1.1
Bay of Plenty	3	BP	31	21	10	15	14	13	7	—	*	3	—	9	123	0.9
Wellington South	7	WS	1	*	2		20	10		12	1	1	3		50	1.4
North Canterbury	8	CN	5		7			3	6			5	15	14	55	0.9
Otago	10	O	1	3	12	14	17	5	10	8	9	6	7	10	102	1.2
Auckland West	11	AW	19		1		21	4	19		6	5	5		80	18.5
Taranaki	12	T	23	18	18	18	2							2	81	0.1
Wellington West	13	WW	17	12	30	30	14	18	65	45	21	23	15	6	296	3.8
North Coast, South Is.	14	NCS	11	4	3		4			4					26	1.4
Miscellaneous (see text)	—	—		1	1		1								3	—
Total Miles	—	—	136	59	84	77	93	53	107	70	37	43	54	44	857	—
Birds per Mile	—	—	1.5	0.6	1.3	0.5	5.2	1.6	16.1	2.5	1.3	1.7	1.2	2.3		3.7

* Indicates monthly patrols totalling less than half a mile; all other values are to the nearest mile.

† The table is based on a total of 3138 birds; a further 145 birds were on cards excluded from the Table (see text).

and North Canterbury zones respectively) are excluded from Table 1 because these are breeding places; the birds found dead there, however, are recorded in Tables 2 and 4.

The continuity of monthly patrols throughout the year varied markedly from one zone to another (Table 1). The Wellington West Coast and Otago zones were the only ones with patrols for every month of the year and even in these, the patrols were sometimes too short to yield a reliable indication of bird mortality in certain months. The coverage for the remaining zones rarely exceeded two thirds of the year. In view of the uneven coverage, the number of birds found per mile (right hand column of table) is strongly influenced by whether or not patrols were made during the periods of heaviest mortality.

The mean number of birds found each month in all zones combined (bottom row of figures in Table 1) shows that mortality was relatively low during the period February to April (less than 1 bird per mile for the three months combined). A similar late summer-autumn decline in mortality was noted in 1960 (Bull and Boeson 1961b) and for *Pachyptila turtur* over the period 1951-59 (Bull and Boeson 1961a).

Kinds of Birds Found

Species of penguins, albatrosses, petrels and shearwaters found during 1961 are listed in Table 2 which also shows the frequency of occurrence by months. Other kinds of birds (mainly gulls and gannets) are grouped together as "miscellaneous species." The three most abundant species during 1961 were *Pachyptila vittata* (1385 specimens), *Puffinus griseus* (583) and *Pachyptila turtur* (342). Species that were new or very rare (less than 10 specimens to date) in the beach patrol records were *Eudyptes pachyrhynchus, Procellaria cinerea, P. westlandica, Pterodroma pycrofti, P. leucoptera, P. longirostris* (first record) and *Garrodia nereis.*

"Miscellaneous species" consisted of the following: *Sula bassana* (26 specimens), *Phalacrocorax carbo* (2), *P. varius* (1), *P. melanoleucos* (1), *P. carunculatus* (9), *P. punctatus* (15), *Phalacrocorax* sp. (1), *Circus approximans* (5), *Haematopus ostralegus* (1), *Larus dominicanus* (75), *L. novaehollandiae* (24), *L. bulleri* (4), *Larus* sp. (1), *Hydroprogne caspia* (2), *Sterna striata* (13), *Hemiphaga novaeseelandiae* (1), *Columba livia* (2), *Prunella modularis* (1), *Zosterops lateralis* (1), *Carduelis carduelis* (2), *Passer domesticus* (1) and *Gymnorhina hypoleuca* (1). The harriers, goldfinches, white eye, hedge sparrow and house sparrow were from "the Brothers" (Zone 14), and all except the harriers, which had been shot, were found near the lighthouse in August and September; this may indicate some kind of migratory movement.

Seasonal Distribution of Species

Table 2 reflects the normal seasonal occurrence of migratory species. In some months, however, certain species were far more numerous than usual: *P. gavia* in March, *P. griseus* in May and *P. vittata* and *P. turtur* in July. Data on these four species are compared in Table 3 in which the mean number of birds per mile indicates the extent of mortality for each species in certain zones. This index of mortality avoids the bias caused by variations in patrolling activity in different months and zones (Table 1).

Fluttering Shearwater *(P. gavia).*

Specimens were few (less than 0.3 birds per mile) on the Wellington West Coast, except in March when they increased about sixfold to 1.3 per mile. A three-mile patrol near Waitarere (Levin) on 12 March yielded 7.3 *P. gavia* per mile. All the birds were in heavy moult and lacked several primaries.

Sooty Shearwater *(P. griseus).*

Except in Bay of Plenty, there was a marked increase in *P. griseus* in all zones in May (Table 3). The monthly average for the Auckland West Coast was 8.6 birds per mile, but 11 per mile were recorded over 15 miles at Muriwai on 21 May. Mortality was particularly severe in South Canterbury where 100 *P. griseus* were found on a mile of beach at Wakanui (Ashburton) on 15 May. On 16 May the Christchurch Press reported an estimated 500 birds on 2 miles of coast at Wakanui and further north "hundreds" of live ones were seen over Lake Ellesmere (17/5/61). In the far north heavy casualties were reported on Ninety Mile Beach (Evening Post 7/6/61). It is interesting that few *P. griseus* were found in the Bay of Plenty in May (only 0.1 per mile on 14 miles of beach), though heavier mortality (1.2 - 2.3 per mile) was recorded later in the year. Possibly *P. griseus* passes the Bay of Plenty in numbers only during its southbound migration.

Broad-billed Prion *(P. vittata).*

A very severe wreck of Broad-billed Prions occurred along the west coast of the North Island during the week commencing 30 June. An average of 40 *P. vittata* per mile was recorded on the Auckland west coast in July, and as many as 144 birds were found on a single mile of beach at Awhitu on 3 July.

Somewhat lighter mortality was recorded on the Wellington West coast where the July average was 7.9 birds per mile; 22 per mile were recorded at Himatangi on 1 July and again at Paekakariki on 9 July. Many Wellington beaches were patrolled on several successive occasions at this time and this may partly explain why the average number of birds per mile was so much less than at Auckland where most of the beaches were patrolled only once. The three miles of the Waitarere - Hokio Beach (Levin) yielded 130 *P. vittata* but these were collected during three separate patrols thus giving an average of 14 birds per mile over 9 miles. If, however, all these birds had been found on one patrol, instead of being picked up in three batches, the figure would have been 43 per mile over 3 miles.

The first indication of the *P. vittata* "wreck" was the finding of 19 birds on 3 miles of beach at Castlecliff (Wanganui) on 30 June; on the same day the "Levin Chronicle" reported that the Manawatu district was "invaded by hundreds of sea birds" blown inland by "the gale force westerly winds which have swept the countryside recently." Beach patrollers recovered 296 *P. vittata* on Wellington west coast beaches on 1 July and a further 213 during the rest of the month. Occasional specimens were found during the following months up to the end of November (75 in all), but most of these had been dead some time, and clearly the main mortality was in the first week of July.

Fairy Prion *(P. turtur).*

Fairy Prions suffered no very severe mortality though there was a rise, particularly on the Auckland west coast in July coinciding with

TABLE 2: List of Species Found Each Month

Months Birds Found:	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Specimens
Species of Birds													
Megadyptes antipodes					3								3
Eudyptula minor	21	12	11	7	12	5	9	8	4	1	5	6	101
E. albosignata	1	18	1									1	21
Eudyptes pachyrhynchus	1												1
Diomedea exulans				1			1						2
D. chrysostoma							3		1				4
D. bulleri				1	2				1				4
D. cauta			3		2	5	2					3	15
Diomedea sp.*				1					1				2
Phoebetria palpebrata						1		1					2
Macronectes giganteus			2			1							3
Daption capensis	1						1	8	1	3			14
Halobaena caerulea							4				1		5
Pachyptila vittata	5	1			1	24	1276	64	5	3	6		1385
P. salvini					1	1	151	9			1		163
P. desolata subspp.						1	18	23	1	1			44
P. belcheri							74	5	1				80
P. turtur	34	27	9	3	3	1	143	39	19	36	22	6	342
Pachyptila sp.*	4	10	3	2				1					20
Puffinus carneipes	3		2	1	2							2	10
P. bulleri	1	1	1	2	2	1				1	2	7	18
P. griseus	65	1	6	3	426	35	2	1	1	10	14	19	583

TABLE 2 (Continued)

Species of Birds	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Specimens
P. tenuirostris	10				1					3	1	7	22
P. gavia gavia	24	3	39	3	17		14	1		5	2	4	112
P. gavia huttoni	6	3							3	3	3	2	20
P. assimilis subspp.							1					2	3
Procellaria cinerea										1		1	2
P. westlandica					1								1
P. aequinoctialis					4	1							5
Pterodroma macroptera	1										1	3	5
P. lessoni	1					1	1		1				4
P. inexpectata					3							1	4
P. brevirostris							1				1		2
P. pycrofti	1												1
P. leucoptera						1							1
P. cooki												1	1
P. longirostris												1	1
Garrodia nereis					1								1
Pelagodroma marina		1	1							4		5	11
Pelecanoides urinatrix	8	1	1		3	2	24	11	1	3	1	21	76
Miscellaneous species‡	29	23	31	16	13	11	11	11	16	6	4	18	189
TOTALS	216	101	110	40	497	91	1736	182	56	80	64	110	3283

* Too fragmentary to allow specific identification.
‡ Other than petrels or penguins.

TABLE 3: Number of *P. gavia*, *P. griseus*, *P. vittata* and *P. turtur* Found per Mile Each Month on Certain Coasts

Species	*P. gavia*		*P. griseus*					*P. vittata*		*P. turtur*	
ZONE*	AW	WW	BP	WS	O	AW	WW	AW	WW	AW	WW
Jan.	0.7	0.1	0	(0)	(0)	2.8	0.6	0.1	0	0.4	0.6
Feb.	–	0.2	0	–	(0.3)	–	0	–	0.1	–	0.5
March	(1.0)	1.3	0	(0)	0	(1.0)	0.1	(0)	0	(0)	0.3
April	–	< 0.1	0	–	0.1	–	0.1	–	0	–	0.1
May	0.7	0.1	0.1	2.1	3.9	8.6	2.3	0.1	0	0.1	0.1
June	(0)	0	0	0	0.2	(6.3)	0.2	(0)	1.2	(0)	0.1
July	0.5	0.1	0	–	0	0.1	0	40.0	7.9	5.2	0.6
Aug.	–	< 0.1	–	0	0	–	0	–	1.4	–	0.8
Sept.	0	0	–	(0)	0	0	0.1	0	0.2	0	0.9
Oct.	0	0.1	(2.3)	(0)	0	0	0	0	0.1	0.2	1.3
Nov.	0	0.1	–	(0.3)	0.1	1.0	0.3	0.4	0.3	0.2	1.4
Dec.	–	0.2	1.2	–	0	–	0.7	–	0	–	0.5
Year	0.5	0.2	0.2	0.9	0.7	0.3	0.2	9.5	2.1	1.4	0.6

* See Table 1.
Figures based on patrols of less than 5 miles are given in parentheses.

the wreck of *P. vittata*. Whereas mortality was low on the Auckland west coast for the rest of the year, it increased somewhat on the Wellington west coast to a level of about one bird per mile until the end of November. The maximum counts for individual patrols on the Wellington west coast were 2.7 per mile over $4\frac{1}{2}$ miles at Waikawa on 19 August and 4.8 per mile over 5 miles at Foxton on 7 October. Maximum counts on the Auckland west coast were 15.0 per mile over $1\frac{1}{2}$ miles at Awhitu on 13 July and 6.8 per mile over 4 miles on 20 July.

Differences Between Zones

The mean number of birds per mile on the Wellington west coast during 1961 (3.8) was much higher than on the Otago coast (1.2) even though both coasts were patrolled regularly throughout the year (Table 1). The numerical importance of certain species also differed markedly from one zone to the other (Table 4); for instance, prions (*Pachyptila* spp.) constituted 76% of the total birds found on the Wellington west coast; but less than 1% of those on the Otago coast ($P < 0.01$); the comparable figures for *P. griseus* were 5% and 58% respectively ($P < 0.01$). These differences may be due, at least in part, to the fact that the two coasts face in opposite directions. Thus winds blowing birds ashore on the Wellington west coast would blow them away from the Otago coast and *vice versa*. Since the prevailing wind in New Zealand is westerly, more birds would be expected on the Wellington west coast than on the east-facing Otago one.

The prevailing wind, however, is not the only factor that influences the numbers and kinds of birds found. For instance, although in July large numbers of prions were washed ashore on both the Auckland and Wellington west coasts, some of the species were found in significantly different proportions in the two areas. For example, *P. vittata* constituted 89% of the prions found on the Wellington west coast in July, but only 71% of those on the Auckland one; the comparable figures for *P. belcheri* were 1% and 6% respectively, and for *P. salvini* 2% and 13% respectively ($P < 0.01$ in each instance); the proportions of *P. turtur* (7% and 9%) and of *P. desolata* (1% and 1%) were similar in the two zones. These results suggest a difference in the species composition of the flocks of prions that were off the two coasts at that time.

Again, there were differences in the number of birds found even between different parts of the Wellington west coast zone. In July, five patrols of northern beaches, between the Turakina River and Castlecliff, totalled $8\frac{1}{2}$ miles and yielded 30 birds (3.5 per mile) whereas patrols further south at Otaki at this time covered $6\frac{3}{4}$ miles and yielded 75 birds (11.1 per mile). For all months (except July) combined, the northern area yielded 0.3 birds per mile ($19\frac{1}{2}$ miles) whereas patrols between Otaki and Waikanae (selected to match the northern ones in date and length of patrol) yielded 3.5 birds per mile ($19\frac{3}{4}$ miles). This difference is probably due to the trend of the coastline (Fig. 1). The prevailing north-westerly winds would tend to blow birds past the more northerly beaches and to bring them ashore further south where the coastline is more at right angles to the prevailing wind. If these findings are confirmed in other years, perhaps the Manawatu River, rather than the Wanganui, should be used to mark the northern limit of the Wellington west coast zone.

TABLE 4: List of Species Found on Different Coasts (Zones).

Index No. of Zone‡	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Index Letters of Zone	NC	AE	BP	EC	HB	W	WS	CN	CS	O	AW	T	WW	NCS	
Species of Birds															Total Birds
Megadyptes antipodes										3					3
Eudyptula minor	2	10	12	1			1	4		2	23	2	34	10	101
E. albosignata								21							21
Eudyptes pachyrhynchus											1				1
Diomedea exulans											1		1		2
D. chrysostoma													4		4
D. bulleri										2			2		4
D. cauta							1	2		1	5		5	1	15
Diomedea sp.*													2		2
Phoebetria palpebrata							1						1		2
Macronectes giganteus							1				1		1		3
Daption capensis			1				4	1			1		7		14
Halobaena caerulea											5				5
Pachyptila vittata			1			2	1	2			763		614	2	1385
P. salvini											140		23		163
P. desolata subspp.											12		32		44
P. belcheri											69		11		80
P. turtur	1	1	5				5	20		1	109		178	22	342
Pachyptila sp.*		1	1					10					8		20
Puffinus carneipes		1	7								2				10
P. bulleri	1		8								2		7		18
P. griseus	1	5	19				43	12	100	71	265		62	5	583

TABLE 4 (Continued)

Species of Birds / Index Letters of Zone	NC	AE	BP	EC	HB	W	WS	CN	CS	O	AW	T	WW	NCS	Total Birds
P. tenuirostris		2	7					1			7		5		22
P. gavia gavia		2	6					4			39	1	55	5	112
P. gavia huttoni								4			4		10	2	20
P. assimilis subspp.			2								1				3
Procellaria cinerea			1		1										2
P. westlandica							1								1
P. aequinoctialis							3		1		1				5
Pterodroma macroptera		1	3								1				5
P. lessoni											1		3		4
P. inexpectata			1								3				4
P. brevirostris											1		1		2
P. pycrofti		1													1
P. leucoptera													1		1
P. cooki			1												1
P. longirostris							1								1
Garrodia nereis														1	1
Pelagodroma marina		1	8										1	1	11
Pelecanoides urinatrix	3	1	24				3				13		27	5	76
Miscellaneous species†	1	7	6		2		18	33		42	17	4	38	21	189
TOTALS	9	33	113	1	3	2	83	114	101	122	1487	7	1133	75	3283

‡ See Fig. 1.
* Too fragmentary to allow specific identification.
† Other than petrels or penguins.

DISCUSSION

Whereas strong onshore winds are necessary to bring birds ashore in numbers, it is quite common to find relatively few birds even after several days of such winds. The 1961 wreck of prions was preceded by others in 1918, 1932, 1946 and 1954 (Bull and Boeson 1961a). The fact that such wrecks are separated by intervals of several years, despite the much more frequent occurrence of strong onshore winds, or of particular weather patterns, suggests that the wrecks are due to the birds being in poor physical condition. There are several reasons for believing that food shortage was an important cause of the 1961 wrecks.

On 16 May 1961, the "Christchurch Press" reported that mutton-birders considered the 1961 season the worst for 30 years; they had found "scores" of young birds dead in their burrows or on the tracks outside; others captured for marketing were so small that it took 55 instead of 40 to fill the usual tin. With so many dead or ill-conditioned young on the breeding islands, many of the birds that did manage to leave safely were probably in no condition to withstand the strong onshore winds they encountered while migrating up the Otago and Canterbury coasts.

Again the heavy mortality among *P. gavia* in March, *P. griseus* in May and *P. vittata* in July suggests some fairly widespread pre-conditioning factor such as food shortage, and this apparently extended to Tasmania where *P. tenuirostris* suffered heavy mortality in October (Evening Post 16/10/61). Moreover, 1961 was an unusually poor year for whales in Cook Strait; the Tory Channel whaling station had killed only 53 whales by 25 July compared to the 223 obtained by this date in 1960 (Evening Post 25/7/61), but this may indicate over-fishing rather than food shortage. Finally, the *P. vittata* that came ashore at Otaki in July were considerably lighter than those of breeding adults weighed alive at Whero and Herekopare Islands by Richdale (1944a). Forty freshly dead *P. vittata* from Otaki varied from 108 - 170g. (mean 130g.) compared to Richdale's figures of 161 - 235g. (mean 196g.) for 70 birds. Dr. Bernard Stonehouse weighed some of the *P. griseus* that came ashore near Ashburton, and has kindly provided the following information from a paper he is preparing. When received, the birds were slightly decomposed and, after applying a correction, the average dry-plumage weight of 69 birds was 370g. (range 290 - 430g.) which is far below the 787g. (666 - 978g.) and 659g. (430 - 970g.) found at the breeding grounds by Richdale (1944b, 1945) for healthy adult and juvenile birds respectively. The crops of the Ashburton birds were empty or contained only materials of negligible weight, and the birds were extremely emaciated (B. Stonehouse, *in litt.* 17/6/63).

The several wrecks of prions mentioned above were all on the west coast, but wrecks of other species have occurred elsewhere, for instance the present one of *P. griseus* on the east coast of the South Island and another of *D. cauta*, *P. bulleri* and *P. macroptera* in Palliser Bay (Wellington south coast) after a southerly gale in February 1947 (Cunningham 1948). Mr. M. Hodgkins of Tauranga has mentioned several interesting earlier wrecks of petrels in the Bay of Plenty. "The heaviest strandings I have ever seen here were during the war years and shortly after. Several times I noted hundreds — perhaps thousands — stranded between Papamoa and Mt. Maunganui." No records were kept at this time, but "from memory the chief species were diving

petrels, muttonbirds and [flesh]-footed shearwaters. In May 1946, after three weeks of east wind, there was an enormous deposit — running to many hundreds — of little else save diving petrels, extending for some miles at least, east of Mt. Maunganui. That was, I think, the last of the big deposits, and numbers have been generally going down ever since." (M. Hodgkins, *in litt.* Aug. 1961).

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★

OBSERVATIONS ON CHICK MORTALITY IN A COLONY OF BLACK-BILLED GULLS IN THE THERMAL AREA AT WHAKAREWAREWA

By M. J. DANIEL

INTRODUCTION

It is well known that the Black-billed Gull *(Larus bulleri)* and the Red-billed Gull *(Larus novaehollandiae scopulinus)* breed in several areas near Rotorua on the volcanic plateau of the central north island (Oliver; 1955), the largest colony of the Black-billed Gulls being at Sulphur Point on Lake Rotorua, with other smaller colonies on the same lake and at Lake Rotomahana (Black; 1954).

This communication reports some observations taken during the 1962/63 breeding season on the many hazards facing the eggs, chicks and adults of a small colony of Black-billed Gulls (c. 125 birds),

nesting on several areas around a thermal lakelet, Roto-a-Tamaheke, in the Whakarewarewa thermal reserve behind the Forest Research Institute.

Although this unusual and dangerous nesting site for gulls might seem unique, Oliver (1955), mentions that according to Phillipps and Lindsay, a colony of about 150 Red-billed Gulls once nested on warm ground beside a hot pool at the Waiotapu thermal reserve. The colony was forced to move however when the pools dried up after an earth movement.

DESCRIPTION OF THE THERMAL GULL COLONY

The thermal lakelet Roto-a-Tamaheke is of irregular outline and measures only about 100 yds. by 80 yds. (Fig. 1). The temperature of the water at present is hot to scalding, being from 70 degrees to about 98 degrees centigrade (158-208 degrees Fahr.) on the north side where a boiling geyser occasionally rises to over 20 ft. The ground around is warm and the mud on the edge of the nesting sites varies from about 50-65 degrees centigrade (122-149 degrees Fahr.). The only vegetation around the lakelet is manuka *(Leptospermum scoparium)* and kanuka *(L. ericoides)*, which have a high tolerance both for the hot ground and the sulphurous steam.

From Fig. 1, it can be seen that the gulls nest in five separate areas around the lakelet, all on the opposite side to the little-used footpath from the Institute to the village. Observations were recorded daily or twice daily from three vantage points using binoculars and telescope. However, at times observations were extremely difficult

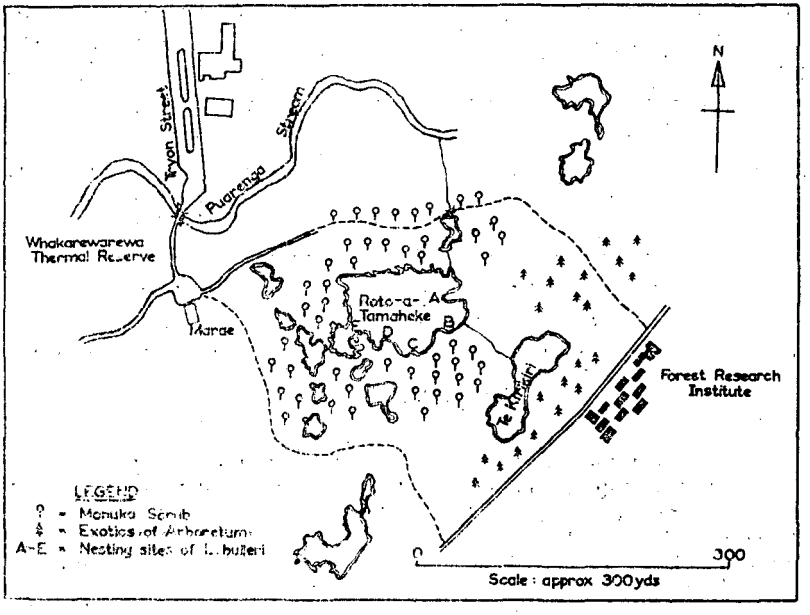


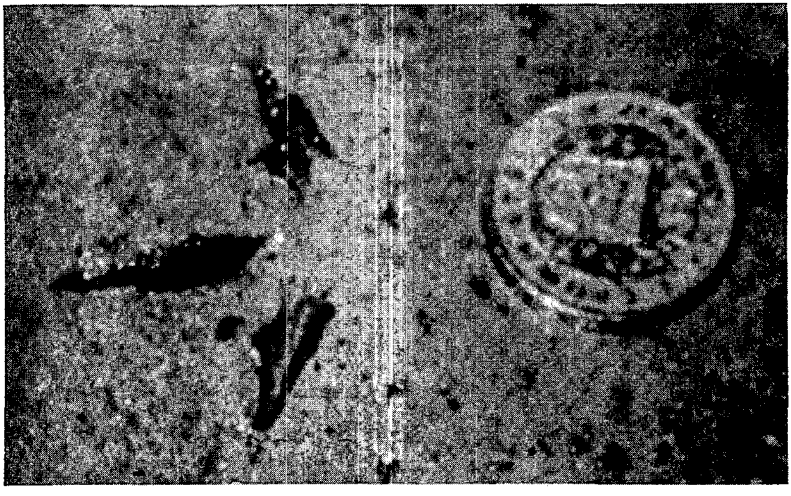
Fig. 1 — Map of thermal area showing location of five nesting areas of **L. bulleri** on lakelet Roto-a-Tamaheke.

H. G. Andrew

XXV (a, b, c) — The one and only Greater Yellowlegs **(T. melanoleuca)** so far recorded in the south-west Pacific.

[I. G. Andrew

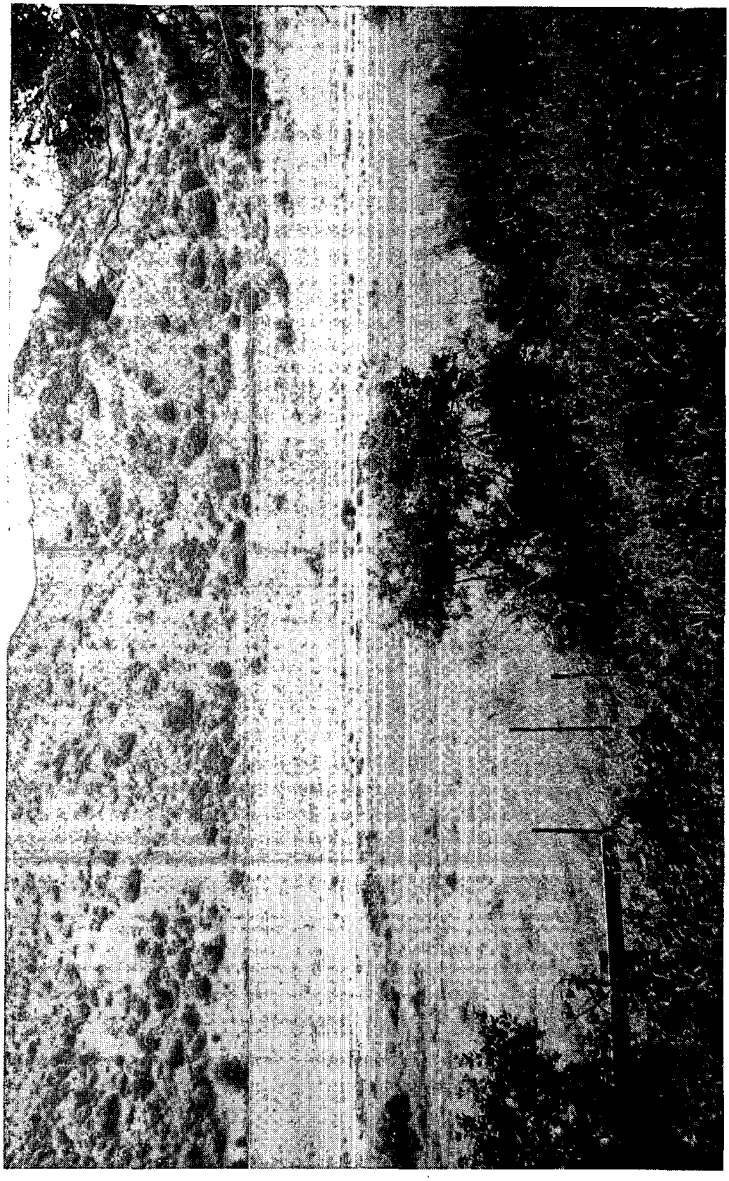
XXVI — (a) Greater Yellowlegs at Porirua, November, 1962.



(b) Footprint, natural size, from a transparency by J. M. Cunningham.

[Kaj Westerskov

XXVII (1) — North Island Weka moves freely between open country and scrub.

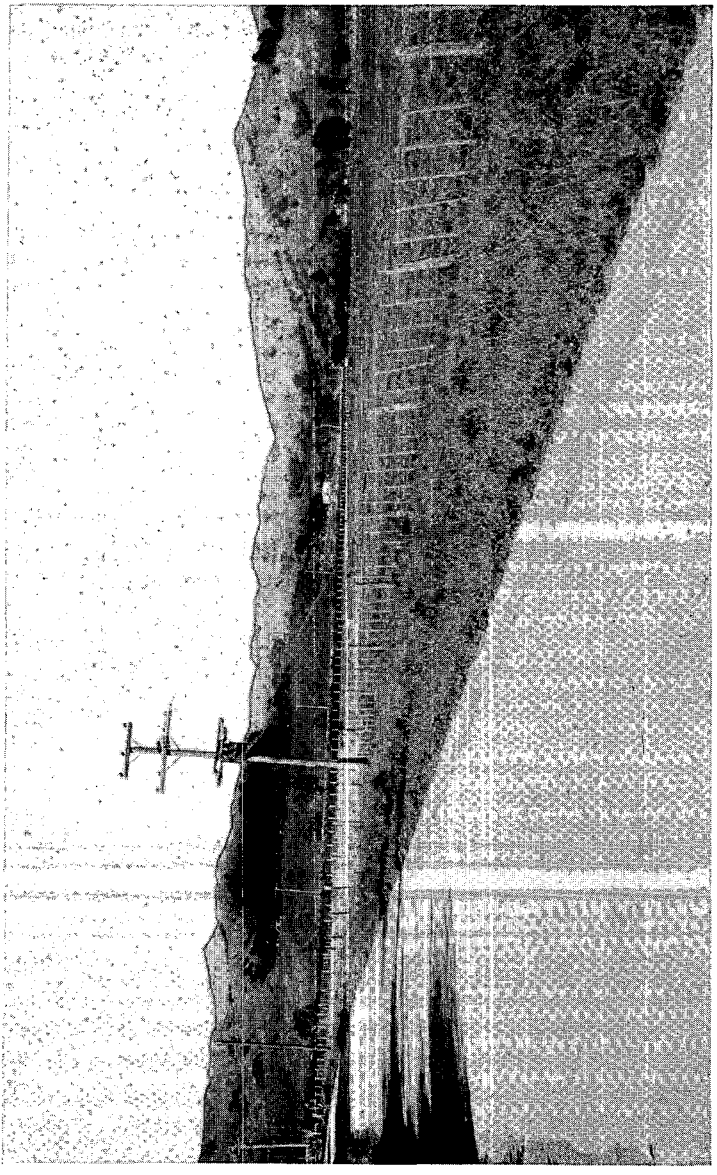


[A. L. K. Carroll

XXVIII (2) — Wekas abound on these hills near Gisborne.

[T. P. Fisher

XXIX (3) — Sedge **(Mariscus ustulatus)** provides excellent cover for Wekas.

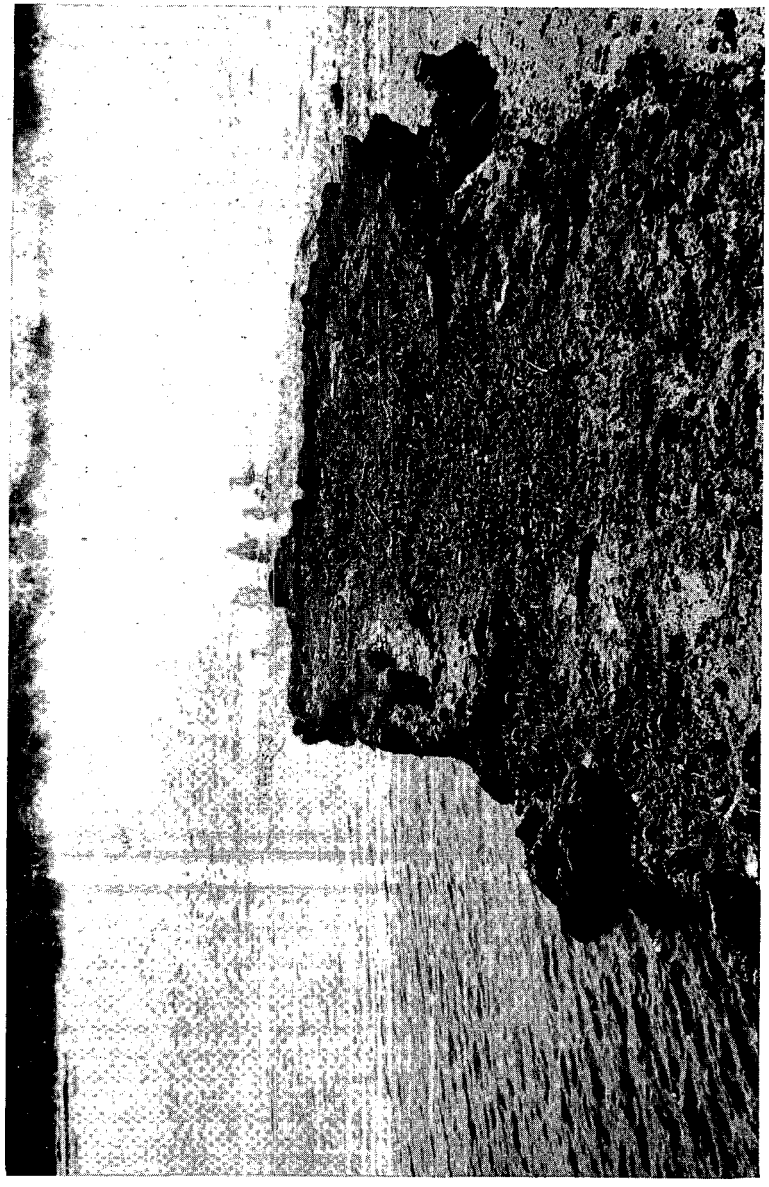


[A. L. K. Carroll

XXX (4) — Typical Weka country, Taurau Valley, Gisborne.

[M. J. Daniel

XXXI (1) — Part of thermal lakelet Rōto-a-Tamaheke looking across at nesting sites A, B and C of **L. bulleri.** Because of the sulphurous steam the visibility was rarely as good as this.



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XXXII (2) — Colony A on lakelet Roto-a-Tamaheke, showing crude nests, desiccated eggs, two desiccated chicks and the remainder on the warm mud at the edge of the hot water.

because of the numerous hot pools, boiling mud-holes and the swirling sulphurous steam that sometimes covered the lakelet for hours (Plates 1 & 2).

OBSERVATIONS

The following condensed data clearly demonstrate the success or lack of it, in the 1962/63 breeding season.

Number of nesting areas in the colony:	= 5
Numbers of pairs of Black-billed Gulls:	= 40 (A - 9, B - 16, C - 11, D - 3, E - 1).
Number of pairs of Red-billed Gulls:	= 1 (E - 1)
Number of non-nesting juvenile gulls:	= approx. 43
Total number of gulls in the thermal colony:	= approx. 125
Total number of desiccated eggs found:	= 30 (others by Maoris)
Total number of desiccated chicks found:	= 9 (others by Maoris)
Total number of chicks killed by hot water:	= at least 12
Greatest number of live chicks seen on sites:	= 35
Number of young gulls successfully leaving colony:	= 1 or 2 only.

From this it can be seen that assuming an average of 2 eggs per breeding pair, the percentage failing to hatch as the result of desiccation was about 57%. Of the probable 82 eggs laid, only 2 young at the most successfully left the colony, a success of only 2.4%. Of the 21 chicks found dead, 9 or 43% were desiccated on the nesting sites (see Plate 2), the other 12 were killed by falling into the hot water either accidentally or driven in by Maori children. Instances of both of these were observed. On one occasion two young chicks were pushed into the hot water by several adult gulls squabbling over a nest site. Both were killed instantly. On another occasion, the silica rock supporting a nest was seen to crumble away into the water along with one chick and an adult gull. Both were killed, probably by shock, within a very short time.

From the eggs that were desiccated by the intense solar radiation, the warm rocks and the proximity of so much scalding water and steam, it was noticed that several chicks were dehydrated and killed while only partially out of the shell. Besides very rapid breathing, the only behavioural adaptation of the chicks that could be seen was complete prostration in the few depressions and cavities of the silica rock of the nest site. It was very noticeable that both the adults and the chicks were very wary of the water and when approached would stand huddled on the edge of the hot water as shown in Plate 2. Only with great difficulty could the Maori children drive the chicks into the water to their death.

DISCUSSION

Several of the adults were seen incubating their desiccated and dehydrated eggs for as long as 45 days. This is not as long, however, as the 75 days recorded for *Larus ridibundus* by Kirkman (1937).

Although young gulls are precocial and have some degree of thermoregulation at an early age, it seems as if in this case, the severe

stresses of this hostile environment imposed too great a strain on their powers of thermoregulation, both physiological and behavioural. According to Marshall (1960), the mean day temperature of gulls is about 41 degrees centigrade. Bartholomew and Dawson (1954), working on the thermoregulation of the Western Gull *(Larus occidentalis)* in the desert region of California, found that with intense solar radiation this can quickly rise to 43.3 degrees centigrade. To reach homoiothermy and avoid a higher and fatal temperature, the precocial young gulls must either seek shade in cracks and crevices on the nesting site or in the shadow of their parents or swim in water (Tinbergen, 1953; Bartholomew and Dawson, 1954). Also to avoid excessive and fatal desiccation and dehydration they must drink fresh water. Bartholomew and Dawson (1954), in another study on doves, found that at a body temperature of 39.5 degrees centigrade they drank four times as much water as at 23 degrees centigrade and that 24 hours without water caused a 15% loss in body weight. The Black-billed Gulls of this thermal colony had to rely on rain water collecting in fissures in the warm rocks for their only water. This soon evaporated on a hot day, leaving only the hot and highly saline water of the lakelet. It is not surprising that at least 26% of the chicks died of dehydration and heat distress.

Taking the mean body temperatures of the young gulls to be about 41 degrees centigrade and the saline water of the lakelet to be from 29-57 degrees centigrade above this body temperature, it is not surprising that death was almost instantaneous in the water, even for the adults falling in.

It seems probable that this colony was originally an offshoot of the main Lake Rotorua colony, where the gulls still go to feed. According to J. L. Nicholls (pers. comm.) they were nesting on this lakelet as early as 1941. At this time the lakelet was hot but by 1948 had cooled down enough for swimming. By 1951, however, it had heated up again to its present temperature. It seems likely that if the temperature remains high and the Maori children continue to molest the young gulls, this enterprising colony will be wiped out in a few years.

The only other species apparently not affected by the steam was the Myna *(Acridotheres tristis)*. Several of these were seen among the chicks, probably seeking regurgitated food. Also, large numbers of Black-backed Gulls *(Larus dominicanus)* were seen on occasion flying and soaring on the hot air currents several hundred feet above the thermal area, but they were never observed feeding on the dead gulls and abandoned eggs.

It is of some interest that in 1952, a Pied Stilt *(Himantopus leucocephalus)* nested on the edge of this same lakelet and successfully raised four young (Johnson, 1954).

ACKNOWLEDGEMENTS

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FOOD HABITS OF THE NORTH ISLAND WEKA

By A. L. K. CARROLL

Until comparatively recent years, Wekas, *Gallirallus australis greyi*, abounded throughout the North Island, ranging freely wherever there was food and cover sufficient for their needs. Reports from early settlers contain frequent references to the amusing antics and annoying habits of these flightless birds, which were numerous and enterprising enough to become pests in many places. Following settlement of the land, they decreased in numbers, but it was not until approximately 40 years ago that they had disappeared almost completely, leaving a small residual population in the East Coast district and a few birds in the vicinity of Waipu, Northland (R. T. Adams, pers. comm., Int. Affairs file). It is possible that the sudden disappearance was due to an epidemic, as reports were received from people who had at that time seen numbers of Wekas in poor condition and infested with ticks.

Those surviving in the East Coast area soon multiplied rapidly and are now to be found occupying roughly 1,200 square miles, with highest concentration of numbers in the Gisborne - Tolaga Bay district, cf. Fig. 1.

Here they continue to flourish to such an extent that they have become a nuisance to local farmers and market gardeners, particularly in the dry summer months, when they peck the succulent tomatoes, melons and pumpkins, rob fowl-yards and dig up plants in search of insects. Oliver (1955) writes that against the Wekas' misdeeds must be set the fact that they consume large quantities of grass-grubs and other noxious insects, as well as rats and mice. However, as a result of complaints made to the Department, Wekas are now being trapped in the Gisborne district for subsequent liberation in selected sites in the North Island. These operations have met with varying degrees of success. In some areas it would appear that colonies have become firmly established as a result of liberations.

The primary purpose of the present investigation was to examine food habits of the Weka, but other work of a more general nature was also undertaken.

From June 1961 to December 1962 Wekas were collected in the Gisborne area at the rate of approximately five a month. These were frozen and sent to Wellington for examination. Altogether 94 specimens were studied — weight and external measurements taken, condition of internal organs noted, bursa, caeca and adrenals measured, reproductive organs examined and stomach contents sorted, identified and measured. A collection was made of wings and tails of these specimens as a basis

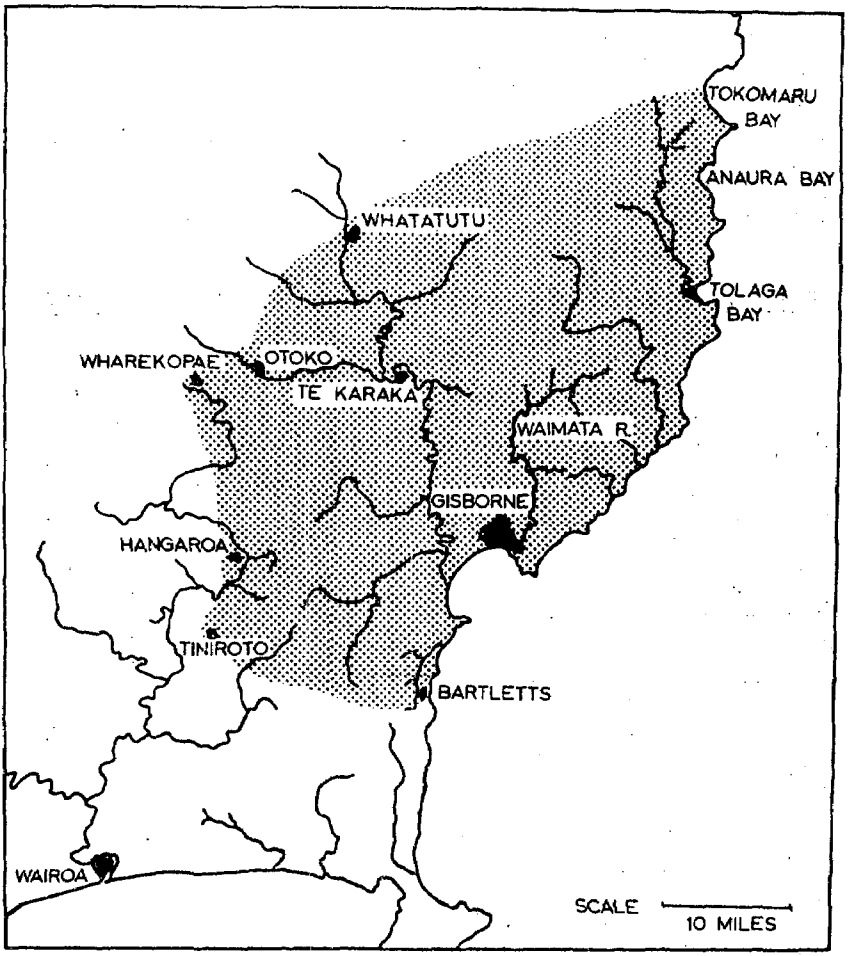

Fig. 1 — Showing maximum reported range of Weka population in East Coast area. November, 1962.

for future work on moult sequence. The number of birds studied thus was not great, but nevertheless should be considered as a reasonable sample.

In early November 1962 I visited Gisborne for the purpose of studying Weka habitat and conferring with Mr. T. P. Fisher, Senior Field Officer at Gisborne, who is responsible for all Weka work in that district. Specimens of plants were collected, Weka habitat inspected and photographed and local residents interviewed. This field study provided the background essential to completion of the work done in the laboratory.

HABITAT

North Island Wekas range from sea level to 1,500 ft. Primarily birds of marginal bush and open scrubland (see Pl. 1), they have adapted themselves to a wide variety of conditions wherever there is cover and water sufficient for their needs. Although they may be seen on the beaches, in back-yards and in cultivated areas, they are particularly numerous in semi-open farmland on the hills behind Gisborne. Here there is rough pasture, scrub in the gullies and adequate water (see Pl. 2). An important feature in this area is the presence of 'under-runners,' formed by subsidence of the soil immediately below the surface, resulting in a network of burrow-like tunnels with numerous openings to the surface. These provide ideal covered runways. Sedge *(Mariscus ustulatus)* is the dominant plant in much of this country, the low-growing tussocks providing dense cover, while not hindering the rapid movement of the birds (see Pl. 3).

As a large proportion of the specimens examined in the laboratory were collected from the Waimata Valley, a special study has been made of this area. Conditions are as described above. The hills are sheep pasture with numerous mariscus clumps, especially on the banks of water courses. Scrub grows in the gullies and rushes are common on the flats. The hills are honeycombed with under-runners, while piles of cut and dried scrub provide additional cover.

Another particularly favoured type of Weka habitat is dense cover, such as blackberry *(Rubus fruticosus)*, growing on the margins of cultivated fields. Drains provide excellent runs with maximum shelter, and plantations with undergrowth are favourite haunts, especially when inkweed *(Phytolacca octandra)*, is present. Wekas are frequently to be seen on the roads, emerging from marginal drains or long grass, running swiftly across, neck outstretched, to disappear in similar cover on the other side. It is here that many are killed, indeed, in some places dead Wekas are almost as numerous on the roads as are dead hedgehogs (Pl. 4).

Wekas nest on the ground, most commonly in tall crops, in long grass at the base of bushes, or among the exposed roots of trees. However, I observed one nest quite in the open on a road-side bank and another in the tool-shed of a suburban garden in Gisborne.

FEEDING HABITS

Although primarily carnivorous, Wekas are omnivorous. Thus not only do they hunt the wire-worms and cut-worms at the roots of young corn plants, but they eat the remains of the grain from which the plant has sprouted. Fig. 2 shows Weka damage to young corn. In the dry summer months they attack juicy fruits, such as tomatoes. This is probably in search of liquid, as gardeners tell me that if containers of water are placed among the plants the Wekas usually drink from these instead of pecking the fruit.

It would seem that they deserve their reputation for causing damage in fields and gardens, but impartial observers assure me that they probably do no more than pheasants and blackbirds. These peck at random throughout a crop, whereas Wekas feed in a limited area, usually close to cover. Thus the damage they do is obvious. Also their boldness brings them closer to habitation so that they are frequently observed.

Fig. 2 — Young corn plants showing Weka damage.

As Wekas have no crop, the gizzard contents provided the source of material for food studies. This meant that the food was finely ground, making sorting and identification a laborious process. It was impossible to make a true quantitative analysis of gizzard contents as the soft parts of the food soon disappeared, leaving a residue of harder portions of the plants and animals eaten. However, from these hard remains it was possible to make a qualitative food analysis.

Although 94 specimens were collected, the gizzard contents of only 86 were used in the final examination. Six young chicks were excluded and the other gizzards were either empty or decomposed beyond the possibility of examination.

It is important to note that measurements of both volume and weight were of dried material.

Grit.

Grit was nearly always present and commonly consisted of a few large, irregular stones together with a little fine sand. It comprised 18.69 per cent. of the total volume and 53.18 per cent. of the total weight of the gizzard contents.

In order to calculate percentage volumes and weights of different types of food in the gizzard, the grit was subtracted from the total contents leaving vegetable, seeds, animal and miscellaneous, which were then presented as percentages of the total food. This was done for each month as well as for the whole year.

Identification of plant material has been based on Allan (1961) and Hyde (n.d.), determination of insects and other invertebrates on Hudson (1892), Imms (1947 and 1951) and Parker and Haswell (1940).

Vegetable.

This consisted of grass leaves and stalks, fibres (possibly from tough leaves and stalks, e.g. sedge), small pieces of wood, clover leaves, small leaves (e.g. manuka *Leptospermum scoparium*) and occasionally moss. There was usually a residue of finely-ground, unidentifiable vegetable matter. Grass was a consistent item of diet, occurring in 50 gizzards throughout the year, fibres were found in 31, small pieces of wood in 23 and clover leaves in 20; small leaves were found in 9 and moss in 3 specimens.

For the whole year the percentage volume of vegetable matter, excluding seeds, was 55.68 cc. and the percentage weight 46.17 gms. Examination of the monthly figures showed that there was a higher percentage of vegetable matter eaten in the winter months. The figure for June appeared to be an exception, but could be explained by the fact that during that month two of the seven gizzards were stuffed, one with maize and one with pumpkin seeds.

Possibly a significant proportion of vegetable matter was taken accidentally by the birds while foraging for larvae, earthworms and other ground-dwelling animals.

Seeds.

These comprised 13.20 per cent. by volume and 21.16 per cent. by weight of the total food. Although a great variety of seeds was taken, the most commonly occurring belonged to a few families. Most important of these was the family Graminae, with goosegrass *(Bromus*

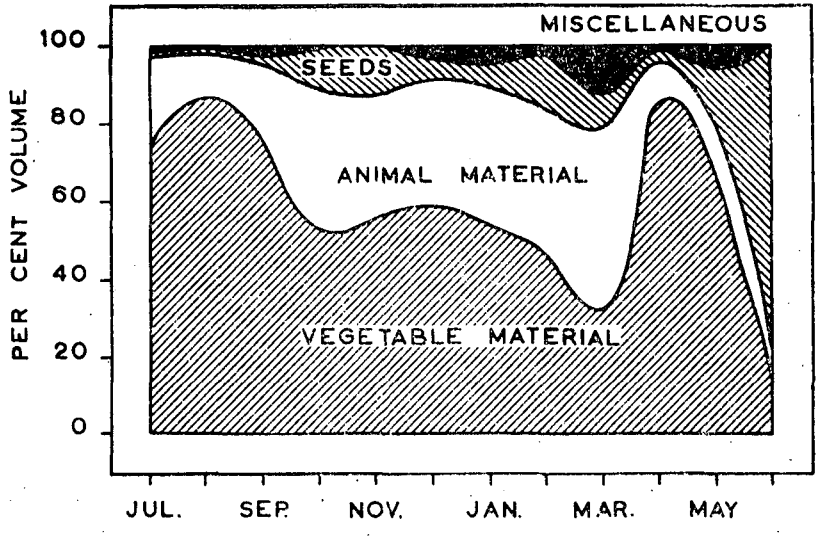

Fig. 3 — Showing seasonal variation in types of food taken by Wekas, expressed as percentages of the total volume (dried).

mollis), rough dogstail *(Cynosurus echinatus),* ratstail *(Sporobolus capensis)* and sweet vernal grass *(Anthoxanthum odoratum)* most frequently eaten. Legumes were also a popular item of diet, these being represented usually by clovers *(Trifolium repens* and *T. glomeratum).* Others occurring with moderate frequency were sedge *(Mariscus ustulatus),* black nightshade *(Solanum nigrum),* sheep's sorrel *(Rumex acetosella,)* members of the thistle family *(Cirsium vulgare* and *C. lanceolatum), Coprosma* (family Rubiaceae) and inkweed *(Phytolacca octandra).*

Animal.

This furnished 28.54 per cent. by volume and 28.09 per cent. by weight of the total food consumed during the year. It formed a significantly lower proportion of the stomach contents during the winter months.

The Weka is well-equipped for obtaining ground- and wood-dwelling animals. Its long, powerful beak and strong claws enable it to dig for earthworms and larvae, also to tear open rotten wood in search of insects living under the bark or in the recesses of the wood itself.

The animal diet was found to be extremely varied, although, as one would expect in the case of a flightless bird, it was confined almost exclusively to animals dwelling in or close to the ground. The most important of these were undoubtedly insects, of which members of the beetle family predominated.

These were eaten during all months of the year with the exception of August. Beetles commonly taken, whether in adult or larval form, belonged to a relatively small number of species. Click beetles (Elateridae) and ground beetles (Carabidae) appeared in 24 and 23 stomachs respectively, while huhu beetles (Longicornia) were also popular, being present in 20 stomachs. Less important but still significant were other members of the Carabid family, also brown and green chafers (Scarabidae).

Orthopterous adults supplied an important part of the insect food, and in 4 specimens orthopterous egg-cases also were found. Of these, by far the most frequently taken were wetas *(Deinacrida megacephala),* appearing in 33 stomachs. It would appear that, in some cases at least, the hard mandibles of these insects were functioning as extra grit in the grinding of food. Grasshoppers and locusts, members of the families Acridiidae and Tettigoniidae, had been eaten by 13 birds, and cockroaches (Blattidae) were found in 3 specimens.

Next in importance among the insects were members of the Hymenoptera. Ants (Formicidae) were most commonly found, appearing in 10 gizzards, while ichneumon flies (Ichneumonidae) were in 2 gizzards. Round galls containing hymenopterous insects were found in 2 specimens. One bird had made such a large meal of galls that its gizzard was quite distended.

Other insects were lepidopterous pupae. (*Porina* sp.) found in 7 specimens and shield bugs (Pentatomidae) in 3.

Insect eggs were a frequently occurring item of diet and had been eaten by 23 birds. Three specimens contained the puparia of blowflies (Calliphorinae).

Molluscs, represented by slugs *(Limax)* and very small snails, had been picked up by 18 birds. The only part of the slugs remaining was the internal shell. Snails were of various species although the most frequently occurring was *Potamopyrgus* sp. Only once was the radula of a land snail *(Helix)* found.

Crustacea appeared in 15 specimens. These were of two kinds — slaters (Isopoda) and small fresh-water shrimps (Amphipoda). Slaters were taken more frequently than shrimps and occurred in 12 birds.

Spiders (Arachnida) were found in 6 stomachs.

Of the remaining varied items of animal food, only two were of significant occurrence. Egg-shell fragments appeared in 7 stomachs and bones of a frog, *Hyla aurea,* were found in 4.

One especially interesting find was the remains of a peripatus *(Peripatus novae-zealandiae).* This was in the gizzard of a bird collected in July from the Waimata Valley. These unusual animals, almost bridging the gap between arthropods and annelids, have not, to my knowledge, been previously reported from this area.

Of the remaining animal contents, by far the most important were earthworms *(Lumbricus).* These soft-bodied annelids were often detected only by the presence of residual setae, the rest having disappeared completely. Appearing in 65 stomachs, they frequently comprised a considerable proportion of the animal food taken.

Members of the class Myriapoda were found in specimens taken in every month of the year. Millipedes (Diplopoda) were the only representatives of this group, apart from one centipede (Chilopoda), and occurred in 23 gizzards.

Miscellaneous.

This material comprised 2.58 per cent. by volume and 4.58 per cent. by weight of the total food consumed. Most of the items appeared to be of casual origin, e.g. fragments of sheep's hoof and a piece of wire. I placed in this category also any inextricably mixed residues of powdered sand and organic matter, which occurred from time to time. It was of small importance and added little to the final picture of the Weka's feeding habits.

CHICKS

Six specimens were collected during the last three months of the year. They appeared to follow a feeding pattern similar to that of the adult birds, but, as was to be expected in chicks, with a higher intake of protein food.

SUMMARY

North Island Wekas, once plentiful, became almost extinct approximately 40 years ago, leaving only a small residual population in the Gisborne - East Coast area and Northland (Waipu). Since then they have multiplied rapidly in the vicinity of Gisborne and are now abundant in that part of the country.

Over a period of 18 months 94 Wekas were collected from the Gisborne district for study.

Gizzard contents were examined and were found to consist of vegetable matter, seeds, insects and other small invertebrates and occasionally birds' eggs and frogs.

Predominant items of diet were of plant origin — grass, fibrous material, small pieces of wood and clover leaves. A wide variety of

TABLE 1 — Total Volumes and Weights of Adult Stomach Contents (Dried)

Month	*No. of Birds*	*Grit*		*Vegetable*		*Seeds*		*Animal*		*Miscellaneous*	
		Vol. cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g
July	6	4.5	4.0	16.7	2.2	0.2	0.1	5.1	0.8	0.6	0.4
Aug.	5	1.8	2.0	7.4	1.0	0.1	trace	1.2	0.2	1.8	0.8
Sept.	6	7.2	7.9	10.4	1.6	0.2	0.13	1.0	0.1	–	–
Oct.	9	7.3	8.1	7.9	2.4	1.9	0.7	7.2	1.5	0.2	0.2
Nov.	16	11.2	12.4	41.9	3.7	9.7	1.3	24.1	3.4	0.3	0.2
Dec.	11	17.2	29.3	29.8	3.3	1.5	0.5	11.0	1.4	1.7	0.7
Jan.	6	4.0	4.9	11.8	2.3	1.3	0.6	9.3	3.5	1.3	0.8
Feb.	4	1.1	2.2	9.0	1.2	2.6	0.4	4.7	0.8	–	–
Mar.	5	2.7	4.0	5.1	0.7	3.6	0.7	9.3	1.4	3.2	0.4
April	5	1.7	1.9	21.7	1.6	0.3	0.1	1.5	0.2	–	–
May	6	5.2	3.7	9.4	1.5	1.6	0.6	4.1	1.8	0.9	0.3
June	7	7.8	8.5	6.9	1.0	30.0	5.8	1.2	0.1	0.1	0.5

TABLE 2 — Total Volumes and Weights of Chick Stomach Contents (dried)

Month	*No. of Birds*	*Grit*		*Vegetable*		*Seeds*		*Animal*		*Miscellaneous*	
		Vol. cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g
Oct.) Nov.) Dec.)	6	1.8	1.9	7.1	0.9	0.2	0.1	8.0	1.2	trace	trace

TABLE 3 — Percentage Volumes and Weights of Chick Stomach Contents (dried)

Month	*No. of Birds*	*Grit*		*Vegetable*		*Seeds*		*Animal*		*Miscellaneous*	
		Vol. cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g	*Vol.* cc	*Wgt.* g
Oct.) Nov.) Dec.)	6	10.6	47.1	46.9	42.4	1.3	4.6	51.8	53.0	—	—

TABLE 4 — Frequency of Occurrence of Food Items in Weka Gizzards: Plant Origin

	Total	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
No. of Gizzards Examined	86	6	5	6	9	16	11	6	4	5	5	6	7
Vegetable —													
Grass leaves	50	4	4	3	6	7	4	3	2	4	5	5	3
Fibres	31	1	2	1	4	7	6		1	3	4	1	1
Small leaves (e.g. manuka)	9			1	1	1	1	2	1	2			
Clover leaves	20	1		3	2	1	4			1	4	2	2
Small pieces of wood	23	2	3	1	1	3	3		1	1	3	3	
Moss	3	1						1					1
Fine vegetable matter	26	3	4	1	1	1	5	3		1	2	2	3
Seeds —													
Grass. Graminae	33	4	1	4	3	4	4	1	1		3	4	4
Clover. Leguminaceae	17	3		2	2	4		1			3	1	1
Sedge. Cyperaceae	15	4	2				2	2	1		2	1	1
Nightshade. Solanaceae	11					3			1	3		2	2
Dock family. Polygonaceae	9	1			1	1	1	2			1	2	2
Coprosma. Rubiaceae	8						2	2			2	1	1
Inkweed. Phytolaccaceae	6		2					1			1	2	
Rush. Juncaceae	4					2	2						
Thistle. Compositae	9			1	1		2	2	2			1	
Blackberry. Rosaceae	2				1			1					
Araliaceae	2				1			1					
Liliaceae	2	1		1									
Urticaceae	3					1	1		1				
Umbelliferae	3			1		1				1			
Verbenaceae	1									1			
Chenopodiaceae	1	1											
Geraniaceae	1	1											
Labiatae	1					1							
Euphorbiaceae	1						1						
Ranunculaceae	1							1					
Papaveraceae	1											1	

TABLE 5 — Frequency of Occurrence of Food Items in Weka Gizzards: Animal Origin

		Total	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
No. of Gizzards Examined		86	6	5	6	9	16	11	6	4	5	5	6	7
Animal —														
Beetles.	Coleoptera	65	5		5	8	15	9	6	4	3	4	3	3
	pupae	1						1						
	larvae	12	2		1			1	3	1	1	1	1	1
Wetas and Grasshoppers.	Orthoptera	38			1	3	6	5	4	4	4	3	4	5
	Egg cases	4	3		1									
Ants, etc.	Hymenoptera	18		1		1	3	6	1	1	2	1		2
Moths.	Lepidoptera larvae	7	1			1		1				1	3	
Bugs.	Hemiptera	3	1				1	1						
Flies.	Diptera	1	1											
	puparia	3			1						1		1	
Springtails.	Collembola	2				1	1							
Peripatus.	Onychophora	1	1											
Spiders.	Arachnida	6	1			1					2	1	1	
Insect eggs.		23	1		3	2	1		1	1	5	4	3	1
Millipedes.	Myriapoda	23	3	2	1	3	1	2	1	1	2	2	3	2
Slaters, etc.	Crustaceae	15	3	1	1	3	2	3			1	1		
Slugs and Snails.	Mollusca	18			2	2	4	4	1	2	1		1	1
Frogs.	Amphibia	4				1	1	2						
Egg shell.		7	2				2	1	1	1				
Earthworms.	Annelida	65		5	5	6	8	8	5	3	2	5	6	7

seeds was found, most common being of the grass family, with clover and sedge next in order of importance. Insects predominated in the animal food taken, the most important being beetles, wetas and grasshoppers. Earthworms also were a major item of diet, while insect eggs and millipedes were frequently found.

ACKNOWLEDGEMENTS

I should like to thank Dr. K. Westerskov, Senior Biologist, Research Section, Wildlife Branch, for his invaluable help and encouragement; Mr. T. P. Fisher, Senior Field Officer, Gisborne, for his interest and willing co-operation in the project, especially the collecting of specimens; Professor J. T. Salmon of Victoria University for assisting with identification of insects; Mrs. M. Johnson, Senior Seed Analyst, Seed Testing Station, Department of Agriculture, Palmerston North, for assisting with identification of seeds; Mr. C. M. McCann, Dominion Museum, for his identification of bones; also Mr. A. Blackburn of Gisborne for his useful information; and Mrs. H. Hall and Miss L. Hicks, Research Section, Wildlife Branch, for preparing the map and graphs.

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BREEDING CYCLE OF THE NORTH ISLAND WEKA

It is common for Wekas to nest more than once a year although chicks are particularly numerous during the spring months. Mr. A. Blackburn of Gisborne observed a pair of Wekas which raised four broods during one year — the first in March, the second in June, the third in September and the fourth in December. Each brood numbered two or three chicks. Mr. C. Burland of Patutahi reported similarly, the broods he observed being raised in June, August, November and March. There are usually 3 - 4 eggs in a clutch although Mr. Blackburn reported 6 eggs as not abnormal and 5 quite usual.

I have been able to find the following nesting records:—

25/10/52	nest	(Notornis, *5:* 222. J.D.C.)
5/8/52	nest with 3 eggs	(Notornis, *6:* 94. J.M.M.)
24/5/54	nest, 4 hatched	(Notornis, *6:* 94. A.B.)
10/9/54	nest with 2 eggs	(Notornis, *6:* 94. Mr. P. Benson)
6/53	nest, 4 hatched, 3 reared	
8/53	nest, 2 hatched, 2 reared	
11/53	nest, 3 hatched, 3 reared	(Notornis, *6:* 94, Mr. C. Burland)
3/53	nest, 3 hatched, 3 reared	
6/54	nest, 3 hatched, 3 reared	

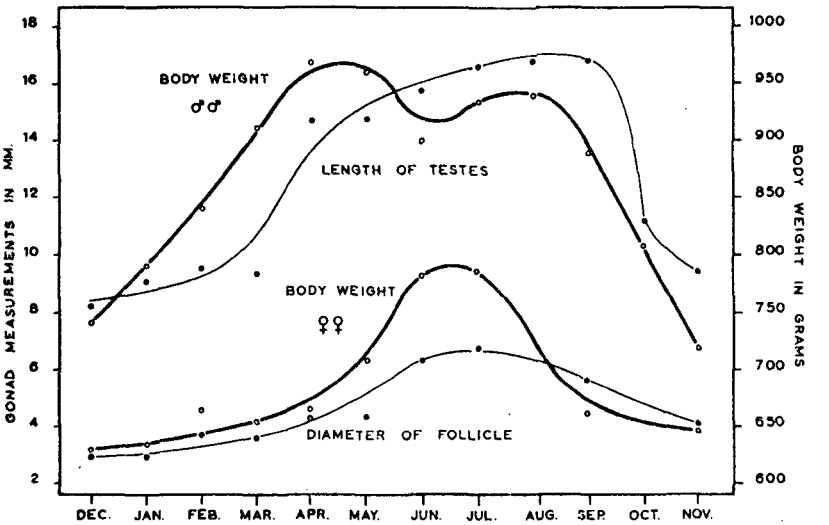

Fig. 1 — Showing seasonal variation in body weight and gonad size of North Island Weka. Note the peak months.

10/7/54	nest with 2 eggs	
26/6/55	nest with 3 eggs	Records of O.S.N.Z. Nest Records
9/61	nest with 4 eggs	Scheme.
7/9/62	nest with 4 eggs	
7/9/62	nest	Recorded by Mr. T. P. Fisher.

A study of this limited information showed that the greatest nesting activity would seem to occur between the months of June and September.

Examination of the gonads of 37 adult males showed increased development of testes from March to September, reaching a maximum in August. Activity of the ovaries in 26 adult females appeared to be greatest between May and September. Unfortunately, few females were collected except during November and December. However, as the breeding cycle shown from nesting records confirmed the results of examination of the gonads, it is reasonable to assume that, although breeding might occur throughout the year, it increases in winter and early spring, that is, from June, reaching a peak about September.

It is interesting to note that weight increase and subsequent gonadal development start in mid-summer and reach a peak in mid-winter with main breeding in winter and early spring, in contrast to many other New Zealand birds both native and introduced, e.g. pheasant (see Westerskov 1956: 62).

A study was made of body weights in relation to size of gonads throughout the year. Gonad measurements used in preparation of the graphs were length of testes and diameter of the largest follicle. The graph shows fluctuation in body weight and gonad size throughout the year, also the relationship between these two phenomena, using the method of the three-point running mean.

In males, increase in body weight tended to precede increase in size of testes. This is the usual sequence in the breeding season.

In females, the monthly figures for body weight and size of follicles appeared to follow a similar pattern. Unfortunately specimens were few, so the results here were of limited value.

SUMMARY

From nesting records and gonad measurements a study was made of the breeding cycle. It appears that, although breeding occurs throughout the year, it reaches a peak during winter and early spring (June to September).

Wekas' commonly raise more than one brood in a year; up to four have been recorded. The average number of eggs in a clutch is 3-4, although 5 or 6 are not abnormal.

REFERENCE

Westerskov, Kaj, 1956: Productivity of New Zealand pheasant populations. Wildlife Publ. No. 40 B. Dept. of Internal Affairs, Wellington. 144 pp., 4 pls., 16 figs.

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SEXING OF WEKAS

As Wekas are a monomorphic species it was necessary to find a reliable method of sexing the birds.

Length of culmen and weight of body were the two criteria used, and the birds then sexed by dissection. This method proved successful with adult birds, males commonly having greater culmen length and body weight than females. Juvenile birds may be confused with adult females, but are usually easily identified by their dark-coloured eyes and grey legs. Adults have red eyes and their legs are more brown or red-brown than grey.

It is important that measurement of the culmen should be taken from the proximal end of the horny part and not from the feathers, which often mask the true end of the culmen. When this is done, the margin of error in sexing is very small.

Among the 94 birds examined, the culmen length of adult males ranged from 44 mm to 51 mm, with the greatest numbers in the 47-50 mm group (average 47.8 mm). Length of culmen in adult females ranged from 41 mm to 47 mm, with the highest proportion in the 42-44 mm group (average 43.1 mm).

Weights of males ranged from 532 gm to 1053 gm, with 55 per cent. of birds weighing between 900 gm and 1,000 gm (average 912.7 gm). Female weights varied from 382 gm to 1,010 gm (average 698.7 gm), but only two specimens weighed more than 806 gm. Of these, one weighed 950 gm, culmen 46.5 mm; the other 1,010 gm, culmen 44.5 mm. These birds were both exceptionally fat.

The table shows a significant relationship also between length of tarsus and sex of bird. However, it could be difficult to take this measurement successfully on live birds, whereas accurate measurement of the culmen is an easy matter.

The other two measurements, of middle toe and claw (M.t.c.) and of claw only, were too widely variable to be of any value in determining sex, although the average length of each was, as one would expect, less in females than in males.

TABLE: Relationship Between External Measurements and Sex of Wekas

		Tarsus (mm)	M.t.c. (mm)	Claw (mm)	Culmen (mm)	Weight (gm)
Range	♂♂	59 - 68	62 - 72	12.5 - 17	47 - 50	532 - 1053
	♀♀	54 - 58	62 - 65	12 - 15	42 - 44	382 - 1010
Average	♂	62.8	66.4	14.8	37.8	912.7
	♀	57.4	63.1	13.8	43.1	698.7

SUMMARY

Wekas may be sexed with a reasonable degree of accuracy by measuring culmen length and body weight. Culmen lengths in adult males commonly range from 44 mm to 51 mm and in females from 42 mm to 44 mm. Males usually weigh between 900 gm and 1000 gm and females between 670 gm and 806 gm. Juvenile birds may be confused with adult females but are usually distinguishable by the dark colour of their eyes and legs.

REFERENCE

Williams, G. R., and Miers, K. H., 1958: A Field Method of Sexing the Swamp-hen or Pukeko. Emu, 58: 125-127.

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SHORT NOTES

SOME NOTES ON THE BIRDS OF NORFOLK ISLAND

Nine days from 29/9/62 were spent on Norfolk Island and the following notes are the result of this visit. As little has been published recently, these notes may have value when a more complete survey of the natural history of Norfolk Island and its two outliers, Phillip and Nepean, is made.

Norfolk Island to-day is much changed from what it was when discovered by Captain Cook in 1774. Most of the flourishing landbirds belong to introduced species. A few stragglers arrive from Australia. Petrels no longer nest in vast numbers on the main island; but gannets (or boobies), terns and noddies are still plentiful.

Nepean Island is perhaps the least changed; but even there an introduced ice-plant thrives on the top of the island, its pink flowers adding a touch of colour among the white Masked Gannets at their nests. Phillip Island is denuded of forest.

SPECIES LIST

MASKED GANNET *(Sula dactylatra)* — Nepean Island, a mile off the south coast, was visited on October 6. On the flat top among low vegetation three hundred were counted; each of the one hundred and fifty pairs was with a chick ranging from a day old to nearly fully fledged. One pair had two infertile eggs. One chick only is reared. A breeding period from August to December is indicated.

TURNSTONE *(Arenaria interpres)* — On October 3, eight were seen on the beach inside the lagoon, Emily Bay, and later the same birds were feeding in swampy pasture near the Administrator's residence.

EASTERN GOLDEN PLOVER *(Pluvialis dominicus)* — Three birds, almost certainly of this species, were seen on 3rd October associating with Turnstones and Godwits in Emily Bay.

BARTAILED GODWIT *(Limosa lapponica)* — 22 were counted feeding in company with Turnstones and Golden Plover in the swampy pasture near the Residency just inland from the beach, Emily Bay. In view of the date it seems probable that they were resting on the migratory flight to New Zealand.

RED-BILLED GULL *(Larus novaehollandiae)* — One was seen in flight with some White-capped Noddies off Emily Bay on October 2.

SOOTY TERN *(Sterna fuscata)* — Known locally as the Whale Bird. It nests in large numbers on Nepean Island. On my visit on October 6 only six birds were seen, apparently the vanguard of the thousands that are described as nesting there by the end of that month. Large quantities of eggs are gathered by Norfolk Islanders. A closed season has been gazetted from November, 1962, to October, 1963.

WHITE-CAPPED NODDY *(Anous minutus)* — The breeding season of this bird was about to begin, and small numbers were seen in company with White Terns flying in from the sea in the evening. On Nepean Island four or five were observed. Being a tree-nesting species, it would not nest there.

WHITE TERN *(Gygis alba)* — This species was common, just starting to mate, and selecting nesting sites. A few weeks later, I would have seen the eggs in their precarious position on the horizontal branches of the endemic Norfolk Island Pines.

GREY NODDY *(Procelsterna cerulea albivitta)* — I saw three nests on a cliff on Nepean Island on October 6. The birds were apparently sitting.

WHITE-FACED HERON *(Ardea novaehollandiae)* — Four were observed feeding on swampy pasture, and resting on fence posts near the Residency, Kingston.

STRAW-NECKED IBIS *(Threskiornis spinicollis)* — A single specimen was observed in company with the White-faced Herons. This seems to be a new record for Norfolk Island. Evidently a straggler from eastern Australia where it is common.

GREY DUCK *(Anas superciliosa)* — On Sept. 30 three ducks of this species were seen on swampy land near Kingston and again on Oct. 4. They seemed to be darker than New Zealand specimens, so probably were examples of the Australian sub-species *rogersi*.

HARRIER *(Circus approximans)* — On 4th Oct. a single example, almost certainly of this species, was observed in flight.

KINGFISHER *(Halcyon sanctus)* — Heard on most days, and seen on two. It is not common.

CRIMSON ROSELLA *(Platycercus elegans)* — This Australian species was present in sparse numbers. In spite of being shot because of its liking for fruit, it has survived, while the Norfolk Island Parakeet *(Cyanoramphus cooki)* is extremely rare or extinct. It is probably self-introduced, or may have been liberated in the early period of the island's history.

INTRODUCED BIRDS

STARLING *(Sturnus vulgaris)* — This is the commonest bird on the island, and was seen everywhere I went.

BLACKBIRD *(Turdus merula)* — A few were seen every day.

SONG THRUSH *(Turdus ericetorum)* — Only a few were seen.

HOUSE SPARROW *(Passer domesticus)* — A common bird to be seen near human habitation all over the island.

CALIFORNIAN QUAIL *(Lophortyx californica)* — Small numbers noted.

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NOTES ON BIRDS ON RUAPUKE ISLAND, FOVEAUX STRAIT

Ruapuke Island, in the eastern approaches of Foveaux Strait, was visited between 20th and 24th February, 1963, in the course of geological field work, and some scattered observations on the birds seen during this visit are recorded here. These notes are sketchy, and it is hoped that they can be augmented by more detailed observations in the future. Most of the geological work was of necessity confined to the shore-line, and unfortunately the small area of bush remaining was not visited.

Ruapuke covers about 3,400 acres, and like most of the small islands in Foveaux Strait is low-lying: the highest point is only 140 ft. above sea level. At the present time only one land-owner, Mr. Alfred Topi, lives permanently on the island. Except for a relatively small area of bush in its central part, the island comprises open scrub-land, low-lying swampy areas with much *Phormium tenax,* and tussocky and grassed areas used for grazing about 3,000 sheep. The coast-line is irregular and indented, low rocky cliffs alternating with fine dune-backed beaches. Of the latter, several are separated by sandy spits from small fresh or brackish lagoons.

According to Mr. Topi, a few Muttonbirds *(P. griseus)* still breed on Ruapuke, but they are reported to be much more numerous on the nearby small islands, including the Hazelburgh group, three miles south-south-west of Henrietta Bay. Red-billed and Black-backed Gulls were constantly seen, with a small number of White-fronted Terns. A single heron, probably a Reef Heron, was seen in the distance, perching at the edge of cliffs on the eastern side of the island.

Grey Ducks, Black Swans, and Canada Geese are reported by Mr. Topi to come over to the lagoons on Ruapuke from Waituna Lagoon, 12 miles to the north, during the shooting season.

Pairs of Black Oystercatchers were seen on most of the beaches, and a single Pied Oystercatcher at Henrietta Bay. A few Pied Stilts were present beside the lagoon (Waitokariro) behind Henrietta Bay. Banded Dotterels find ideal nesting sites on areas of sandy alluvium at two localities, namely Waioihe Bay (near North Head) and the spit at Tauatemaku Lagoon, and many birds were seen flocking at the latter place.

Wekas, presumably the same sub-species as that on Stewart Island, are present over the whole island. A single Harrier was seen. Parakeets, probably Red-fronted, were twice observed flying over open scrubby ground, while Bellbirds were present in the plantation at Mr. Topi's house at Henrietta Bay. Mr. Topi mentioned that Bush Pigeons are also present. Almost certainly the numbers of birds, such as parakeet and pigeon, vary considerably throughout the year, with movement to and from Stewart Island and some of the other small islands in Foveaux Strait.

The Pipit was commonly seen in all areas visited, and is probably the most abundant land bird. Apart from small flocks of Starlings, introduced passerine birds appeared to be rare.

— W. A. WATTERS

A DABCHICK'S NEST IN HAWKE'S BAY

The finding of the nest of the Dabchick *(P. rufopectus)* always seems to have been difficult in New Zealand and is such an uncommon event now that a short account of the successful search for a nest at Horseshoe Lake, Hawkes Bay, may be justified. Dabchicks, not in large numbers, are known to frequent the many scattered lakes of Hawkes Bay, but Guthrie-Smith was never able to find a nest (Sorrows and Joys of a New Zealand Naturalist, 194-150).

On 24/1/63 Mr. B. D. Hankins took R. H. Sibson and me to Horseshoe Lake, a private wildfowl sanctuary, to look for Coots *(F. atra)*, one pair of which was quickly located. The resident shepherd kindly lent us a pram dinghy. The lake and its surroundings are much modified by drainage and grazing (v. *Notornis X*, 185). Yellow waterlilies cover much of the lake's surface so that there is comparatively little open water. Perch *(Perca fluviatilis)* thrive in the lake and grow to a large size. At least three pairs of Dabchicks were present. One pair had either one or two chicks riding pick-a-back. Another pair was occupying a small bay of open water near the middle of which was a domed Goat Willow *(Salix caprea)*, some twenty feet in diameter with its lowest boughs sweeping the water. The nest was a heap of soft waterweed about a foot across just above water level. It was very hard to see, being in the gloom at the very heart of the willow where the many twiggy branches originated from a matted network of fibrous roots. The two eggs had been well covered with weed by the sitting bird as it left the nest and were quite invisible. It was not easy to push the light dinghy into the springy tangle of willow branches and the finding of the nest was an act of faith.

— R. B. SIBSON

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PARTIAL CONFIRMATION OF TWO OF REISCHEK'S LITTLE BARRIER RECORDS

Last century the German naturalist, Andreas Reischek recorded Fairy Prion *(Pachyptila turtur)* and Fluttering Shearwater *(Puffinus gavia)* breeding on Little Barrier Island (Trans. N.Z. Inst. 18: 94, 183). Neither record has since been confirmed.

At 2034 hrs. on 1/12/62 Mrs. Anne Blanshard, Susan Blanshard and myself were sitting about ten feet below the summit of Little Barrier (2374ft.). As I swept my torchbeam across the sky a Fairy Prion fluttered into my lap. This is the only one I have recorded in thirteen nights on the summit, although Mr. R. H. Blanshard, caretaker of the island, has a photograph of a Fairy Prion found injured on the Summit Track on the 26/11/60. No evidence of its breeding has been found.

On 29/1/63 Mr. Blanshard landed C. G. Cathie, R. H. Sibson, P. D. G. Skegg and myself on Lot's Wife, a small andesitic stack off the northern end of the island. Diving Petrels had earlier been recorded breeding on Lot's Wife (Turbott N.Z.B.N. 2 (5)) and several of their burrows, unoccupied by this date, were located. On a rocky ledge an addled Fluttering Shearwater egg was fonud, and feathers belonging to this species were collected. Other burrows inspected were much larger than those of the Diving Petrel, and presumably belonged to Fluttering Shearwaters.

— LOIS J. BISHOP

ITEMS OF SPECIAL INTEREST FROM THE 12th ANNUAL REPORT OF THE BANDING COMMITTEE

This report deals with birds banded and recovered between 1/4/61 and 31/3/62. During the year 71 species were banded, including five species new to the New Zealand banding list; namely Mottled Petrel, Chatham Island Petrel, Eastern Weka, Bush Pigeon and Black-backed Magpie. 98 species have now been banded in New Zealand.

Additional valuable information is provided on the longevity of some tubinares and on the immense distances travelled by some sea-birds. A Southern Royal Albatross originally banded as an adult breeding male by J. H. Sorensen in February, 1943, was breeding at the same site in December, 1961. This is the oldest New Zealand banded bird ever recovered; and its actual age can be assumed to be considerably more than 25 years. A Light-mantled Sooty Albatross banded as an adult in February 1947 was again breeding on Campbell Island in October 1961. A Pycroft's Petrel banded as an adult on Hen Island on 20/12/54 was recaught on the same slope on 19/12/61.

Five Cape Pigeons banded at the Tory Channel Whaling Station, three in 1958 and two in 1959, were caught and released at Signey Island, South Orkneys; and another was found breeding in Adelie Land. Reciprocally, ten nestling Nellies banded in Atlantic Antarctica are reported as recovered in New Zealand, nine of them in their first winter.

There are, as usual, numerous recoveries of young Gannets in Australia. One banded at Cape Kidnappers in January 1960 was found in Western Australia in July 1961.

Some Eastern Wekas were re-introduced from the Chatham Islands and liberated in the Arthur's Pass National Park.

A South Island Pied Oystercatcher ringed as a nestling at Lochiel was recovered four months later in Aotea Harbour, 650 miles N.E.

The many recoveries of the three species of gulls are beginning to reveal something of the pattern of dispersal from the breeding colonies. More evidence of the northward movement of Caspian Terns in autumn is provided. Fledglings banded at Palliser Spit and L. Ellesmere were recovered at Papatoetoe and Ngauranga respectively.

Finally, one query. In the light of recent research, is it wise or correct to attach the trinomial *cabaret* to New Zealand Redpolls?

— R.B.S.

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REVIEW

New Zealand Bird Portraits, by Dr. M. F. Soper. Publ. Whitcombe & Tombs Ltd., 1963. 28/6.

To readers of *Notornis,* Dr. Soper is already well known for his outstandingly beautiful photographs of birds, both rare and common. He uses the hide not only to take portraits but also to find out how birds live. Now he has gathered his experiences together in a book which is a "must" for all serious ornithologists in New Zealand and will make a delectable gift for the plain unpretentious bird-lover. What Moon has done for Northland, Soper has now done for inland

Otago and sub-alpine Southland. By their meticulous field observations both have added much to our knowledge of bird behaviour, especially during the nesting season.

Near Queenstown Dr. Soper has devoted much time to the ducks, gulls, terns and plovers which form the association so characteristic of riverbeds and lakes east of the Southern Alps. Besides patiently photographing them, he has noted the times of their coming and going and carefully studied their ecological needs. He has no doubts about the full specific status of the Black Stilt; but, as he says, much remains to be learnt about this rare and puzzling bird. The Eglinton Valley also, right up to the Homer Tunnel, has been another happy hunting ground. Hence a unique series of studies of Robin, Rifleman, Tomtit, Yellowhead and Rock Wren. Aliens which have come under his critical eye are Black Swan, Canada Goose and Little Owl.

This is an excellent book. The publishers are to be congratulated on their choice of paper and type and on the quality of the photographic reproduction. It deserves in all sincerity a "Well made, New Zealand."

— R. B. S.

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