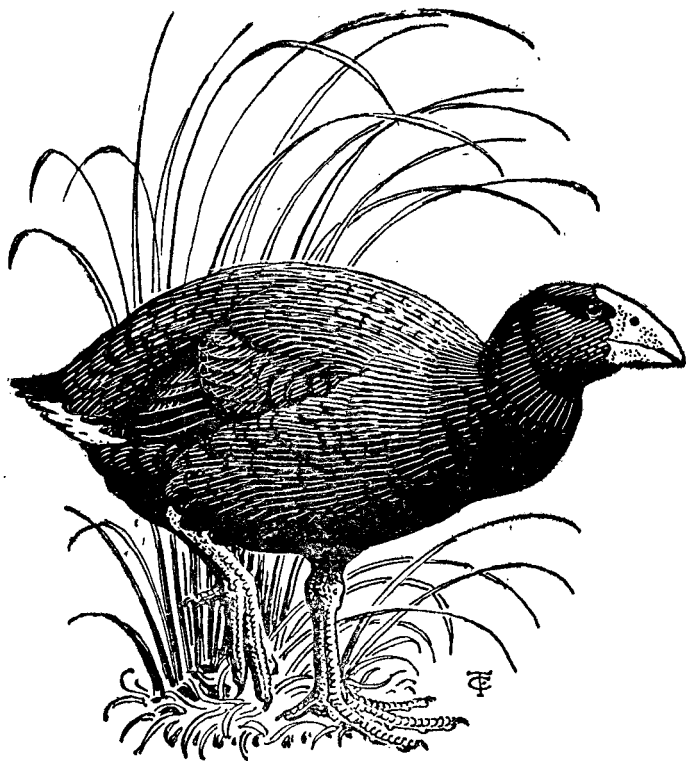


NOTORNIS



QUARTERLY JOURNAL

of the

Ornithological Society of New Zealand
(Incorporated)



Volume Fifteen, Number Two, June, 1968

A BIOLOGY OF BIRDS

Many members have still to purchase a copy of this O.S.N.Z. publication.

It seems that some have been put off by the title. While parts of the text may not interest all members, most of it covers material not easily available and of close interest to anyone interested in N.Z. birds and in their conservation.

This book, a valuable companion to the *Field Guide*, was reviewed in *Notornis*, June 1967, page 85.

It is available at only \$1.33 (including postage) from P.O. Box 40-272, Upper Hutt.

NOTORNIS

In continuation of New Zealand Bird Notes

Volume XV, No. 2

JUNE, 1968

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THE BIRDLIFE OF CODFISH ISLAND

By A. BLACKBURN

SUMMARY

The birdlife in December, 1966, is recorded in detail. Predation by the Weka, particularly on nesting sea-birds, is noted and discussed; and the mammalian life, both native and introduced, is described. A brief outline of the early history of the island, and a general description of the topography and vegetation are included. A possible reason for the total absence of some species of birds is suggested. The value of the island as a future sanctuary for rare species is discussed.

INTRODUCTION

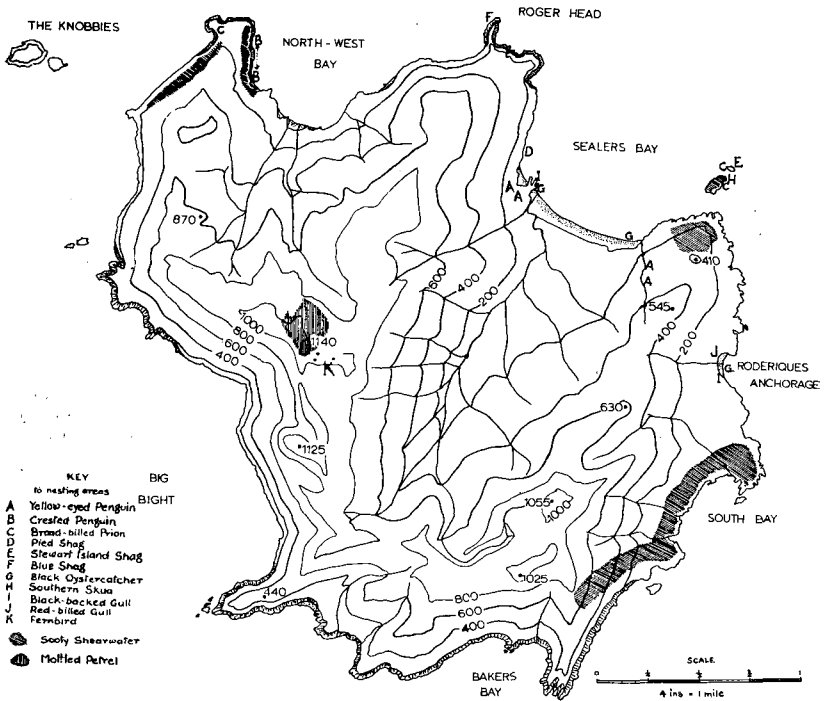
Codfish is a large island separated by about two miles from the north-west coast of Stewart Island, adjacent to where the towering Ruggedy Range falls sheer into the sea. Visits by naturalists have been few and far between, and much work remains to be done. The present survey is far from complete, but at least it reveals some of the wide gaps in our knowledge of the island's fauna.

The expedition was organised by Wildlife Service, the party being led by B. D. Bell, and comprising E. Sharpe and M. Crombie, both of Wildlife Service, A. H. Whitaker of Animal Ecology Division, D.S.I.R., J. I. Townsend of Entomology Division, D.S.I.R., I. M. Ritchie of Botany Dept., Lincoln College, and the writer. We departed from Bluff at 8 a.m. on 6/12/66 on board the "Buccaneer," a 60ft. crayfish boat owned by Mr. J. Waitiri, after having been held up for five days by a continuous gale and rain storms, and arrived off Codfish Island at 3 p.m. Despite the disturbed state of the sea, few birds had been observed en route, other than large numbers of Sooty Shearwaters. An Arctic Skua (*Stercorarius parasiticus*), 7 White-faced Storm Petrels (*Pelagodroma marina maoriana*), 2 Prion sp. (*Pachyptila*) and 6 Diving Petrels (*Pelecanoides urinatrix*) completed the tally. Later one or two White-capped Mollymawks (*Diomedea c. cauta*) were seen off the coast of Codfish.

We remained on the island until 17/12/66, and throughout our stay were much frustrated by recurring gales from the south-west and north-west. We had taken ashore a dinghy and outboard motor, but attempts to round the headlands at the N.W. and S.E. corners of the island were unsuccessful, so that the western and southern coasts were untouched. Journeys overland to these parts would have been arduous in the extreme, so we were obliged to confine our observations to the northern and eastern coastlines, to the summit area, where a night was spent in a gale of unusual severity, and generally to the bush and scrub within a radius of about a mile from our camp at Sealer's Bay.

TOPOGRAPHY AND VEGETATION

Codfish Island covers 3660 acres, and rises to a height of 1140 feet, the summit consisting of a large knoll of bare rock, surrounded by thick vegetation. It will be seen from the map that much of the coastline consists of precipitous rocky cliffs, and elsewhere



it consists either of a sloping rock shelf 20 to 30 feet high, or of boulder beaches. Sealers' Bay provides a fine sweep of sandy beach, and at low tide only there are small stretches of sand at Roderique's Anchorage and in North-West Bay. Well-defined ridges are shown by the map contours, which also indicate the big valley with its considerable stream of peat-stained water which flows down to Sealers' Bay. Streams exist in many of the smaller valleys.

Most of the island is covered with forest or scrub, the forest varying in height from 20 to 60 feet, and the scrub from a low *Dracophyllum* heathland type to a mixed community up to 20 feet high. Considerable areas of vegetation have been modified by burning at some stage, for a search in several areas revealed traces of charcoal. This would have been done either during the settlement of Codfish by sealers between 1825 and 1850, in an attempt to provide grazing for live stock, or during the years from 1892 to 1913, when the island was taken up as a pastoral run. There are thus sudden changes in the vegetation, but generally it consists of (a) the sand dune community behind Sealers' Bay; (b) the *Olearia-Senecio* scrub on exposed headlands and western slopes; (c) the manuka-kamahi belt, mainly on the western end of Sealers' Bay; (d) the podocarp forest; and (e) the *Dracophyllum* heathland on the upper ridges. *Rata* is prominent throughout.



[B. D. Bell

Plate IX — North-eastern aspect of Summit Rock, showing the dense vegetation round the base, and pakihi scrub, habitat of the Codfish Island Fernbird.

HISTORICAL

Early maps, according to Howard 1940 (1) showed various names for Codfish: Whenuahou, Fenouacho, Pukehou, Pegasus I., and Passage I. This author believes that from 1818 on, sealing gangs were in occupation for long periods. Certainly in 1823 sealers' huts occupied the site of the settlement believed to have been founded in 1825/6, when sealers, probably from the ship *Glory*, took Maori wives and settled there. Bishop Selwyn visited Codfish in February, 1844, and found a total population of 33, including 5 whites, although the Bishop considered that a few years earlier there must have been over 60. By 1850 Codfish was completely deserted.

Probably only very few cattle were grazed from 1892 to 1913, when the project was abandoned, and the grazing lease was surrendered in 1915. Poppelwell 1912 (2) recorded "a few cattle" present in 1911.

Visits by naturalists have been few and far between. In April, 1911, D. L. Poppelwell spent two days collecting botanical specimens; in December, 1934, and January, 1935, E. F. Stead, R. A. Wilson and P. Elworthy were on the island for 17 days studying its birdlife; in November, 1948, R. I. Kean, R. K. Dell and four others made a 7 day visit to ascertain the island's suitability for the introduction of rare indigenous birds, and resulting from this visit Dr. Dell made a valuable record of the birdlife; on 16/7/48 Dr. R. A. Falla spent a day ashore; in August, 1964, B. D. Bell and party visited the island, and listed the birdlife. Then in March, 1965, another party led by Bell, of which the writer was a member, spent three days ashore during their return from islands to the south.

MAMMALS

Deer, cats, goats and stoats have all been stated by local people to be present, but there is no evidence whatever that any of them do occur. Falla (pers. comm.) states that in July, 1948, he saw what appeared to be a few deer tracks; but a probable explanation lies in the well-worn possum tracks which occur throughout the forest.

BAT (*Mystacina* or *Chalimolovous* sp.). Bats of unidentified species were observed in March, 1965, flying about the Summit Rock (Blackburn 1965 (3)), but conditions during a night spent on the summit in December, 1966, were so bad that further observation or mist-netting was out of the question.

POSSUM (*Trichosurus vulpecula*). It is not known when this pest was introduced to the island; but the Lands Department records at Invercargill show that an authority to trap was considered in 1928, and systematic trapping appears to have begun prior to 1934, and to have been carried on until a few years ago. An old blazed trail to the summit proved of use to us, and there are the decayed remains of a substantial trappers' camp on a small headland west of Sealers' Bay. The animal is distributed fairly evenly throughout the forest and along the coastline, and has caused widespread damage to certain types of vegetation of value to birdlife, in particular to konini (*Fuchsia exorticata*) which

is now scarce, wineberry (*Aristolotelia serrata*) which seems to have gone, and orihau (*Pseudopanax colensoi*). The ground cover has also suffered extensive damage, and the punui (*Stilbocarpa lyalii*) stated by Poppelwell as forming luxuriant stands in 1911, is now confined to the larger of the two islets at the eastern end of Sealers' Bay. A.H.W. trapped consistently for specimens, and 168 'trap nights' produced 16 possums, while 16+ were killed by the dog, and 2 were shot.

RAT (*Rattus exulans*). The presence of rats is mentioned by Stead 1935 (4), and by Dell 1950 (5), so that we were most anxious to define the species. The first rat was trapped on the second night ashore, this being a female, and positively identifiable as kiore by the number of mammae. All rats subsequently trapped by A.H.W. were kiore. The population is low, but is apparently subject to fluctuations; for while none were taken in the forest areas, old caches of miro seed husks were numerous there, and in places the ground has been extensively burrowed, probably for insect larvae. The identification of the rat species has a considerable bearing on the future use of Codfish, and its importance is discussed towards the end of this paper.

FUR SEAL (*Arctocephalus forsteri*). The main concentration was along the shore of the western side of North-West Bay, where c.100 were observed. A few had made their difficult way to rock ledges about 100 feet a.s.l. Numbers have increased substantially since 54 were recorded in 1948 (Kean 1948 (6)).

BIRDLIFE

The impression of an abundant and varied birdlife gained during three days spent on the island in March, 1965, was fully confirmed during the present longer visit. At the campsite on the first morning, Bellbirds were building overhead at 28 feet in a kamahi, Yellow-crowned Parakeets were feeding on kamahi flower, Red-crowned Parakeets on blooms of *Olearia arborescens*, Yellow-breasted Tits were feeding flying young, and Brown Creeper were continually moving through in numbers.

On most mornings, wind inhibited any worthwhile dawn chorus; but the early morning of 13/12/66 was calm, and an extract from my field notes on that occasion may be of interest: "First light appears in the east at 3.15 a.m., and the only sounds to be heard at that hour until 4 a.m., when the light strengthens, are the short cadences of song from innumerable Tuis, the musical trilling of Oystercatchers along the beach, the repetitive call of a Morepork nearby, and the whistle of an occasional Kaka. At 4 a.m. precisely the Bellbirds began, and on this windless morning they are particularly good. The volume of sound appears to stimulate the Yellow-eyed Penguin into 'song,' and several are heard braying in the vicinity of the camp. A few minutes after 4 a.m. the Yellow-breasted Tit begins a vigorous song, to be continued for half an hour. By that time there is the chatter of Parakeets, the whistling of innumerable Kaka, and the varied song of the Brown Creeper to replace the now silent Tuis and Bellbirds. At 5.30 a.m. a Fernbird begins to call, and sustains it for quite 20 minutes."

Along the sand dunes of Sealers' Bay, birdlife is abundant in the low mixed vegetation, Tuis and Bellbirds in particular. Many pairs of Brown Creeper inhabit this area, a few Codfish Island Fernbirds, and several pairs of Grey Warbler and Yellow-breasted Tit, plus an occasional Fantail.

YELLOW-EYED PENGUIN (*Megadyptes antipodes*). A favoured nesting area was situated in a deep dry creek-bed with high overhanging banks about 200 yards north-west of the campsite, for here we found several nest sites already vacated by the young birds, except one still containing two half-grown nestlings. Another pair nearer the campsite, in an open, decayed tree stump, also had two young still in heavy grey down, as did two other pairs along the creek-bed at the eastern end of Sealers' Bay. All sites were under the bush canopy. Relief at the nest usually took place from about 3.30 p.m. on, and again at the same hour in the morning, and was normally accompanied by much calling, for upwards of half an hour. The first part of the call is an indrawn whistle, akin to a pleasant note of the Kaka, followed by a loud braying note. A half hour of this "song" heard by the campsite at 3.30 a.m. provided an excellent opportunity of studying the bird's call, for sleep was out of the question. Dell 1950 (5) described the species as common, with fairly heavy concentrations in the vicinity of beaches and streams, so the numbers breeding on Codfish may have fallen off.

SOUTHERN BLUE PENGUIN (*Eudyptula m. minor*). This species is extremely common, and seen in large numbers, feeding at sea, and ashore after dark. In daylight hours odd birds were still found ashore, up to 500/600 feet a.s.l. Along the sand of Sealers' Bay the tracks of 72 birds leading seawards were counted one morning.

CRESTED PENGUIN (*Eudyptes p. pachyrhynchus*). In November, 1948, Dell recorded a small colony on the northern coast. This is located at the western arm of North-West Bay, and extends for some 400 yards under the huge boulders which here line the coast. The actual numbers and state of nesting could not be determined, but obviously the young had already vacated many of the sites, and only a few adult birds were seen. It appeared to us that the colony is now considerably more extensive than indicated by Dell.

BROAD-BILLED PRION (*Pachyptila v. vittata*). Recorded by Stead in 1935 as breeding on off-shore islets. We found them breeding in unknown numbers on the outer islet at the eastern end of Sealers' Bay, a young bird removed from a burrow being in the final downy stage, and just beginning to lose the down on its head. Numerous small burrows on the inner islet were doubtless also of this species. Here in the midden of a nesting pair of Southern Skuas were many fresh and skeletal remains of Broad-billed Prion. A breeding colony of unknown extent was also discovered on the high headland at the extreme north-western tip of Codfish.

SOOTY SHEARWATER (*Puffinus griseus*). Only the northern and eastern coasts were examined, as high seas from the south-west prevented us from rounding the headlands at the north-west and south-east points of the island. So the remainder of the coastline remains *terra incognita* in respect of this and other species of seabirds. The accompanying map shows the distribution so far as our observations went, and indicates a vast breeding population. In North-West Bay there was a heavy concentration on the steep slopes behind the great boulders containing the Crested Penguin colony. On the headland east of Sealers' Bay, and on the nearby island, the numerous larger burrows probably all belonged to this species. All along the south-eastern coastline the vegetation has been burnt off at some stage, so that the skeletons of *Olearia* spp. stand out above the dense low growth. Here all suitable areas are riddled with Sooty Shearwater burrows, beginning above a steep bare fringe of rock 15 to 20 feet high. No mutton-birding has taken place on Codfish for many years, so far as is known, so the reason for burning the coastal vegetation is obscure.

SHORT-TAILED SHEARWATER (*P. tenuirostris*). This species is included on account of a beach-washed specimen picked up at Sealers' Bay. When shown to Mr. J. Waitiri of Bluff, who conveyed us to Codfish, he immediately recognised the corpse as that of a "little muttonbird," and stated that the muttonbirders of Big South Cape Island usually pick up a few "little muttonbirds" each season when torching. These would be immatures of the Tasmanian species, which could well be breeding in small numbers on the more southerly islands, and even on Codfish.

MOTTLED PETREL (*Pterodroma inexpectata*). Dell did not record this bird in November, 1948, other than a single corpse in the bush, but Wilson 1959 (6) states that in 1935 it was a common breeding bird, and with the Sooty Shearwater, monopolised most or the bare spurs near the sea. We did not find it so, and fear that there may have been a very serious decline in the numbers of this rare petrel breeding on Codfish. Late each evening, that is, from about 10 p.m. onwards, 10 to 12 birds would be heard from the campsite flying inland singly at intervals. From the high-pitched call of "ti ti ti" a majority of these were clearly Mottled Petrel, and the remainder with a rather lower pitched and slightly varied call we considered might have been Cook's Petrel. We spent the night of 11/12 December at the summit, and in the Mottled Petrel breeding area marked on the map, which we defined in March, 1965, very few birds came in. A gale of unusual severity contributed largely to this, but burrows in use were extremely sparse throughout the area. We were dismayed at the large number of freshly killed corpses, all stripped clean by Wekas, and quite obviously killed by them. It would seem that this predator constitutes a very serious threat to the continued existence of the Mottled Petrel, for the same sad state of affairs possibly exists all over the island. In examining burrow areas along the south-east coast, we found no definite sign of breeding Mottled Petrel.

COOK'S PETREL (*P. cooki*). Our only record of this species was a fresh beach-washed specimen, with a damaged wing, possibly caused by a Southern Skua. At the end of 1935, Stead 1936 (8) found it nesting in great numbers on Codfish. He dug out a number of nests, and the eggs indicated that laying had begun about 12th December, some weeks later than on Little Barrier Island. He says "The birds were plentiful . . . their burrows being everywhere from 15 feet above sea level up to the tops of the bush." Entrance to the burrow was almost always in rather steep ground, usually among the roots of trees. He estimated that there were over 20,000 burrows. Dell found none of this species in November, 1948, and considered their visit was a little early in the season. We found none in early March, 1965, and thought we might have been too late. In December, 1966, we could not have missed seeing the birds in the forested areas had they been there, for in addition to search by night, there were extensive trap lines for possums and kiore to be visited. So it may be that the only known southern breeding colony of this rare species has been virtually destroyed, again presumably by the Weka, except for perhaps a rapidly dwindling handful of birds; and there remains, so far as is known, only the precarious breeding colony on Little Barrier, with small numbers on Great Barrier.

SOUTHERN DIVING PETREL (*Pelecanoides urinatrix chathamensis*). Very old skeletal remains at a Skua's midden was the only evidence of the occurrence of this species. In 1948, Dell found their burrows in the consolidated sand dunes of Sealers' Bay, a few feet about high water mark, and less commonly higher up in the dunes; but these dunes are nightly patrolled by numerous Wekas, and there is no sign of these burrows today. It is possible that breeding colonies still exist on Codfish, but we neither heard the birds at night, nor observed any in the seas off the coast.

PIED SHAG (*Phalacrocorax varius*). Six adult birds at a roost at the western end of Sealers' Bay, probably near the spot where 6 were noted in a breeding colony by Dell in 1948.

WHITE-THROATED SHAG (*P. melanoleucos*). An occasional bird was seen off the coast, but there was no evidence of breeding.

STEWART ISLAND SHAG (*P. carunculatus chalconotus*). A brief visit was made on 7/12/66 to the outer of the two islets at the east end of Sealers' Bay, but weather conditions made it inadvisable to prolong our stay. However, it was noted that the breeding colony of this species on the outer face was fairly extensive, and that there were many small burrows of what later proved to be Broad-billed Prion. A second visit was made on 13/12/66 under more moderate conditions, and a check on the state of the shag colony was attempted. It was estimated that there were at least 150 adult and sub-adult birds, the bronze and pied forms being in about equal numbers. Nests counted were 64, but of these the contents of 36 were not checked for fear of disturbing the birds. Disturbance of such colonies can cause irreparable damage, and furthermore in this case Southern Skuas from a nest on the inner islet regularly patrolled the colony every 15 minutes or so, on the lookout for unguarded nestlings. Of the 28 nests checked, the following details were recorded:



[B. D. Bell

Plate X — A mixed phase pair of Stewart Island Shags at the nest.

Bronze Phase in attendance at nest:

3	nests containing	2	chicks	
5	"	"	1 "	
1	"	"	2 "	+ 1 egg
1	"	"	1 "	+ 1 egg
1	"	"	3 eggs	
1	"	"	2 "	
2	"	empty		

Pied Phase in attendance:

3	nests containing	2	chicks	
1	"	"	1 "	+ 1 egg
4	"	"	1 "	
2	"	"	1 egg	
1	"	empty		

Mixed pairs at nest:

1	nest containing	1	chick
1	"	"	3 eggs

No parent in attendance:

1	nest containing	2	chicks
---	-----------------	---	--------

Mixed pairs unoccupied — 2

Dell recorded this colony in 1948 but did not visit it. It is interesting to note that Stead estimated 60 nests in 1935. We were frustrated in an attempt to reach the Nobbies, only a mile from the north-west point of Codfish, where we have reason to believe there is a large colony of this species.

BLUE SHAG (*P. punctatus steadi*). This subspecies nests in small numbers, about 8 pairs, high up on the beetling western rock face of Roger Head. Nesting was over at the time of our visit, but about 10 birds were counted in North West Bay, and 2 had been previously observed along the rocky coastline S.E. of Roger Head. Earlier observers did not record the bird as breeding on Codfish.

HARRIER (*Circus approximans*). Two birds were seen occasionally.

BUSH HAWK (*Falco novaeseelandiae*). Two nesting pairs were recorded by Stead in 1935, and one sighting was made by Dell's party in 1948. We did not record it.

STEWART ISLAND WEKA (*Gallirallus australis scotti*). Immediately on establishing camp, a pair took over the site, and subsequently spent much of their time chasing intruders. The Weka was observed at all levels up to the summit, 1140 feet, and in all situations, feeding along the intertidal rocks, on the beach of Sealers' Bay, in the low coastal vegetation, and throughout the forested areas. All birds were small and 'scraggy' in appearance, due possibly to the population pressure. Dell reported young birds in November, 1948, but we encountered none on the main island, which may be significant; but we were surprised to find a pair with two well grown young in the almost impenetrable thickets of *Hebe elliptica* on the inshore islet at the eastern end of Sealers' Bay, and others called as we were leaving. Obviously these birds had reached new territory, and new prey, by swimming.

The dire effects of predation on even large petrel species has already been indicated, and will be discussed towards the end of this paper.

BLACK OYSTERCATCHER (*Haematopus unicolor*). A pair at either end of the beach at Sealers' Bay were the only records. Those at the eastern end had two young, 6 to 8 days old when first observed on 6/12/66. On the inert young being picked up, they called continuously in two notes of the same timbre as the call of the parents, but audible for a few yards only. The smaller chick disappeared about a week later, doubtless a prey to the beach-haunting Wekas. For the first few days of observation, both parents kept with the young continuously, the food supply consisting mainly of sand-hoppers, judging from the marks in the sand. On approach, one parent would fly towards the intruder, and the other run into the dunes, while the chicks stretched out inert on the sand. After a few days, one parent only remained with the young, while the other fed along the rocks some distance away. Becoming accustomed to intrusion, the bird with the chicks would then fly a few yards only towards the observer, and then run into the dunes. On the approach of 5 Southern Skuas, the bird took to high flight and kept above the Skuas despite their efforts to gain the advantage of height. On their departure, the Oystercatcher made one sheer drop to the beach at astonishing speed.

SOUTHERN SKUA (*Stercorarius skua lonnbergi*). On a high northern headland of the larger islet at the eastern end of Sealers' Bay, a pair had two nestlings, about 9 and 7 days old. The parent birds were not unduly aggressive. They were joined on one occasion by an immature bird, and on another by three birds. No other nests were seen.

BLACK-BACKED GULL (*Larus dominicanus*). Not common along the coastline, but odd pairs were found to be nesting, as shown on the accompanying map. Two clutches of 2 eggs each gave the following measurements: 69.5 x 48.4, 70.0 x 46.4, 72.6 x 47.5, 73.0 x 48.9. Average 71.3 x 47.5.

RED-BILLED GULL (*L. scopulinus*). Two or three scattered pairs had nested at Roderique's Anchorage, where we found a chick about three weeks old. A small number frequented the tide-line of Sealers' Bay, but we found no other evidence of nesting.

WHITE-FRONTED TERN (*Sterna striata*). 5 or 6 birds normally fed in the late afternoon and up to 7.30 p.m. off the rocky point north of the campsite, and odd birds seen elsewhere. There was no evidence of breeding.

PIGEON (*Hemiphaga novaeseelandiae*). Although the population is not high, the bird was met with in all parts of the forest. One member of our party reported quite a concentration along the western slopes of a heavily bushed ridge towards the east coast.

SOUTH ISLAND KAKA (*Nestor meridionalis*). A very numerous bird, common in all parts. On one damp, mild morning a walk of about 600 yards up an easy ridge S.W. from the campsite gave a count of 35 birds seen or heard, and this would be a fair

sample of most of the forested area. On the few calm nights we experienced, their musical whistling was an enjoyable feature.

RED-CROWNED PARAKEET (*Cyanoramphus novaeseelandiae*)

YELLOW-CROWNED PARAKEET (*C. auriceps*)

Both species were found in good numbers throughout, and we could not define any altitudinal variation in the numbers of either.

ORIENTAL CUCKOO (*Cukulus saturatus horsfieldi*). An interesting record was made by Falla (pers. comm.) when he spent a day ashore on 16/7/48.

LONG-TAILED CUCKOO (*Eudynamis taitensis*). This species is surprisingly numerous, perhaps the result of the very high population of Brown Creeper, which it probably parasitises. There were many sight records, mostly of birds being hotly pursued by Tuis.

MOREPORK (*Ninox novaeseelandiae*). Infrequently seen, but two, and sometimes three, heard from the campsite on calm nights.

RIFLEMAN (*Acanthisitta chloris*). Frequently met in the forest from about 200 feet a.s.l. A call would usually attract two or more birds.

SOUTH ISLAND FANTAIL (*Rhipidura f. fuliginosa*). Not a common bird, and more frequently seen in the coastal fringe than in the forest.

YELLOW-BREADED TIT (*Petroica m. macrocephalus*). Common in all situations, particularly in the coastal fringe. At least 3 pairs inhabited the sand dunes, and at the campsite, in the dunes, and in a small rocky bay, pairs were seen feeding flying young. An unusual nest was found at 4 feet in a hollow stump, containing three freshly laid eggs. The nest did not fill the hollow, and was constructed as a perfect globe, with a 1½ inch cup.

CODFISH ISLAND FERNBIRD (*Bowdleria punctata wilsoni*). Dell states that in 1948 it was comparatively abundant in the sand dunes, but refers to its restricted habitat there. The finding of several nests and its more extensive 'pakihi' habitat is described by Blackburn 1967 (9). The population is possibly large and flourishing.

BROWN CREEPER (*Finschia novaeseelandiae*). Without doubt the most abundant species, in both the forest and the coastal fringe. The small flocks referred to by Dell were probably family parties for we found them moving and feeding in loosely knit family groups, the juveniles in some cases still being fed. We considered that many pairs must have been nesting for the second time, in view of the activity of the numerous Long-tailed Cuckoos; but we searched for nests without success.

GREY WARBLER (*Gerygone igata*). Although not common, it is today more abundant than indicated by Dell, who saw only two birds in 1948. Three pairs, one with flying young, inhabited the sand dunes, and others were often seen, and song heard frequently.

SONG THRUSH (*Turdus philomelos*). One bird only, briefly seen in the sand dunes.

BLACKBIRD (*Turdus merula*). Seen occasionally throughout the forest, but more often only its alarm note heard, as it is most wary.



[I. M. Ritchie

Plate XI — Punui (*Stilbocarpa lyalii*) survives only on an islet at the east end of Sealer's Bay.

PIPIT (*Anthus novaeseelandiae*). One record only.

BELLBIRD (*Anthornis melanura*). Very common in all situations, especially along the coastal fringe. The sand dune area held innumerable birds.

TUI (*Prothemadera novaeseelandiae*). Also abundant, although its numbers are not comparable with those of the Bellbird. The upper fringe of the sand dunes was always alive with them.

SILVEREYE (*Zosterops lateralis*). Stead recorded 2 or 3 pairs in 1935, and Dell did not find it in 1948. We recorded at least three small flocks of 10 to 15 birds, two in the coastal fringe, and one near the summit.

STARLING (*Sturnus vulgaris*). The only record was two groups of 2 birds observed from the sea above the eastern coastline.

Various introduced birds have been recorded by other observers, viz. Redpolls by Stead, Chaffinch, House Sparrow, Yellowhammer, and Hedge Sparrow by Dell, Hedge Sparrow, Redpoll, Chaffinch and Yellowhammer by Bell; but these species were not recorded by us.

DISCUSSION

The various races of Weka are desirable enough birds on the mainland, but on the many off-shore islands where the Maoris have introduced them for food, they can be shown to be highly inimical to a number of other species. On most of the southern islands, the Banded Rail (*Rallus philippensis*) is a very common bird where no Wekas are present, but it has been exterminated on those where the Weka has been introduced. There is tragic evidence of the predation by Wekas on several of the smaller petrels on the islands lying east of Stewart Island; and now we have clear evidence of their preying heavily upon the larger Mottled Petrel, and by implication, of the possible destruction of the breeding colony of Cook's Petrel. Possums have exterminated, or substantially reduced, many plant species of value to birdlife. The kiore or Polynesian rat undoubtedly has cycles in its population, and when at a peak, apparently preys upon the eggs and young of certain species. Such predation seems to account for the disappearance of the Pied Tit from Cuvier Island in the north, and of the Yellow-breasted Tit from Inner Chetwode Island in Cook Strait, kiore being common on both islands. On Codfish, peak populations are no doubt kept partly in check by the Weka, for the Tit is a common bird there.

Despite these disadvantages, the absence of more serious predators such as wild cats, stoats, weasels, black and Norwegian rats, renders Codfish an extremely valuable island as a future sanctuary for certain of our rare species. Measures to control the possum and the Weka are urgently required, and such measures need not be injurious to any other of the island's fauna, except the kiore. In considering the transfer to Codfish of a species such as the Saddleback (*Philesturnus carunculatus*), which feeds much on the ground, serious thought must be given to possible predation by the Weka. While the Weka is abundant on Big South Cape, which was the final stronghold of the southern Saddleback, the ground cover is much more open than on Codfish. Here the denser cover might give

considerable advantage to the Weka in preying upon the Saddleback, as seems to be the case on Inner Chetwode Island.

One can only speculate on the reasons for the total absence from Codfish of the Saddleback, Robin (*Petroica australis*), Wren (*Xenicus longipes*), and Snipe (*Coenocorypha aucklandica iredalei*), all of which were abundant on Big South Cape prior to the invasion of black rats in 1963. It is possible that separation from Stewart Island occurred much earlier in the case of Codfish than of Big South Cape, so that Codfish may have been populated by colonisation from Stewart Island. The sheer stark mountains of the Ruggedy Range across the two mile wide channel from Codfish could well have proved a barrier to species either incapable of sustained flight, or unwilling to undertake sustained flight above the bush canopy. The strong subspeciation of the Codfish Island Fernbird seems to support this theory of early separation.

ACKNOWLEDGEMENT

B. D. Bell kindly checked the manuscript of this paper, and my thanks are also due to him and to I. M. Ritchie for supplying the accompanying photographs. Mr. Ritchie kindly provided the accompanying map in outline.

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SHORT NOTE

BLACK SHAGS FLYING WITH BILLS AGAPE

At Kapiti on 6/4/68 two Black Shags (*Phalacrocorax carbo*) flew north at a height of a couple of hundred feet near the coastline. Both birds had their bills wide open and a few minutes later a single bird was seen to fly south, also with its bill open. Perhaps the birds had swallowed large fish and were uncomfortable: but high purposeful flight is unusual at such times. The air, however, was still and very hot and one wonders if the action was perhaps a cooling mechanism, in the way a dog pants with its tongue out. In warm weather nesting birds may sometimes be seen with their bills open, and "resting birds exposed to hot sun" sometimes even pant. (*A New Dict. of Birds*, ed. A. L. Thomson, 1964, p. 697).

I have however not previously seen a bird flying with its bill open, nor am I able to find any explanation for it, or even that such a habit has been recorded, in New Zealand or overseas literature. I would be interested to know of any published reference to it.

— J. M. Cunningham

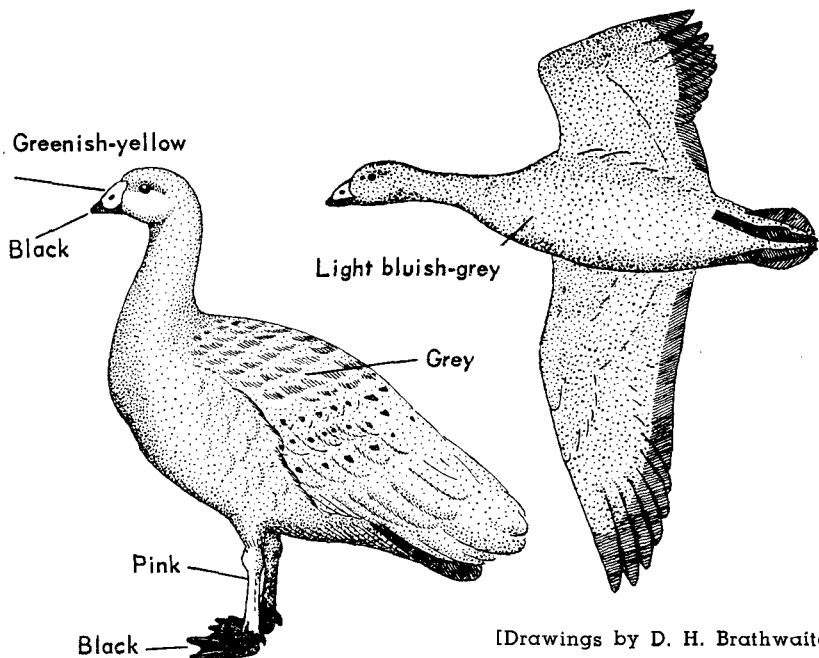
THE CAPE BARREN GOOSE, (*CEREOPSIS NOVAEHOLLANDIAE* LATHAM) IN NEW ZEALAND

By G. R. WILLIAMS, N.Z. Wildlife Service, Wellington

There are eleven species of Anatidae in New Zealand of which seven are native. Another fourteen have been recorded either as temporary residents or as natives already extinct before European settlement began. Since that time, only one fully-resident species has become extinct (Williams 1964).

Among the temporary residents the Cape Barren Goose is unique in that it has been introduced by man and has apparently also reached this country unaided. Because it may, like some other species from Australia in recent years, eventually establish itself here permanently, I have prepared this note to prompt others to report on past and future sightings.

The most recent and valuable summary of the taxonomy, range, numbers and ecology in Australia of *Cereopsis* has been made by Frith (1967). The species is the sole representative of the tribe Cereopsini (subfamily Anserinae) and is, perhaps, related to the



(Drawings by D. H. Brathwaite)

CAPE BARREN GOOSE (Both Sexes alike)

extinct New Zealand flightless goose, *Cnemidornis*. Its present distribution is on islands off the coast of southern Australia, from the western end of the Great Australian Bight to the eastern end of Bass Strait. It is more common on the smaller islands, presumably because these are less modified and disturbed. Though range and numbers were originally greater than at present, Frith believes that the population of 5000-6000 is currently increasing. Cape Barren Geese occur in small flocks and feed, mainly on grasses by grazing on land or along the edges of lakes and seashores. In parts of their range they sometimes cause very localised damage to crops (Anon. 1968).

Importations were made to New Zealand in 1869, 1871 and 1912 (Thomson 1922). The first two came to nothing, but the third — made by the Otago Acclimatisation Society — was at least temporarily successful: The single pair bred at the Government Poultry Farm at Milton and some of the offspring were sent to the Society's aviary at Clinton where they too, bred, after reaching the age of three years.

In 1914 four were liberated at the head of Lake Hawea and five young were reared there in 1916. A year later the birds apparently bred again at Lake Hawea and a pair from Clinton was liberated at Minarets Station, Lake Wanaka. The Annual Reports of the Otago Acclimatisation Society (from which these details have been obtained) contain no other explicit references to the birds breeding in the wild, though there were brief comments about them "doing well" and being seen about the liberation areas. The last statement is in the Report for 1923: "A few Cape Barren Geese can be seen at the head of Lake Hawea and in the Lake Wanaka District." Two years earlier the Society had discontinued breeding the species in captivity because it was considered too tame for sport. The remaining stock of four was disposed of by sending two to the Wellington Zoo and two to the Dunedin Botanical Gardens. Apparently birds not liberated in previous years or kept for breeding were given to private persons and their fate is unknown.

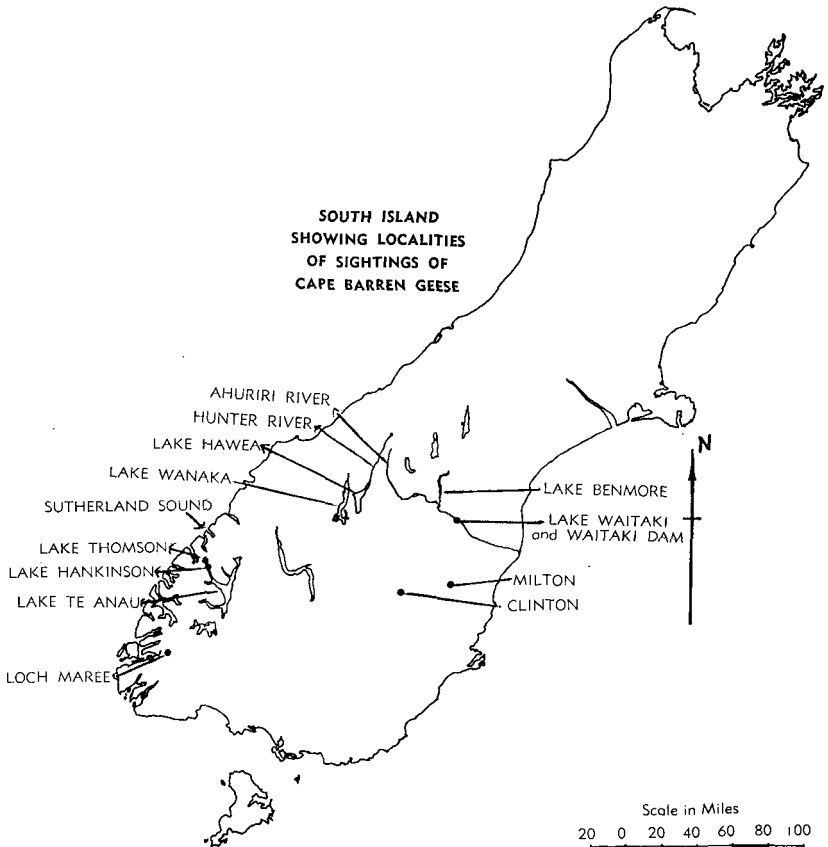
Two residents in the liberation areas (Tanfield, pers. comm.) recall that the geese increased in numbers until, in 1927, according to one of his informants, there were 27. They were subject to illegal hunting and the last was seen in the Hunter Valley about 1946. This statement agrees well with one by Sutherland (1943) to the effect that, in 1940 or 1941, there were five or six birds, including some young on the Hunter River, some of which may have been shot. With this, the history of the population of Cape Barren Geese known to have been introduced appears to come to an end.

Other reports of the species in New Zealand apparently refer to birds carried over the 1300 miles from Australia by the prevailing westerly or north-westerly weather systems (as have other Australian species from time to time — Williams, 1963, p. 56). However, the birds concerned may have been strays or descendants from the Wanaka-Hawea population.

Two were seen on Lake Thomson, west of the Middle Fiord of Lake Te Anau in 1934; and in mid-March 1947 two were reported from Loch Maree in southwestern Fiordland. Three months later, two were seen on Lake Hankinson (Vercoe 1947). Lake Thomson

is about 100 miles south of the Hunter River and about 50 miles north of Loch Maree. Lake Hankinson is about 5 miles east of Lake Thomson. All these lakes are closely surrounded by mountains and by beech forest (*Nothofagus* spp.) to the water's edge. Such habitat is very different from that typical for the species. However, the open pastoral or tussock-covered flats and mountain sides around Lakes Hawea and Wanaka are a little more like the Australian environment. The occurrence of birds in untypical habitat adds weight to the supposition that those seen in Fiordland were vagrants from across the Tasman Sea.

No more sightings were recorded until Keillor in 1966 (pers. comm.) gave what I believe to be reliable reports of these geese being seen in May of that year: "A single bird standing among the boulders a short distance from the edge of the Ahuriri River. . . . It was the same shade of blue as the stones . . . its wing-beat was slow compared with that of the introduced Canada goose."



"Three light blue geese on the north shore of Lake Waitaki, a short distance from the power house."

"Three light blue geese flying up the Waitaki River towards the Waitaki Dam. They had a slow wing-beat and wings the same shape as a delta-winged plane."

"Seven geese in the Benmore area. They were two shades of blue, a lighter shade under the wings."

"Five pale blue geese on Lakes Waitaki and Benmore, smaller than Canada Geese."

As all these records refer to localities within a 30-mile stretch of the same river system and were made during one short period, they probably refer to members of one flock. In this particular area the Waitaki River, its tributary the Ahuriri and the associated hydro-electric lakes Waitaki and Benmore closely resemble ecologically the Hawea-Wanaka district.

The most recent report is another from Fiordland: Early in 1967 one goose was seen on Sutherland Sound, an arm of the sea surrounded by beech forest, about 25 miles north of Lake Hankinson (Axbey, pers. comm.).

Only careful observation will now show whether a small breeding population still exists in this country in north or north-western Otago and whether dispersals from this population give rise to the birds recorded from Fiordland. If all those seen during the last 20 years had been carried over from Australia it is a little surprising that others have not made some landfalls in the northern half of the South Island or the southern half of the North, where habitat should be at least equally as favourable as in Fiordland or Otago and where the chances of being reported would be much greater.

In the hope that this account may prompt the reporting of other sightings, here is a brief description of the species:—

The general body colour is grey with small dark brown feathers on the upper surface of the wings. In flight, the underside of the tail is noticeably dark. The bill is short and dark and there is a yellowish-green fleshy covering around the nostrils. The legs and feet are pink and the toes black. The voice is a pig-like grunt and body size is smaller than that of a Canada Goose and larger than that of a Paradise Duck. Dorward (pers. comm.) warns that, in Australia, Cape Barren Geese have been confused with White-faced Herons (*Ardea novaehollandiae*) and adds that there is an unconfirmed report of these geese having been seen in Tierra del Fuego.

Acknowledgements: I am grateful to the following for information: H. W. Axbey, J. Checketts, Dr. D. F. Dorward, M. Drake, K. H. Miers, H. R. Tanfield and C. Templeton. Mr. M. Harrison drew the map.

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OBSERVATIONS ON THE BREEDING HABITS OF PYCROFT'S PETREL

By J. A. BARTLE

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ABSTRACT

Previous observations on Pycroft's Petrel (*Pterodroma pycrofti*) are summarized, and the distribution of the species is discussed. There are no records north of New Zealand, nor any to the south of the breeding-grounds. The nesting habitat is described, especially with reference to the apparent preference of Pycroft's Petrel for Pohutukawa (*Metrosideros excelsa*) forest.

Eggs are laid during the last week of November and the first week of December, with a peak on 26 November. Incubation is commenced by the male. Repeated desertion is discussed, with shortage of food reserves as a possible cause. Incubating birds lose 3-4 gm. per day. The mean weight for the species is 159 gm.

On the breeding grounds eighty-one per cent of the population are unemployed birds. The proportion of unemployed birds in other petrel populations is discussed. The activity of breeding birds is compared to that of unemployed birds. Unemployed birds are responsible for calls heard over the colony in the air, most breeding birds arriving inconspicuously. The unemployed population may exert a social stimulus on the breeding birds.

In the Appendix, individual burrows are described. Frequent reference has been made to the literature on petrel behaviour and ecology, and work on some important aspects is reviewed.

INTRODUCTION

On a 19-day visit (24 December 1962 - 11 January 1963) to Hen Island many features of the breeding habits of Pycroft's Petrel puzzled us. Eleven nights were spent working the colony at Dragon's Mouth Cove, and although no birds were banded on this visit, behaviour and habitat were observed.



[P. C. Harper

Plate XII — Pycroft's Petrel climbing a Pohutukawa on departure for the sea.

For 24 days (25 December 1963 - 17 January 1964) this species was studied on Aorangi, the southern island of the Poor Knights Islands. Three nights were spent intensively working the colony on a saddle near the centre of the island. General observations made during this visit did not solve any of the major problems.

During a second visit to Aorangi (23 November 1964 - 19 December 1964) of 26 days, I made a study of this species at the small saddle colony, spending 16 nights on the colony. Some of the problems previously encountered were solved.

This paper is based on the information gathered from these three visits, especially the last, and on the observations of Fleming (1941), and other earlier workers.

TERMS, NOMENCLATURE, AND METHODS

Richdale's (1963a) terms are used because they are the most precisely defined terms applicable to my study.

In nomenclature I follow Falla (1933), Fleming (1941), and Oliver (1955), but differ from Falla (1942) and the "Checklist of

New Zealand Birds" (1953) in retaining specific rank for the name "*pycrofti*." This is because there are no specimens from the breeding grounds to show variation with age and plumage-wear, and also little data on the breeding habits of the small Pacific forms of *Pterodroma*. When more information is available, especially on breeding behaviour, "*pycrofti*" may be allocated subspecific rank. The differences between *Pterodroma longirostris pycrofti* Falla and *Pterodroma longirostris longirostris* (Stejneger) [*P. cooki masafeuræ* Lonnberg] are considerable even in the characters regarded by taxonomists as diagnostic, although there are admittedly many similarities. Whether it is *convenient* to group these two forms under a single specific heading depends on individual opinion. All other names follow the "Checklist of New Zealand Birds" (1953).

The study in 1962-63 and 1963-64 did not involve banding, but as many individuals as possible were examined. Virtually all burrows in the neighbourhood of the colonies were also examined. All individuals seen on the ground on Aorangi during November-December 1964 were captured by hand, and banded. Their place of capture was plotted on a sketch-map, they were sexed by the method described by Serventy (1956), then weighed; and the condition of plumage, claws, and brood-patch was noted. On subsequent nights the place of capture and weight of the retrapped bird was recorded. Salter 500 and 1000 gm. spring balances were used. The true accuracy of these balances was within 5 gm., and consistency in readings was within 2 gm.

Each Pycroft's Petrel burrow located on Hen Island (1962-63) and on Aorangi (November-December 1964) was examined at least once each day. Twigs were placed across the entrance to indicate whether birds had entered or left the burrow, and the nesting chamber was usually investigated only when the twigs were knocked down. Members of a breeding pair were banded on different legs so that they could be identified without removal from the burrow. These techniques avoided unnecessary disturbance of the birds.

A brief description of each burrow of this species located on Aorangi is included in the Appendix. The burrows are marked with numbered pegs. Future workers should be able to find the sites of these burrows because a prismatic compass and chain measure were used to establish their position relative to one another and to magnetic north.

Names of places on the Poor Knights Islands mentioned in this paper have recently been approved by the N.Z. Geographic Board.

SUMMARY OF PREVIOUS OBSERVATIONS

Falla (1933) was the first to observe and describe Pycroft's Petrel from a pair collected in a burrow at Dragon's Mouth Cove, Hen Island. In November 1933 E. F. Stead found Pycroft's Petrels breeding on the neighbouring Chickens Islands where Reischek (1885) had recorded Cook's Petrels (*Pterodroma c. cooki*) in December 1880. Most workers assume that Reischek was confusing Cook's with Pycroft's Petrel. In November 1938, Fleming and Buddle first suspected the existence of Pycroft's Petrels on Aorangi, Poor Knights

Islands. Their presence on the saddle in the centre of the island was confirmed in November 1940 (Buddle, 1941), and the colony described as moderately extensive.

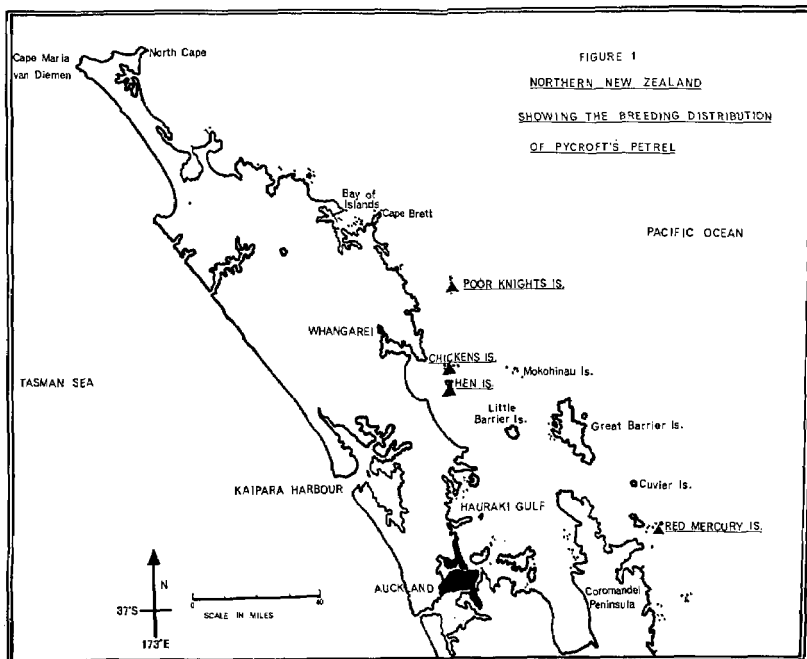
In 1941 Fleming published a study of this species from information gathered on the Hen and Chickens Islands mainly between 25 November and 9 December 1939. Sibson (1949) published some useful notes on this species made on Hen Island in December 1946, and December 1947 - January 1948. Since then some banding has been carried out, but little has been published.

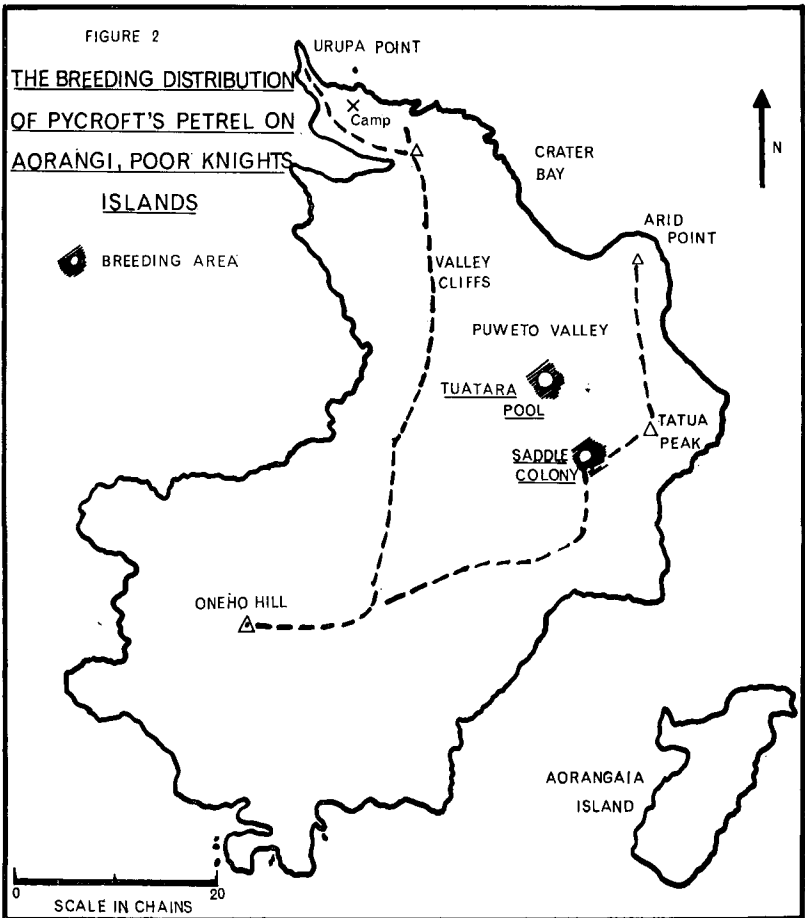
In November 1962 Skegg (1963) discovered a new breeding-ground on Red Mercury Island, which seems to have a larger population of Pycroft's Petrels than either of the two breeding-grounds discovered more than 20 years earlier (Skegg, pers. comm.).

DISTRIBUTION

Few observers have ever identified this species at sea. Fleming (1946) recorded a probable sighting north of Little Barrier Island, Sibson (1949) has a record of three possible sightings off Hen Island, and Chambers, Chambers and Sibson (1955) recorded several to the east of Hen Island on 15 December 1953.

Nine storm-killed beach specimens are known, all from the east coast beaches of Northland. The northernmost specimen flew into the Cape Maria van Diemen lighthouse in 1896. There are no records south of the breeding-grounds.





The breeding distribution is restricted to three groups of islands off the east coast of northern New Zealand: Aorangi, Poor Knights Islands; Hen Island and the Chickens Islands; and Red Mercury Island and probably other islands of the Mercury Group.

1. *Breeding Distribution on Aorangi*

Aorangi is a small island (168 acres), rising to 709 feet in height at Oneho Hill. Almost half the area is taken up by Puweto Valley, a wide hanging valley with a northerly aspect, bounded on the east by a ridge running from Arid Point to Tatua Peak. From this peak, another ridge running south-west to the summit dips to the saddle (where Pycroft's Petrels nest at the head of the valley) and rises through a wide belt of Kanuka (*Leptospermum ericoides*) to Oneho Hill. On the west, Puweto Valley is bounded by the steep Valley Cliffs which are similar to the sea-cliffs surrounding the island except at the landing places.

Pycroft's Petrels nest inland on Aorangi where only 12 burrows belonging to this species were located. Nine were in the saddle area, while three were on the floor of Puweto Valley, within 100 yards of Tuatara Pool.

At night, during the breeding season, the flight calls of Pycroft's Petrels can be heard from almost any part of the island, and most of these birds seem to be flying inland in the general direction of the saddle. These calls do not emanate from breeding birds, and are an unreliable guide to the breeding population.

Much more time is needed for an exact survey of the distribution of Pycroft's Petrels on Aorangi, but the pattern is one of scattered burrows with a central concentration at the saddle.

2. *Breeding Distribution and Numbers on Hen Island*

A description of Hen Island can be found in Skegg (1964). The breeding distribution of Pycroft's Petrel on Hen Island seems more complex than on Aorangi. Fleming (pers. comm.) notes that in November-December 1939 the usual concentration of Pycroft's Petrels at Dragon's Mouth Cove was not seen — an anomalous situation not reported by earlier or later parties. In his paper he has therefore described Pycroft's Petrel burrows as being found over almost all parts of the island, with a concentration on the northern and western faces, but without burrows being aggregated into large colonies. He states, "More burrows were found on the lower slopes, under three hundred feet, than on the ridges leading up to the highest peaks (1385 feet) . . . [but] there are few *Pycrofti* in the hard soil of the abrupt cliffs immediately above the shore . . ."

Skegg (1964) endorsed these observations, but in December 1962 - January 1963 I found the majority of Pycroft's Petrels on the island in concentrations along the tops of the sea-cliffs at Dragon's Mouth Cove and Old Woman's Cove (see map Skegg (1964) p. 182), less than 150 feet above the sea. These birds were not nesting in "hard soil" but in humus under Pohutukawa. In view of this, it is important to note that Fleming (pers. comm.) saw only 20 individual Pycroft's Petrels on the ground during his stay on Hen Island in 1939, and that most of these were nesting inland. E. F. Stead wrote in his field notes (1933), that, "The birds nest from 25 feet above sea level to about 400 feet. We found none above 400 feet, though they may have been there."

Total numbers on Hen Island (once thought to be the stronghold of the species) are, in fact, quite low. Skegg (pers. comm.) says that in his estimate of "... up to four or five hundred pairs" (Skegg, 1964) for the Hen and Chickens group he was allowing for only 100 pairs on Hen Island. Only 5 burrows (all at Dragon's Mouth Cove) which definitely belonged to this species were found during my stay on Hen Island, and all were used by unemployed birds. The Dragon's Mouth Cove concentration was tentatively estimated at 40 pairs, but there were far fewer than 40 breeding pairs. Thus an estimate of some 100 pairs of Pycroft's Petrels for Hen Island seems realistic, but well over half of these birds are likely to be unemployed.

NESTING HABITAT

Pycroft's Petrel burrows are not spread evenly over the whole island, but are localized and form colonies.

1. *Altitude*

Pycroft's Petrel breeds at low altitudes. The highest point on Aorangi is only 709 feet above sea level. The Chickens Islands reach a maximum altitude of 775 feet on Middle Chicken Island, where this species breeds (Skegg, 1964). Red Mercury Island rises to a height of 510 feet. Hen Island, however, is a rugged, steep island with rocky pinnacles up to 1385 feet above sea level.

This petrel is confined to the lower levels of these islands. On Aorangi, Pycroft's Petrels are absent from the high ridges above 450 feet, and nest on the lower slopes about the saddle and on the floor of Puweto Valley. On the Chickens Islands, burrows are usually on the lower slopes not far above the sea, and on Red Mercury Island, they nest in numbers on the slope up to 230 feet above Rolypoly Bay (Skegg, pers. comm.). Finally, on Hen Island, although scattered burrows have been reported at high levels, most observers agree that a large majority nest below 400 feet.

The other small *Pterodroma* breeding in the Hauraki Gulf area, Cook's Petrel, is ecologically isolated from Pycroft's Petrel on the basis of nesting habitat, for its breeding-grounds at Little Barrier Island are at a high altitude. Turbott (1961) says that burrows occurred between 1,000 feet above sea level and the summit, 2,370 feet, but were most common on the last few hundred feet. Thus, Cook's Petrel barely overlaps Pycroft's Petrel with regard to altitude of breeding colonies within the Hauraki Gulf, although in Foveaux Strait, beyond the range of the latter species, Cook's Petrel nests at lower altitudes (Stead, 1936b).

Two other pairs of closely related petrels living in the same area are ecologically separated by the altitude of their breeding-grounds. In New Zealand, the Fluttering Shearwater (*Puffinus g. gavia*) breeds on many offshore islands at altitudes below 1,300 feet, whereas the closely related Hutton's Shearwater (*Puffinus gavia huttoni*) breeds at more than 4,000 feet in the Seaward Kaikoura Range (Harrow, 1965). In the West Indies, the Cahow (*Pterodroma hasitata cahow*) nests not far above the sea at Bermuda (Murphy and Mowbray, 1951), while the Black-capped Petrel (*Pterodroma h. hasitata*) burrows in the cliffs about 4,250 feet on Hispaniola (Wingate, 1964).

In the three species-pairs cited, geographic isolation now reinforces the effect of altitudinal isolation, but in a prehistoric time when petrel populations may have been higher, altitudinal isolation may have been more important than geographic.

2. *Topography*

The various colonies of Pycroft's Petrel vary in topography, which does not seem to be a limiting factor.

The steepness of the slope in which burrows are made may vary greatly. For instance, on Aorangi, one burrow (Burrow D) had been excavated in the side of a deep drainage channel, while

others were on the almost flat valley floor or the crest of the gently sloping saddle. In contrast, on Hen Island most burrows are on steep slopes immediately above the beach.

Pycroft's Petrel colonies on Hen Island mainly face the north and west. Burrows on Red Mercury Island are found on several slopes with different aspects. On the saddle at Aorangi burrows face either north or south.

3. Soil, Drainage, and Ground Cover

Fleming (1941) considered that soft soil for burrowing limited the siting of Pycroft's Petrel burrows on Hen Island. The inefficiency of burrowing and the short overall length of burrows also suggests that this species is unable to burrow successfully in hard soil. Not all burrows, however, are in loose humus and soft soils, some being in consolidated clay soils, but, on the whole, the hard, dry clays of the higher ridges are avoided.

Most of Aorangi was cultivated by the Maoris, and the deep soft soils are extensively utilized by burrowing petrels, including Pycroft's. The soils of the Hen and Red Mercury Island colonies are well-drained, but not particularly hard.

Ward (1961) showed that the petrels of Stephen's Island (mainly Fairy Prions, *Pachyptila turtur*, and Sooty Shearwaters, *Puffinus griseus*) are restricted by the consistency of the soil to certain areas. The distribution of 5 soil types of Stephen's Island can be correlated with that of petrel burrows, except where other factors are operating (Ward). Gillham (1960) suggested that soil depth and texture was critical in determining Grey-faced Petrel (*Pterodroma macroptera*) distribution on the Mokohinau Islands.

Drainage is a significant factor in the nesting habitat. With some exceptions, such as the White-chinned Petrel, *Procellaria aequinoctialis* (Hagen, 1952), petrels require fairly well-drained soils for maintenance of the nesting chamber. None of the Pycroft's Petrel colonies which I have seen are liable to flooding, although moist soils, such as utilized by Cook's Petrel on Little Barrier (Turbott, 1961), are sometimes tunnelled by Pycroft's Petrels on Hen Island.

With the small *Pterodroma* species ground cover may also be a limiting factor. On Cabbage Tree Island, the Gould Petrel (*Pterodroma l. leucoptera*) does not burrow, but shelters beneath dead palm fronds in between heaps of boulders on the valley floor. Hindwood and Serventy (1941) consider that this protection is vital for breeding success, and could be critical in confining this species to this particular island. Many Pycroft's Petrel burrows are not protected by stones or large rocks which seem unnecessary on an island where there are no trampling animals (unlike Mokohinau and Stephen's Islands). Nor are they needed, as with the Gould Petrel, for protection of the incubating bird itself.

4. Vegetation

Most other writers consider vegetation unimportant in determining the breeding distribution of petrels. However, on Red Mercury Island (Skegg, pers. comm.), on Aorangi, and on Hen Island Pycroft's Petrels are largely confined to Pohutukawa (*Metrosideros excelsa*)

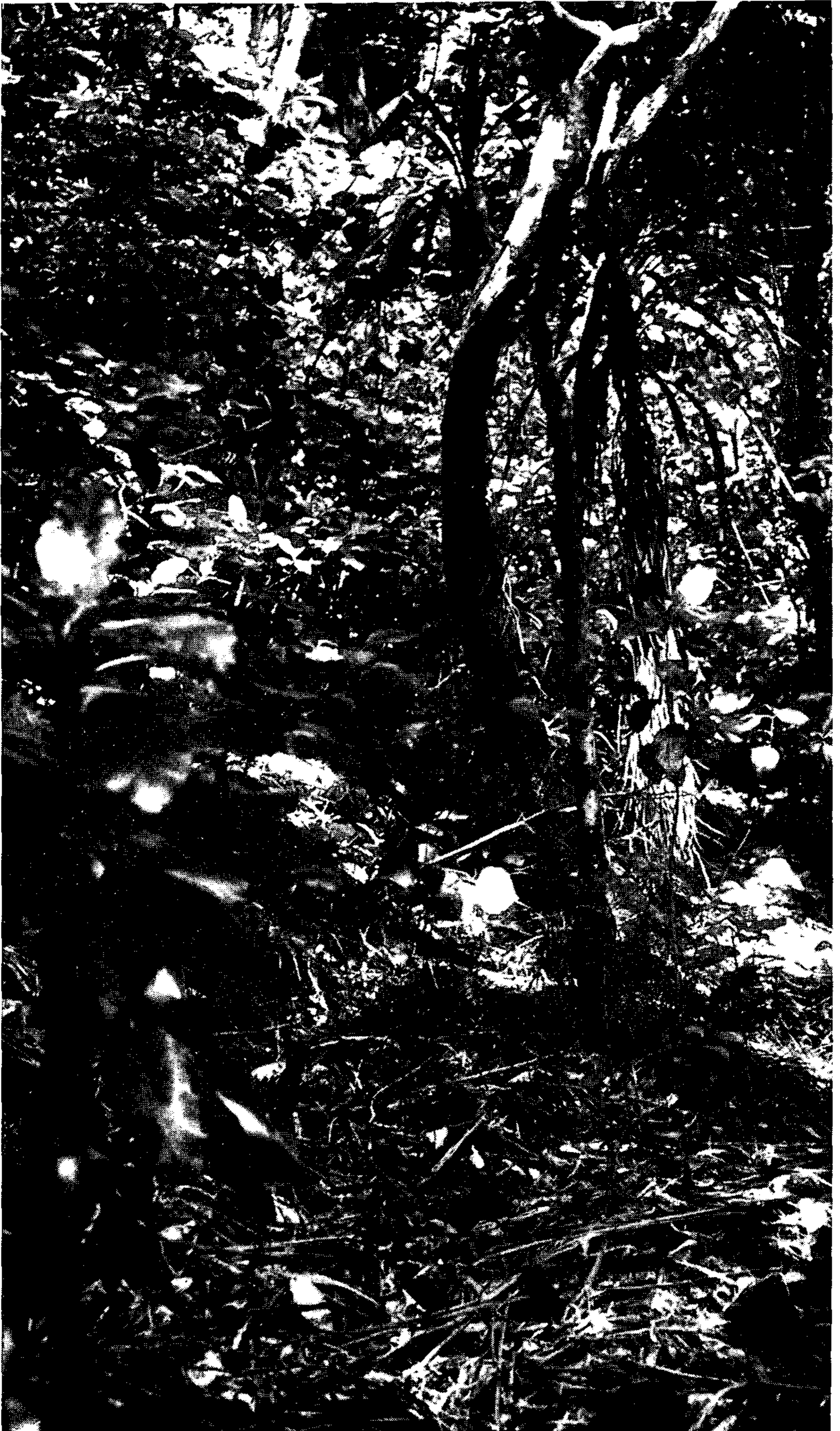


Plate XIII — Typical vegetation on The Saddle Colony, Aorangi, Poor Knights Islands.

forest. In the case of Red Mercury Island this may not seem significant in view of the large area of Pohutukawa forest, but on Aorangi it is only one of 6 forest types, some of which are extensive.

Most of the Pohutukawa trees in these forests are very old (on Aorangi probably at least 150 years), and are between 30 and 40 feet tall. Often many trunks spring from the base of the tree at ground level. Plate XIII is a typical view across the Pycroft's Petrel colony on the saddle, Aorangi. The canopy trees (out of sight) are mainly Pohutukawa. In a small canopy break stand several Cabbage Trees (*Cordyline australis*). In the foreground is a broadleaved "Bird-Catching Tree" (*Heimerliodendron brunonianum*) which has not yet been observed to cause mortality in Pycroft's Petrel as it does with the Gould Petrel on Cabbage Tree Island (Hindwood and Serventy, 1941). The most common members of the shrub layer beneath the Pohutukawa, *Macropiper excelsum* var. *majus*, and *Coprosma macrocarpa*, can be seen on the left and right, respectively. The almost flat ground surface is covered by a deep litter which conceals the burrow entrances.

In a series of papers Gillham (1956, 1961, and 1963) has shown how petrels modify the vegetation. Gillham has clearly demonstrated that petrels may modify tussock grassland, short shrub, sedge, and other similar communities, but little has been written about the effects of burrowing petrels on tall forest. Gillham (1960) considered vegetation relatively unimportant in determining the breeding distribution of the Grey-faced Petrel on Burgess Island (Mokohinau), where, however, the only forest community is confined to the cliffs.

Great densities of birds such as that of the Buller's Shearwater (*Puffinus bulleri*) heavily modify the forest on the Poor Knights Islands, but a small, not particularly active species, present in extremely low densities, probably does not. The density of Pycroft's Petrel is so low on Aorangi that even centuries of occupation by the species would have little physical or chemical effect on the vegetation and soil.

Pycroft's Petrels seem to be preferentially associated with Pohutukawa forest, but the reasons for this are unknown. One suggestion is that the rough bark and inclined trunks of the Pohutukawa make climbing easy. For nightly departure this is essential in areas of flat or gently sloping topography where boulders which project through the canopy are absent.

5. Other Petrels

On the Hen and Chickens Islands and on Red Mercury Island the dominant petrel is the Grey-faced Petrel which does not, however, form high density concentrations. The burrows of this species are scattered throughout the Pycroft's Petrel colonies.

On the Poor Knights Islands the situation is different, and rather complex. Both islands were inhabited by Maoris until 1823. The northern island (Tawhiti Rahi) never carried introduced mammals, and the plateau which makes up most of the island's area is intensively burrowed by countless Buller's Shearwaters. High concentrations of burrows almost cover the island, and no Pycroft's Petrels have been recorded breeding there.

Pigs left on Aorangi Island were exterminated in 1936. Regeneration of vegetation was retarded, and Oliver (1925) reported that Buller's Shearwaters were practically extinct on Aorangi. In the last 30 years their number has greatly increased on Aorangi, and today there are about 100,000 burrows. Pycroft's Petrels, however, breed on the valley floor and saddle, where the densities of Buller's Shearwaters and Fairy Prions are lowest, if the areas of hard clay on the high ridges are not included.

It is therefore noteworthy that Pycroft's Petrel breeding-grounds are areas where the densities of other petrels are low.

EGG-LAYING AND INCUBATION

1. Egg-Laying

The earliest date on which I have examined a breeding Pycroft's Petrel is 26 November 1964. This bird (D-40135) landed at 8.15 p.m., without calling in the air, about 4 feet from the entrance to its burrow (Burrow A) in the saddle colony, Aorangi. The plumage was unworn, and the claws were very sharp. It weighed 172 gm., 13 gm. above the mean weight for Pycroft's Petrels (Table 4). The brood patch was bare, and distended due to the presence of an egg in the oviduct, and the cloaca was swollen as described by Serventy (1956). D-40135 was relocated later the same evening (at 10.15 p.m.) outside the burrow which its mate, D-40137, was energetically cleaning out. By 1 a.m. D-40135 had laid her egg and left for the sea, having played no part in burrow excavation. The male (D-40137) incubated the egg continuously for the next 14 days, while the female did not return to the nest for 9 days.

A cold and soiled egg was discovered in Burrow B on 26 November 1964 (Aorangi). Stead collected an egg (D.M. 6867) as early as 23 November 1933 on Hen Island. Fleming (1941) says, "Laying begins in the last week of November." "The earliest record is of a female handled on November 26 which had a shelled egg in its body, whilst an egg found on the following day had been laid during the previous night..." Fleming left Hen Island on 4 December (pers. comm.), and he did not find any indication of eggs having been laid later than 30 November, whereas it is probable that an egg was laid as late as 6 December on Aorangi in 1964.

The laying period for Pycroft's Petrel is very similar to that of the Sooty Shearwater (Richdale 1963a) and the Mottled Petrel (*Pterodroma inexpectata*) (Richdale 1963b) in southern New Zealand, i.e. from 21 November to 10 December, with a mean laying date about 29 November.

Cook's Petrel lays its egg in early November on Little Barrier Island (Reischek, 1885) and from 12 December on Codfish Island (Stead, 1936b). The Gould Petrel, also closely related, has a laying period very similar to Pycroft's Petrel (Hindwood and Serventy, 1941). Fleming (1941) regarded the variation between the laying dates of Cook's and Pycroft's Petrels as, "a fundamental difference in their physiological make-up."

Several other workers have recorded that the male keeps the nest open and takes the first incubation shift. One could therefore expect most of the *Procellariidae* to exhibit this behaviour.

TABLE 1
EGG MEASUREMENTS OF PYCROFT'S PETREL (millimetres)
C.M. — Canterbury Museum D.M. — Dominion Museum
K.C.B.C. — King's College Bird Club

Measurement	Date	Locality	Source
50 x 36.5	Nov.-Dec. 1933	Hen Island	E. F. Stead (C.M. AV3921A)
50.5 x 35	" " "	" "	(C.M. AV3921B)
51 x 34	" " "	" "	(C.M. AV3921C)
47.5 x 34.5	" " "	" "	(C.M. AV3921D)
49.5 x 35	" " "	" "	(C.M. AV3922A)
48.5 x 36	" " "	" "	(C.M. AV3922B)
48.5 x 36	" " "	" "	(C.M. AV3922C)
48 x 34	23/11/33	" "	(D.M. 6867)
47.4 x 34	11/12/33	" "	(D.M. 6868)
48.6 x 35.8	19/12/33	" "	(D.M. 2118)
46 x 32	9/12/33	Chickens Is.	" (C.M. AV4208A)
47 x 36	" "	" "	(C.M. AV4208B)
47.5 x 35	" "	" "	(C.M. AV4208C)
47 x 34	" "	" "	(C.M. AV4208D)
48.5 x 34	" "	" "	(C.M. AV4208E)
52 x 38	November, 1939	Hen Island	C. A. Fleming (1941)
48 x 36	November, 1939	" "	C. A. Fleming (1941)
46 x 36	January, 1949	" "	R. B. Sibson (1949)
46 x 36	January, 1949	" "	R. B. Sibson (1949)
48.5 x 34.3	December, 1953	Chickens Is.	Chambers, Chambers and Sibson (1955)
48 x 34	19/12/60	Hen Island	P. D. G. Skegg (K.C.B.C.)
47.5 x 35.5	14/12/61	" "	" " "
51 x 39	17/12/61	" "	" " "
48 x 32	13/12/62	Middle Chickens Is.	" " "
46 x 34.6	3/12/64	Aorangi, Poor Knights Is.	J. A. Bartle
51.0 x 34.6	8/12/64	" "	" "
47.8 x 35.5	17/12/64	" "	" "

Length: Max.: 52.0 Mean: 48.34 Standard deviation: 1.64
Min.: 46.0

Width: Max.: 39.0 Mean: 35.1 Standard deviation: 1.48
Min.: 32.0

2. Incubation

On Aorangi in November-December 1964 only two incubating pairs of Pycroft's Petrels were located during 26 days on the island because of the paucity of occupied burrows and the difficulty of locating them. The first pair was observed for 22 days, and the second for 7 days.

TABLE 2 — INCUBATION IN BURROW A
 Continuous lines indicate incubating adult present,
 while broken lines indicate a deserted nest

Number of days from laying	Date (1964)	Incubation	Visits of Birds (without relief of incubation duties)	Details of Desertion and Egg Breakage	
1	26th Nov.	(D-40137) Male		<i>Egg laid this night</i>	
2	27th Nov.				
3	28th Nov.				
4	29th Nov.				
5	30th Nov.				
6	1st Dec.				
7	2nd Dec.				
8	3rd Dec.				
9	4th Dec.				
10	5th Dec.			D-40135 visited	
11	6th Dec.				
12	7th Dec.				
13	8th Dec.			D-40135 visited	
14	9th Dec.				
15	10th Dec.		(D-40135) Female		D-40137 left for sea
16	11th Dec.				D-40135 deserted.
17	12th Dec.			D-40137 visited	Egg (1) broken and kicked out. Replaced by egg from nest F by observer
18	13th Dec.				
19	14th Dec.	(D-40135) Female			Egg (2) kicked out of nest. D-40135 deserted.
20	15th Dec.				
21	16th Dec.	(D-40135) Female			
22	17th Dec.				<i>Observer left island.</i>

Desertion

Both sexes share equally in incubation, once the routine has been established, but the incubating birds seem characteristically inept. A high rate of egg-loss occurs during the incubation period. Fleming (1941) remarked that the birds were liable to kick out their egg and not retrieve it. On Aorangi, within four days, two different

eggs were kicked out of Burrow A, and one was completely smashed (Table 2). Of four eggs found on Aorangi, two were deserted shortly after laying and another was broken, leaving only one (in Burrow H) being incubated when we left the island.

Such egg loss is by no means confined to Pycroft's Petrel. The same features of desertion were observed in Buller's Shearwaters and Fairy Prions on Aorangi, and in the Sooty Shearwater by Richdale (1963a). The problem of birds sitting on their nests, ignoring and rejecting eggs which they had scraped out (as was the case with D-40135 on 12 December) puzzled Richdale (1963a) as it did Tickell (1962). Tickell discussed the problem with the Dove Prion (*Pachyptila desolata*), and attributed desertion in the early stages of incubation mostly to failure of the male to take over immediately the egg was laid. Tickell's comments apply equally well to Pycroft's Petrel, as illustrated below. On 26 November 1964 Burrow B containing a cold, deserted egg was discovered, with a breeding female, D-40138, in attendance. This egg had already been partly incubated — the inference is that this bird had incubated for a time, but was forced by hunger to return to the sea. The failure to recommence incubating on 26 November is not, however, understandable, for the bird weighed 186 gm., approximately 15% above the mean weight of the species. No male was ever captured in attendance at this nest.

The surprising viability of deserted petrel eggs is now well known from the work of Gross (1935), who found that Leach's Petrel (*Oceanodroma leucorhoa*) eggs were often left unincubated for several days, and that embryos could live for at least 8 days at temperatures between 7° and 29°C (burrow temperature ranged between 4.5° and 15.5°C). On Aorangi in January 1964 a Buller's Shearwater egg kept for seven days at temperatures between 12° and 24°C contained a living embryo. The Pycroft's Petrel egg from Burrow F, incubated for only 2 days out of 9, was fresh when broken. Thus intermittent incubation is possible in some species, and may actually take place.

Experience with pair A of Pycroft's Petrels suggests that this species does not readily desert after disturbance. During the first 12 days of incubation by the male, I frequently disturbed him; yet he remained remarkably faithful to the nest. During the next 10 days the frequency of my visits was reduced, and sometimes the burrow was left undisturbed for up to 20 hours, yet it was during this period that the 2 desertions by the female took place, in neither case immediately after handling.

The tendency for females to incubate for shorter periods than males is seen in pair A of Pycroft's Petrels, but whether this is a general feature is not known. Tickell (1962) says that during the early stages of incubation female Dove Prions have a low incubation urge, which might account for the repeated desertion and mis-handling of the egg by D-40135. The male could not be expected to make up for this lack of devotion having just incubated for a fortnight and lost 23% of his initial weight.

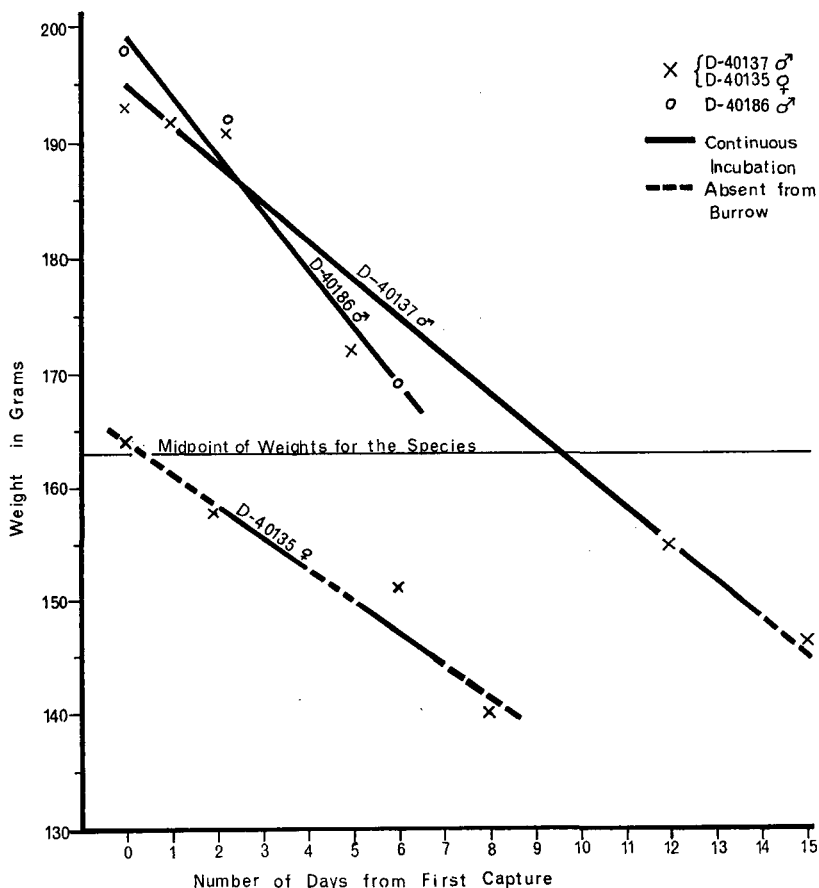


FIGURE 3 — LOSS IN WEIGHT OF INCUBATING BIRDS

Weights of Incubating Birds

The breeding birds on Aorangi in November-December 1964 were weighed regularly in an attempt to ascertain the loss of weight in incubating birds. This was related to the interaction of the incubation urge with the necessity of feeding as demonstrated by the frequency of visits to the burrow without incubation duties being exchanged. The length of incubation periods is governed by the rate of weight loss.

The weights have been plotted on a graph (Figure 3); their generalized locus being indicated by a straight line. The horizontal axis has an origin from the date of first capture; these dates varied for the three individuals shown. For convenience I have regarded the visit of D-40135 to the nest on 8 December as the first visit; since on 26 November she was weighed carrying an egg; and she was not weighed on 4 December (the second visit to the nest).

The midpoint of the weights of the species as determined from Table 4 is indicated in the form of a guide-line. The lack of reliable indication of the weights while the birds were at sea is indicated by a broken line. Perhaps the most striking feature of the graph is the remarkable agreement in slope of the loci indicating a similar level of activity in the three incubating birds. A loss of weight while brooding of 3-4 gm. per day is suggested.

At commencement of incubation, D-40186 was as heavy as the heaviest bird weighed on either Aorangi or Hen Island over a period of several months. The minimum weight attained by these incubating birds (140 gm.) was not especially low when compared to weights as low as 128 gm. recorded for apparently healthy unemployed birds.

Unexpectedly, the weights of breeding adults while at sea, and presumably feeding, decreased at apparently the same rate as those of the incubating birds, although a short dinghy trip during this period indicated an enormous number of planktonic crustacea in the offshore surface-waters, and the weather was relatively calm.

Figure 3 illustrates the critical factor in the repeated desertion of Burrow A by the female bird (D-40135). It will be seen that her initial weight was only one gram above the midpoint of weights for the species. Even if females are lighter than males (not indicated by my series of weights), her weight was surprisingly low (5 gm. below the midpoint) by the commencement of incubation. The male left for the sea when his weight reached 148 gm. (deduced from the graph), while the female weighed 145 gm. when she deserted for the second time. Thus desertion apparently occurs when the bird's weight falls below a critical figure. This interpretation explains the peculiar behaviour of the female, due to various influences, probably mainly lack of *suitable* food at sea (all breeding birds lost weight while at sea.) Apparently, D-40135 took over incubation at a stage where the incubation urge was only just dominant over hunger, and thus, after a short period, the bird was forced to leave the nest to satisfy the feeding impulse. The return to incubate for a day may have been a result of a recurrence of an incubation urge such as that which caused the male to visit the nest after only a day at sea following a fortnight's continuous incubation.

THE POPULATION ON THE BREEDING-GROUNDS

Suspensions that the population of Pycroft's Petrels on Hen Island and on Aorangi consisted mainly of unemployed birds led to a thorough investigation into the nature of the population on this latter island during November-December 1964. I banded as many Pycroft's Petrels as I could find and noted the behaviour and movements of banded birds so as to determine their status within the population.

Despite the fact that I devoted at least four hours every night over 19 days to this project, and ranged widely over the island, only 32 birds were seen on the ground, all of which were captured and banded. I doubt whether there could have been more than about 60 of these petrels on Aorangi.

The population is divisible into three categories:—

1. Breeders and Failed Breeders.
2. Unemployed birds associated with a burrow.
3. Unemployed birds not associated with a burrow.

In the first category there are 6 birds (representing 4 pairs); in the second, 7 birds (representing 4 pairs); and in the third there are 19 birds (6 females and 13 males and pre-breeders). These numbers, expressed as percentages of the total population, are given in Table 3.

TABLE 3
*Percentage of Groups within the Population
on the Breeding-Grounds*

<i>Breeding Birds</i>		<i>Potentially Successful Breeders</i>		<i>Failed Breeders</i>
19	=	6	+	13
<i>Unemployed Birds</i>		<i>Unemployed, Attached to Burrows</i>		<i>Unemployed, Unattached to Burrows</i>
81	=	22	+	59

Undue emphasis should not be placed on these percentages, as they are based on such small total numbers. I have included them to serve only as a guide.

For many years, workers have suspected the existence of large unemployed populations on the breeding-grounds, but only recently has the size and nature of these populations been determined, largely through the work of Dr. L. E. Richdale. Richdale (1963a) analyses the problem clearly with reference to Sooty Shearwaters.

"If the . . . history of each . . . bird were known, the adults could be divided into non-breeding and breeding birds. In practice, however, the problem was to know for certain which were the non-breeding birds. For example, birds found without egg or young could, unknown to the observer, have had a nest somewhere. Further, they could also have lost egg or young, and were therefore failed breeders. . . . The true non-breeders . . . could be further subdivided into three categories . . . non-breeding former breeders; birds old enough to breed but with unsuitable mates; and birds too young to breed."

For this last group I use the term "pre-breeders," following Richdale (1963a).

A Pycroft's Petrel (D-3590) was banded on 14 December 1961, incubating a dirty egg on Hen Island (Skegg, pers. comm.). This bird was recovered the following season, on 28 December. It was calling together with another banded bird (D-3581) exhibiting delayed courtship, typical of non-breeding behaviour. D-3590 had been ashore in its burrow all day (probably the same burrow in which it was banded). No egg was present. This bird was captured on Hen Island for the third consecutive season, on 8 January 1964.

It is the writer's belief that no egg was laid by this pair in their burrow in the 1962-63 season, but the record constitutes only slim evidence of intermittent breeding. There are no other banding

recoveries of Pycroft's Petrel where the breeding status was determined in two consecutive years, and these are needed before a conclusion can be reached.

There seems little doubt that the type specimen of Pycroft's Petrel from Hen Island, collected on 27 January 1932, was an unemployed bird. Falla (1933) records that this specimen (a male) was found together with a female in a new burrow, and that both were in breeding condition, with enlarged gonads. Fleming (1941) noted that these were unemployed birds and thought them failed breeders, but Hindwood and Serventy (1941) and Tickell (1962) have shown that gonads regress rapidly after coition, so that their size in Falla's birds suggests a connection between prolonged endocrinal action and delayed courtship as exhibited by unemployed birds. Brown and Baird (1965) emphasize the connection between social stimulation from birds other than the mate and the development of the gonads.

Fleming (1941) wrote of empty nests with birds in attendance, with broken egg-shells in some nests, but no trace that an egg had ever been laid in others. Skegg (pers. comm.) has also found several birds in empty burrows.

On Aorangi, for a population of 32 birds, 12 burrows were positively identified as belonging to Pycroft's Petrel. Two were inhabited by breeding birds; seven were being used by unemployed birds, present singly, or keeping company, during the day; and three were empty. On Hen Island, for a population of perhaps 40 birds, only 5 burrows could be located, and all were being used by unemployed birds (although none were used during the daytime, as on Aorangi).

In two other members of the Procellariidae the percentage of unemployed birds has been reliably estimated. Of the Sooty Shearwater Richdale (1963a) records that 29% (19%) were breeding; 26% (16%) were keeping company; 28% (6%) were alone in a burrow; and 17% (59%) were caught only on the surface. The corresponding figures for Pycroft's Petrel are indicated in brackets following Richdale's figures. The lower figures for *Pterodroma pycrofti* in the first three categories may be caused by the lower level of social stimulus. The area of Whero Island, where Richdale made his study, is only half an acre; yet there were 512 Sooty Shearwaters breeding there. On the saddle on Aorangi, of similar area, there were only 29 Pycroft's Petrels.

McKean (in litt.) writes of *Pterodroma melanopus* on Lord Howe Island, "Once incubation begins, the number of breeding birds coming in nightly decreases to about one tenth of the population, and stays at one fifth to one tenth of the population for the duration of the breeding cycle."

With the closely related Gould Petrel on Cabbage Tree Island, Hindwood and Serventy (1941) noted three instances of birds keeping company. They state that this is not unusual, and that single birds are also found without eggs or young. Many other writers have recorded unemployed birds in the population on the breeding-grounds, and the feature seems characteristic of all petrel populations.

GENERAL BREEDING ACTIVITY

All observations recorded in this (and the next) section were made during the egg-laying and incubation periods; few observations have been made at other times in the life-cycle.

1. *Nightly Arrival*

No activity on the breeding-grounds has been observed during daylight hours. Although Buller's Shearwaters, Sooty Shearwaters, and Grey-faced Petrels may arrive during twilight, Pycroft's Petrels do not begin landing until complete darkness has fallen, about an hour after sunset. Through dusk, sometimes into complete darkness, Harriers (*Circus approximans gouldi*) and Black-backed Gulls (*Larus dominicanus*) were often observed cruising slowly over the tree-tops covering the Pycroft's Petrel colonies on Hen Island and Aorangi. No actual predation on Pycroft's Petrel was seen, but Harper (in litt.) records that juvenile Fairy Prions are caught by Harriers on Aorangi. A Black-backed Gull can chase and catch an adult prion in flight (Kinsky, pers. comm.). Avian predation is very heavy on adult Mottled Petrels nesting at Big South Cape Island, Foveaux Strait (Stead, 1932). Perhaps the smaller petrels arrive later in the evening than the larger petrels because they are more susceptible to predation.

An examination of 30 occasions on which the time of the first Pycroft's Petrel to arrive over the breeding colony has been recorded indicates an average of 8.30 p.m.; the range is between 8.12 p.m. and 8.52 p.m. These observations were made on Big Chicken Island (December 1962), Hen Island (December-January 1962-63), and Aorangi (November-December 1964) where sunset is at about 7.30 p.m. in mid-summer. These times agree closely with those quoted by Fleming (1941), Sibson (1949, and Chambers, Chambers and Sibson (1955).

No correlation was found between the time of first arrival and environmental factors. Richdale (1963a) found with the Sooty Shearwater that light intensity has a definite effect on the time of arrival. But with Pycroft's Petrels it was impossible to see any relation between the time of the first bird recorded over the colony, and such factors as cloud cover, time of moonrise, phase of moon, time of sunset, wind speed and direction, sea conditions, and air temperature. Nor is the time of first arrival related to general nightly activity of this species, or to the first arrival or later activity of other petrels breeding on the islands. It appears that the activity of Pycroft's Petrel on the breeding-grounds is governed by internal rhythms and intraspecific social stimuli rather than by environmental factors or stimuli from other species.

Nightly activity of this petrel on the breeding colonies varies widely. For example, on Aorangi only one Pycroft's Petrel was heard calling in the air between 8 p.m. and midnight on 30 November 1964 and no birds were seen to land at the colony. In contrast, on 11 December 1964, 11 Pycroft's Petrels were caught shortly after landing. Weather conditions and the activity of other petrels were similar on both evenings.

When flying in from the sea Pycroft's Petrels may be heard calling some distance away. Over the colony they are quieter, and usually circle once or twice before landing, although some birds land

immediately. They fly very quickly over the colony at a considerable height. This varies, but is often about 30 feet above the canopy. In marked contrast, the larger shearwaters and the Grey-faced Petrels circle slowly close to the tree-tops, and an individual of the last-named species may circle the colony 14 times before landing.

Except for the White-faced Storm Petrel (*Pelagodroma marina*), the landing of a Pycroft's Petrel is the most silent and inconspicuous of the ten species of petrel which breed on Aorangi. Pycroft's Petrels sometimes flutter straight down to the ground, but generally land in the tree-tops. In the interval (which may be as long as 10 minutes) between landing in the tree-tops, and fluttering to the ground, they are particularly susceptible to noise made by an observer. In the event of disturbance, they usually fly off from the tree-tops and do not usually attempt to land again in the same evening. Landing in the tree-tops seems to be a habit evolved against possible predators, since the birds can break straight through the canopy.

The landing of breeding birds is highly accurate. All breeding birds landed within 10 feet of their burrows.

2. Calls

Pycroft's Petrels produce at least 7 different calls which are listed below. They may be quite noisy in flight, but are generally silent on the ground.

(a) Flight Calls

These are made as the birds circle before coming in to land at the colony, as the birds approach the colony from over the sea, and up to a mile away over land. They are usually quiet during departure for the sea.

- (i) A quiet, high-pitched, cicada-like chirp. This is the well-known "ti-ti-ti-ti" cry described by Fleming (1941) and written as "zip-zip" by Turbott (1947). It resembles the flight-call of Cook's Petrel (Sibson, 1949) and the Mottled Petrel. About 70% of the calls uttered by Pycroft's Petrel are of this type.
- (ii) A harsher and louder note, uttered at the same frequency as (i), described by Fleming (1941) as "te-te-te-te." Once this was thought to be the call of the female (Fleming, pers. comm.), but this theory can be discounted since I have heard it uttered by unemployed birds of both sexes.

(b) Ground Calls

Pycroft's Petrels have a variety of strange ground calls.

- (i) Shearwater-like cackles, extraordinarily loud and harsh, have been heard only once, when five unemployed birds were found together in a group after landing.
- (ii) A quiet, shearwater-like crooning emitted by a pair in a burrow, described by Fleming (1941) as uttered in conjunction with the growling note described below. I have recorded this type of calling on infrequent occasions in breeding and also in unemployed pairs inside burrows. Relief of incubation is usually unaccompanied by calling. Single birds sometimes call in this manner shortly after landing on the surface of the ground.
- (iii) A growl or grunt, made by lone birds. The stimulus for this call is not apparent.

- (iv) A harsh strangled screech, only heard twice, in each case uttered by a single individual.
- (v) A harsh series of squawks uttered by birds disturbed in the burrow, usually caused by an observer walking over the nesting chamber.

3. Activity on the Ground

Once on the ground, Pycroft's Petrels remain still for a time, perhaps to orientate themselves. Breeding birds usually move quickly to their burrows and enter, sometimes after spending less than 60 seconds on the surface of the ground. Unemployed birds may spend several hours sitting on the surface, if they are not attached to burrows. Sometimes they move slowly and clumsily about, investigating stones and twigs, but often remain without moving, unless disturbed. These periods of inactivity on the breeding-grounds are difficult to interpret. In few species is the density on the breeding-ground so low that chance contact between individuals is unlikely; thus there are few records of comparable behaviour in Pycroft's Petrel to those of Richdale (1963a) for the Sooty Shearwater, who comments on the noise and activity of unemployed birds after landing.

4. The Weight of Pycroft's Petrels

On Hen Island, during December 1962 and January 1963, a total of 27 weights were recorded. The number of individuals involved was not determined, but on Aorangi, in November and December 1964, a total of 53 weights were taken of 32 individuals (See Table 4).

TABLE 4
WEIGHTS OF PYCROFT'S PETRELS IN GRAMS

Hen Island December-January 1962-63
Aorangi November-December 1964

	Number of Weights	Mean	Minimum	Maximum	Mid-Point	Standard Deviation
HEN ISLAND	27	157.8	135	180	157.5	11.2
AORANGI	53	159.6	128	198	163	19.2
<i>TOTAL</i>	80	159	128	198	163	16.8

The agreement of the mean weights from the two localities is good, but when the F-test was applied, it was found that the standard deviations of the Hen Island and Aorangi birds differed significantly at the 5% level. The explanation is that most, if not all, Hen Island birds examined were unemployed; whereas of the 53 weights taken on Aorangi, one third were of breeding birds (most of the 6 breeding birds were re-weighed many times). Since the breeding birds' weight varies more than that of the unemployed birds, the standard deviation is correspondingly greater.

5. Differences Between the Sexes

All birds weighed on Aorangi in 1964 were sexed by the cloacal method. Non-breeding birds cannot be reliably sexed by this method, and to compare the weights of unemployed males and females would be unwise. Tickell (1962) found that male Dove Prions are significantly heavier than female birds.

Fisher (1952) noted that the male Fulmar (*Fulmarus glacialis*) had a conspicuously larger head than the female, and in all pairs of Pycroft's Petrels examined this was a noticeable feature. This was caused by inflation of the throat and neck pouches in the male, and was not reflected in bill measurements. The difference was only apparent on a careful comparison of the members of a pair.

6. Relationships with Tuataras and Rats

The Tuatara (*Sphenodon punctatus*) is sometimes to be found in the burrows of Pycroft's Petrels. On 14 January 1964 a Tuatara was found in a burrow with an adult Pycroft's Petrel which had bloodstained neck and breast feathers. Tuataras are known to eat young Fairy Prions (Harper, in litt.) and it is possible that they also attack adults. When disturbed on the surface, Tuataras will readily enter any nearby burrow, and although they seem to have preferences for certain Pycroft's Petrel burrows, they change burrows frequently.

Stead (1936a) recorded 3 broken eggs of Pycroft's Petrel in the bottom of a big hollow stump as his only evidence of the Maori Rat (the Kiore, *Rattus exulans*) having gathered a food supply. Fleming (1941) and Skegg (pers. comm.), among others, have seen eggs sucked by rats on the Hen and Chickens Islands. No mammals are present on the Poor Knights Islands today. Rats probably consume only deserted eggs.

7. Departure

Pycroft's Petrels depart quietly and unobtrusively. The first birds leave as early as 10.30 p.m., while others are still arriving. Activity on the breeding area is at a maximum between 9 and 11 p.m., the latest timed arrival being 11.10 p.m. Unlike the other petrels on Aorangi, most of which leave between 3 and 4 a.m., the majority of Pycroft's Petrels leave before 2 a.m. It is exceptional to hear Pycroft's Petrels in the air later than this, although I have heard a bird circling and calling as late as 4.10 a.m., about half an hour before sunrise.

Pycroft's Petrel colonies on Aorangi and Hen Island are beneath tall trees. The Dragon's Mouth Cove colony on Hen Island is situated above a fairly steep slope, and birds can take-off, with a short run, gliding out down through the broken canopy. On Aorangi this is not possible as the ground is, in most cases, almost flat, and there are no projecting rocky outcrops conveniently sited as take-off points. On both islands this petrel can be seen climbing trees prior to departure. Lockley (1942) seems to have been the first to record the way petrels climb steep rocks and trees. Pycroft's Petrels climb rapidly, obtaining purchase with bill and claws, and fluttering their wings vigorously (see Plate XII). Lockley observed rocks worn and grooved where generations of Manx Shearwaters (*Puffinus p. puffinus*) had scrambled up, and I have seen trees with

scratched and worn bark where many Pycroft's Petrels have climbed. This habit of climbing trees is widespread among the burrowing petrels.

At Hen Island, Skegg (pers. comm.) recorded Pycroft's Petrels departing from the beach, large rocks, the slopes (flying between branches) and from particular trees, including a Kawakawa (*Macropiper excelsum* var. *majus*) which was in regular use.

After taking off, Pycroft's Petrels rarely call, and they usually fly directly out to sea.

ACTIVITY OF UNEMPLOYED BIRDS COMPARED TO BREEDING BIRDS

1. *Nightly Arrival*

Unemployed birds are conspicuous and noisy during nightly arrival; but breeding birds come in silently, and none has been heard calling in the air or on the ground, except inside the burrow. All Pycroft's Petrels that landed before 8.20 p.m. on Aorangi in 1964 were silent breeding birds. Sibson (1949) noted that the first calls were seldom heard before 8.30 p.m. The noisy unemployed population commences landing at about this time.

Fleming (1941) described a form of courtship flight in which the birds circle high above the bush uttering their almost continuous cry. The delayed courtship of unemployed birds evidently takes place in the air as well as on the ground. Birds often circle the colony calling loudly without landing, and sometimes several are involved; they fly in high, wide circles perhaps half a mile across, well above the tree-tops. That these calls may mutually stimulate is illustrated by the following incident.

Between 8.20 and 8.50 p.m. on 11 December 1964 several birds could be heard calling and circling. At 8.50 the calls rose to a crescendo, with at least 3 birds calling together. At 9.15 a loud and incredibly harsh caterwauling came from a group of 5 unemployed birds on the ground, the only instance where more than a pair were seen together. It seems possible that these 5 birds had landed together as a result of courtship begun in the air.

The aerial courtship of Cook's Petrel on Little Barrier Island is similar (Turbott, 1961). The contrast between the noisy unemployed population and the overall silence of the breeding birds is marked in *Pterodroma melanopus* on Lord Howe Island (McKean, in litt.).

2. *Use of Burrows*

On Aorangi in November-December 1964, of 8 Pycroft's Petrel burrows, two were in use by breeding birds, and the remainder by unemployed birds. Usually no attempt was made to assign empty burrows to this species because of the variation in size and appearance of burrows which they inhabit (see Appendix). Of the burrows used by unemployed birds, 4 were occupied intermittently by single birds, 1 was used by a pair, and 1 by a trio. Pairs were observed keeping company within the burrow on only 4 occasions. The high proportion of single birds in burrows as compared to pairs and trios contrasts with the Sooty Shearwater (Richdale, 1963a), and may be caused by the low level of social stimulus in the colony.

Unemployed birds, once attached to a burrow, are rarely found far away. Richdale (1963a) found that unemployed Sooty Shearwaters move an average of only 8.5 feet from their burrows.

The breeding urge, as manifested by burrowing activity and number of visits to the colony, varies greatly among the unemployed birds. D-3583 came in from the sea on 5 out of 11 nights, but most unemployed birds visited their burrows infrequently and irregularly, usually about once every 4 or 5 evenings.

Despite two evenings' work, each member of a pair at Burrow C added less than an inch in length to their 12-inch burrow, and some other unemployed birds were even less effective at burrowing. Usually only scratchings resulted, and one assumes that more active birds and several generations are needed before the tunnels are properly constructed. The ineffectiveness of Pycroft's Petrels' burrowing is suggested by the relatively short length of most burrows (see Appendix). The burrowing activity of these birds seems part of the complex of delayed courtship and keeping company characteristic of unemployed birds. Breeding pairs engage in corresponding behaviour one or two months earlier.

Falla (1935) commented on the quantity of dead leaves accumulating in the entrances of Pycroft's Petrel burrows, giving them a disused appearance (Plate XIV). These leaves are collected and kicked into place by the birds themselves, and do not accumulate by chance. Dry brown leaves and decaying leaves are mostly used for this purpose, twigs rarely, and fresh leaves only exceptionally. This activity disguises the burrows from predators such as Tuataras which prefer the large open type of burrow.

A trio inhabited Burrow E on Aorangi in 1964. On the night of 6 December a lone male was banded at this burrow, and the following night he returned from the sea with a female, D-40174. The male stayed alone in the burrow for the next 2 days until the night of 9 December. Very late on the evening of 12 December he returned, and stayed all the next day in the burrow, to be joined in the evening by another female, D-40197. They kept company in the burrow during the following day. That night (14 December) the male left, leaving the female alone until the next evening, when the other female (D-40174) arrived and entered the burrow. Both birds then left for the sea and the burrow was not entered again during the next 3 days.

3. *Weight Loss on the Colony*

Weight fluctuations are believed to reflect variations in activity. The weights of unemployed birds tended to be lower than those of breeding birds, probably because some breeding birds build up large reserves of stored food for incubation duties.

Both members of a non-breeding pair in attendance at Burrow C lost weight between visits to the nest, while they were presumably feeding at sea. These periods were not concurrent. D-40161 (the male) lost 6 gm. in 4 days at sea, and D-40195 (the female) lost 9 gm. in 3 days at sea. At Burrow E the non-breeding male, D-40170, lost 2 gm. in a day at sea, while during a day spent in the burrow he lost 4 gm. In one day spent in the burrow, one of the females attached to this nest lost 13 gm., nearly 10% of her

total weight. This suggests a period of intense activity, but a change from full to empty gut could largely account for this loss.

In conclusion, it appears that unemployed birds, perhaps because of their greater activity, lose weight faster when ashore, and also weigh less than breeding birds. Periods spent at sea do not always lead to an increase in weight.

4. *The Brood Patch*

In many birds, immediately prior to incubation, the dermis in a localized area of the abdomen becomes thickened and highly vascularized to form a "brood organ" — the incubation or brood patch, for bringing the warmth of the blood next to the eggs (Rawles, 1960). In petrels, this area is normally covered with thick down. This down is lost immediately before egg-laying, except for a narrow median strip, leaving a large area of naked skin.

In Pycroft's Petrel the brood patch extends from the posterior end of the sternum to a point just anterior to the cloaca, and stretches from side to side of the body forming an area of bare pink skin, roughly 2 x 1 inches, which amply covers the rather large egg. During incubation the body (contour) feathers which normally cover this area are displaced and partly surround and insulate the egg. The skin of the brood patch is particularly sensitive, presumably to ensure that the egg is maintained in the correct incubation position.

On Aorangi in November-December 1964 when a close investigation was made into the status of all birds encountered, it became clear that both breeding and non-breeding birds develop bare brood patches. In 1947 F. F. Darling shot a non-breeding Fulmar at Dunrobin Castle (Scotland) with a bare brood patch (Fisher, 1952) Bailey (1952) showed that the periodic development of the brood patch in passerines is controlled by hormones. It thus appears that brood patches are developed by all adult petrels, whether breeding or not, at certain times of the year in response to endocrinal secretions.

On Aorangi in 1964 most of the breeding birds laid an egg on about 26 November. However, while all the breeding birds had developed bare brood patches by that date, none of the unemployed birds developed naked brood patches until at least a week after, on 2 December. By the end of the week (8 December) all unemployed birds had bare brood patches, except for D-40129 which still had a downy brood patch on 11 December. This bird might have been a pre-breeder. D-40131, an unemployed male bird attached to Burrow D, had a brood patch covered by tufted light grey down when banded on 24 November, but by 11 December the brood patch was completely naked. By 25 December all brood patches are bare (Hen Island), but it seems possible that down may re-develop during the early fledgling period, as Fisher (1952) showed with the Fulmar.

5. *Plumage and Claw Wear: Frequency of Visits to the Colony*

Pycroft's Petrels do not scramble about in the manner of Fairy Prions and some other species, and throughout incubation their plumage remains fresh in appearance, and their claws sharp. There are only scattered rocks on the breeding colonies. It was impossible to differentiate between unemployed birds and breeding birds on the basis of plumage wear. Apparently the greater activity (burrowing, for example) exhibited by the unemployed birds compensates for the much shorter periods spent ashore.

Nineteen unemployed birds not attached to burrows were banded on Aorangi in 1964, and only one of these was recorded ashore more than once over the 26-day period. The unemployed birds attached to burrows came ashore more frequently, but the most active of these made only three separate visits totalling 6 nights and 4 days.

Richdale (1963a) noted sudden influxes of unemployed Sooty Shearwaters during the fledgling period. Evenings of intense activity among the unemployed birds did not correspond to similar periods of activity with the breeding birds, and Richdale concluded that these two sections of the population were affected by entirely different factors. Pycroft's Petrels exhibit similar behaviour. Unemployed birds were very active on 6, 7, and 11 December 1964, but on two of these nights no breeding birds came ashore. Rhythms which control visits to the burrow and relief of incubation duties among incubating birds must be different from those motivating the unemployed population. This conclusion supports my earlier suggestion that weather and other physical factors have little effect on activity on the breeding-grounds.

6. *Importance of the Unemployed Population*

Fisher (1952) suggested that a population of pre-breeders at colonies of Fulmars might stimulate and increase the breeding efficiency of the adult birds. The breeding stimulus that species confer on themselves by their own sociality was described by Darling (1938) and is known as the "Fraser Darling Effect." It is suggested that the large number of unemployed birds may stimulate the breeding population of Pycroft's Petrels. The delayed courtship and burrowing activities in a small population such as that of Pycroft's Petrel, rather than being valueless expenditures of energy, may contribute towards breeding efficiency which is low in this petrel perhaps because of the low overall level of social stimulus. Sociality is dependent on the population density, and breeding efficiency is higher in most of the large sea-bird colonies.

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APPENDIX

Description of Burrows

The burrows of breeding birds are difficult to locate by casual examination, and are less conspicuous than those of unemployed birds which often have freshly-scratched earth at the entrance. Pycroft's Petrel burrows can be distinguished from even the old burrows of other species by their disused, leaf-choked appearance.

Fleming (1941) found Pycroft's Petrel burrows up to 6 ft. long on Hen Island, but most were little more than an arm's reach in length. Nesting chambers which he examined were usually about 15 inches in diameter, and contained well-built nests of leaves and grass. None of the 17 burrows which I investigated on Hen Island or on Aorangi had well-built nests, although most nesting chambers contained varying quantities of dead leaves. The large numbers of these leaves and the occasional finding of a fresh leaf showed that they had been collected by the birds themselves, and had not accumulated by drifting.

Fleming (1941) and also Skegg (pers. comm.) found most burrows in soft soil, although some wound between roots and boulders. The majority seen by Skegg were an arm's reach in length, although variation was between 1 and 7 ft. Wilson (1959) described Pycroft's Petrel burrows as resembling rat holes. Only one burrow I saw resembled a rat hole; a short (1 ft.) burrow on Hen Island had an entrance only 2 inches in diameter.

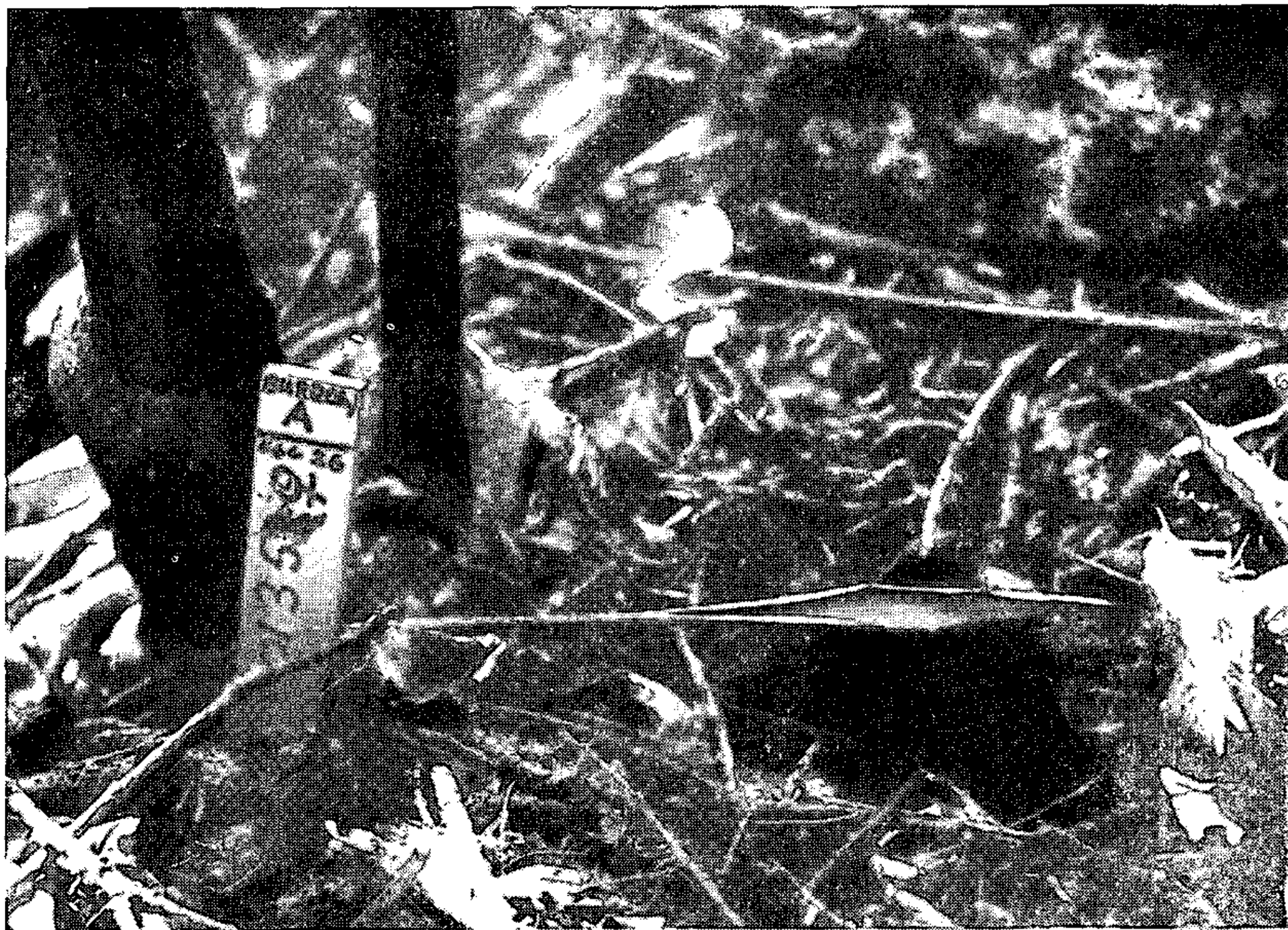


Plate XIV — Burrow A, Aorangi, 1964 (entrance cleared of dead leaves).



Plate XV — Burrow F, Aorangi, 1964.

In January 1964 Mr. L. Scheeler found an unemployed pair in a hole 12 ft. up the trunk of a Pohutukawa overhanging a steep cliff on Hen Island (Skegg, pers. comm.). Pycroft's Petrels have no difficulty in climbing trees, and this case appears to be one of aberrant behaviour associated with the delayed courtship of unemployed birds.

Of three occupied burrows located on Hen Island by Sibson (1949), two were short, and one was about 5 ft. long, and doubled back on itself. Burrows with a right-angled turn after a short (1 ft.) vertical vestibule are frequent on the more level sites at Hen Island. This vestibule is usually followed by a horizontal tunnel running parallel to the ground surface for several feet. All burrows found on Aorangi are described in Table 5. From this, and the above descriptions, the average length of Pycroft's Petrel burrows was calculated as about $2\frac{1}{2}$ ft.

Reischek (1885) wrote that Cook's Petrel burrows were found on Little Barrier Island in even the stiffest clay, winding about roots and stones. Most burrows were between 4 and 8 ft. long, although some were 12 ft. in length. The width of the entrance varied between 4 and 6 inches. He found two large nesting chambers, generally about 1 ft. in diameter, in every burrow. In the chambers were hollows filled with leaves, moss, or fine grasses as with Pycroft's Petrel. Cook's Petrels tunnel in harder soils and yet build longer

TABLE 5
DESCRIPTION OF PYCROFT'S PETREL BURROWS ON AORANGI, 1964

BURROW	INHABITANTS and their Status	LOCALITY	SLOPE	VEGETATION (Canopy)	ENTRANCE Width x Height	TUNNEL Length x Width x Height	CHAMBER Length x Width x Height	NOTES	TOTAL LENGTH of Burrow
A.	D-40137 (Male) D-40135 (Female) Breeding	Saddle	Almost flat	Pohutukawa	6 x 4 inches	Length 2 ft.	18 x 9 x 4 in.	Egg laid at junction of tunnel with chamber	3½ feet
B.	D-40138 (Female) Breeding	Saddle	Gently sloping	Kanuka	Underneath large boulder 6 x 3 inches	36 x 6 x 3 in.	None	—	3 feet
C.	D-40161 (Male) D-40195 (Female) Unemployed	Puweto Valley near Tuatara Pool	Flat	<i>Myrsine divaricata</i>	6 x 4 inches	Length 12 in.	None	—	1 foot
D.	D-40131 (Male) Unemployed	Puweto Valley near Tuatara Pool	In bank of drainage ditch (steep)	Mahoe (<i>Melicytus ramiflorus</i>)	3 x 4 inches	Length 2½ ft.	None	Burrow horizontally parallel with face of bank	2½ feet
E.	D-40170 (Male) D-40174 (Female) D-40197 (Female) Unemployed	Saddle	Moderately steep	Mahoe	6 x 6 inches Clear of leaves with bare earth outside	12 x 6 x 4 in.	18 x 18 x 6 in.	Tuatara frequented this burrow	2½ feet
F.	No Birds Egg	Saddle	Moderately steep	Mahoe	6 x 8 inches	18 x 6 x 6 in.	None	Tunnelled into old Cabbage Tree (<i>Cordyline australis</i>) stump	1½ feet
G.	D-40185 (Female) Unemployed	Saddle	Gently sloping	Pohutukawa	6 x 4 inches	36 x 5 x 3 in.	18 x 15 x 4 in.	Right-angled turn half-way along tunnel	4½ feet
H.	D-40186 (Male) D-40187 (Female) Breeding	Saddle	Moderately steep	Mahoe	4 x 4 inches	18 x 4 x 4 in.	None	Successfully breeding despite length of burrow	1½ feet
1964	Unemployed	Puweto Valley near Tuatara Pool	Gently sloping	Mahoe-Kohekohe Forest (<i>Melicytus ramiflorus</i> - <i>Dysoxylum spectabile</i>)	5 x 3 inches	18 x 5 x 3 in.	18 x 8 x 5 in.	Tuatara found here	3 feet

burrows than Pycroft's Petrels, and it appears that the former species is much more effective at burrowing. The differences between these species in length and form of the burrows seem significant behavioural differences in view of the constancy in type of burrow made by each species in varying habitats.

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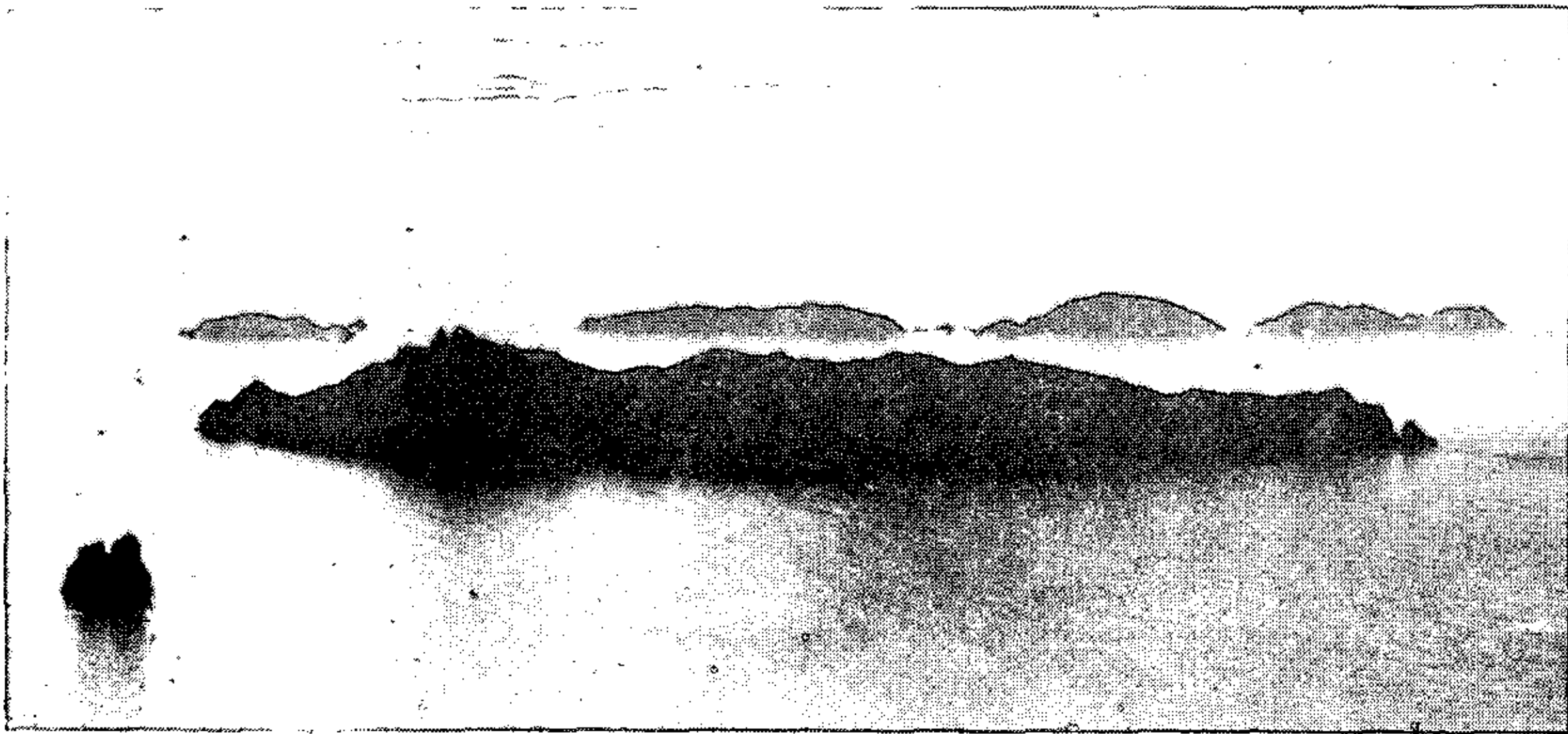
NOTES ON THE BIRDS OF COPPERMINE ISLAND, HEN AND CHICKENS GROUP

By D. V. MERTON and I. A. E. ATKINSON†*

A party consisting of Mr. J. C. Hopkins and the writers visited Coppermine, or Eastern Chicken Island, between the 19th and 22nd November 1965. Since little information on the wildlife of this interesting island is available, our observations for this short period are summarised below.

The Hen and Chickens are Scenic Reserves administered by the Department of Lands and Survey; the Chickens being declared in 1920 and Hen in 1928. Landing without written authority was prohibited in 1956.

Coppermine Island, the most easterly of the group, is 2000 yards long, 330-650 yards wide, and has an area of 180 acres. It lies approximately 10 miles east of Bream Head, and is separated from Middle Chicken (Whakahau or Whatupuke) Island by a channel 180 yards wide. Hen (Taranga) Island is approximately $4\frac{3}{4}$ miles to the south west. Coppermine is the steepest island in the group, the exposed northern and eastern faces being particularly so and the only semi-flat area is on the westernmost summit or D'Arcy Hill (607'). The main ridge, oriented in an east-west direction, is broadened into three rounded summits connected by two narrow steep-sided saddles. The best method of traversing the island is by following this ridge. An automatic lighthouse is situated on the eastern summit (480').



[Whites Aviation

Plate XVI — The Hen and Chicken Islands viewed from the south. Beyond Hen are, from the left, South western (which obscures North western), Big (Lady Alice), Middle and Eastern Chicken (Coppermine) Islands. Sail Rock is in the left foreground and the Poor Knights group can be seen in the distant background.

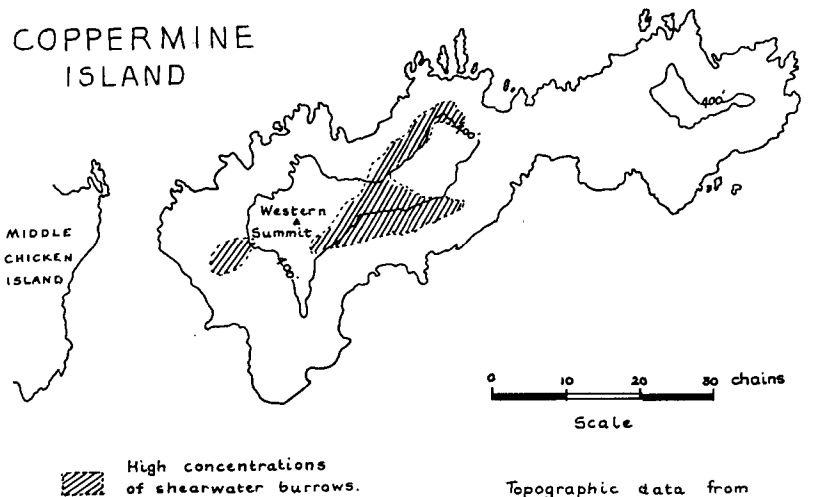
* Wildlife Service, Department of Internal Affairs, Wellington.

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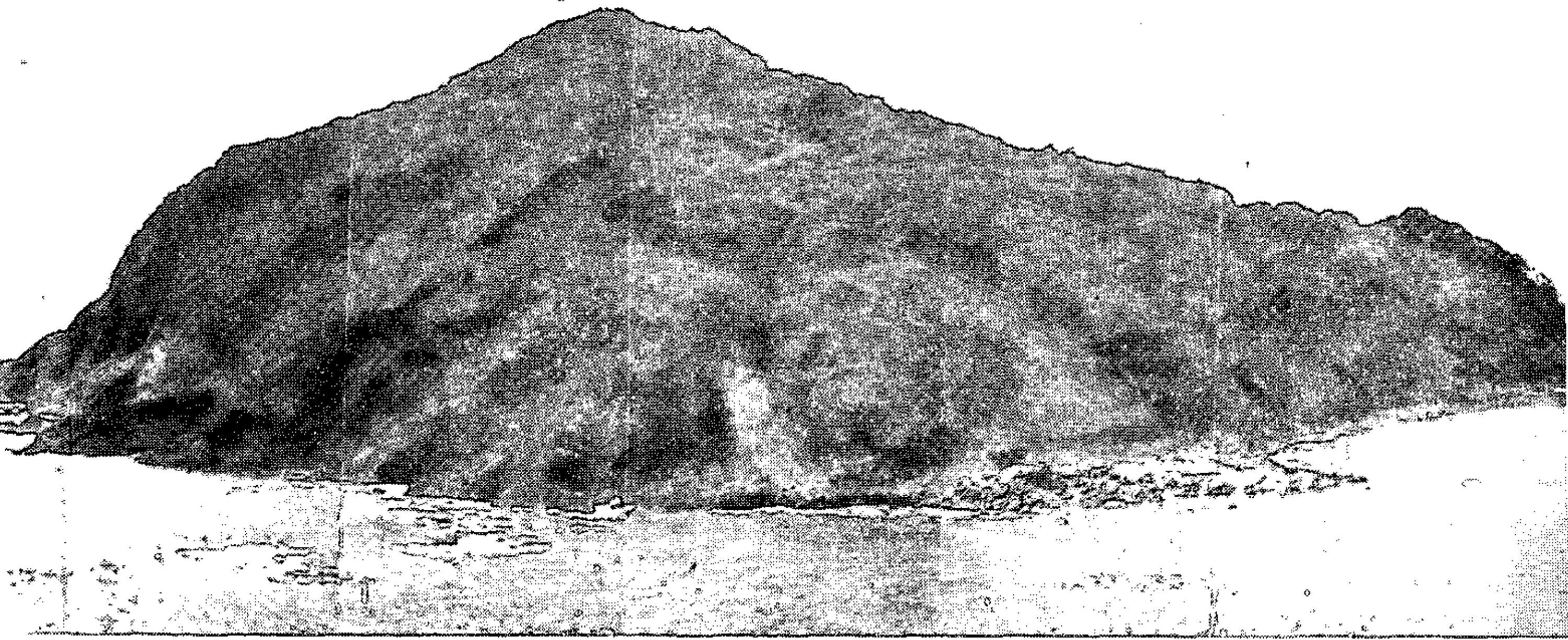
The presence of copper was known as early as the 1840's and attempts were made to mine it in 1849 and 1896. A shaft was put in a little above sea-level in a south-western bay before the venture was abandoned. The current interest in the island's copper minerals has resulted in detailed accounts of the geology and mineralization (Brothers and Hopkins 1967; Thompson and Wodzicki 1967). The most common igneous rocks are diorites and granodiorites that have been intruded while molten into the original basement greywacke, thus bringing about mineralization. Later intrusion of andesitic dykes has resulted in more extended mineralization.

Signs of ancient Maori occupation were found in the form of three terraced sites, about 150' above sea-level on a south-west spur. A pit measuring 5' x 3' x 1' deep occurs near the western summit. Other signs of Maori use were midden deposits, charcoal-rich soil and a piece of obsidian.

Most of the island's steep faces are covered by dense thickets of flax, pohutukawa, kawakawa, ngaio, and taupata. Some of the steep moist talus slopes are completely covered by luxuriant masses of renga lily, a feature we have not seen developed to the same extent on other islands in the group. The kanuka scrub at the eastern end appears to have developed following a fire in the latter half of the last century. The upper central and south-western slopes are covered by a forest of mixed composition, presumably developed since the Maoris left the island. Further details of the island's vegetation are given by Atkinson (in press).



Topographic data from
Lands and Survey Aerial Map
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Plate XVII — Western end of Coppermine Island taken from Middle Chicken Island, showing part of the rugged northern coast, D'Arcy hill (607 ft. a.s.l.), Scran Point, Coppermine Bay and Coppermine Point.

BIRDS

Coppermine is the only large island of the Hen and Chickens Group where numbers of petrel burrows are sufficient to qualify it as a "petrel island." However, a complete list of breeding sea-birds must await a winter visit. No census of the forest birds was attempted because of the difficulty of moving about the island but one of us (D.V.M.) had just spent 10 days on Hen Island where a census (Skegg 1964) had been made so that some comparison of the two islands was possible:—

NORTHERN BLUE PENGUIN (*Eudyptula minor*)

Breeds in moderate numbers along the southern and western coasts. It is considered to be as numerous as on Hen Island.

FLESH-FOOTED SHEARWATER (*Puffinus carneipes hullianus*)

The island supports a major breeding colony. Cowan (1908) compared the burrowed ground to that of rabbit-ridden country, and more recently Skegg (1964) has described the colony.

We saw large numbers of birds every evening wheeling over the island. They seemed to land earlier than other shearwaters, i.e. most were ashore by 8.15 p.m. Although the birds were nesting in many parts of the island, the main concentration of burrows was on the southern slopes of the central region (see Fig.). Counts of burrows were made in high-density areas using 20 circular plots, each of 10 sq. meters (1.78 meters radius), randomly-spaced along contours. We found densities up to 1.2 burrows per sq. metre with a mean value of 0.6 burrows per sq. metre. Most appeared to be in use, having signs of recent activity in their entrances, and only these were counted. In the 17 acres of high-density burrows that



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Plate XVIII — Burrows of Flesh-footed Shearwater at about 350 ft. a.s.l. on the southern slopes of Coppermine Island. Claw marks can be seen in the foreground.

were mapped, the shearwater population must be well in excess of 10,000 breeding pairs. No particular vegetation seemed to be associated with shearwater areas. The main colony was under a puriri-mahoe cover but other concentrations were present in kanuka forest and under flax nearer sea-level. The densely burrowed areas are associated with very friable sandy soils, possibly weathered from coarsegrained diorite and mineralised greywacke. Such soils extend from 150' to 550' above sea-level and were found on northern, southern and western slopes.

SOOTY SHEARWATER (*Puffinus griseus*)

Small numbers were heard each night but none was seen ashore. In 1953 Davenport (1954) found a corpse in a man-made pit.

FLUTTERING SHEARWATER (*Puffinus gavia gavia*)

Moderate numbers were heard each night and one was seen ashore.

NORTH ISLAND ALLIED SHEARWATER (*Puffinus assimilis haurakiensis*)

Moderate numbers were heard coming in each night and two were seen ashore. This species seemed more abundant than Fluttering Shearwater; neither has been recorded from this island before.

GREY-FACED PETREL (*Pterodroma macroptera*)

Neither seen nor heard. As they are winter breeders one would not expect to find many in November. Almost certainly a few nest here, as they do on other islands in this and neighbouring groups.

PYCROFT'S PETREL (*Pterodroma pycrofti*)

Moderate numbers were heard arriving each night and one was seen ashore. This rather rare species has not previously been recorded.

NORTHERN DIVING PETREL (*Pelecanoides urinatrix*)

Several were heard ashore low on the northern slopes one night. None were seen. They have not previously been recorded.

PIED SHAG (*Phalacrocorax varius*)

Several groups of up to 6 birds were seen feeding off-shore or resting on adjacent rocks. No breeding colony was found and we presume that these birds were from Middle Chicken where a breeding colony is present.

AUSTRALASIAN HARRIER (*Circus approximans*)

One was usually present. The species was recorded as breeding on this island in December 1953 by Chambers *et al.* (1955).

SOUTHERN BLACK-BACKED GULL (*Larus dominicanus*)

One pair apparently with a nest at the eastern end of Middle Chicken was often encountered along the coast.

WHITE-FRONTED TERN (*Sterna striata*)

A small nesting colony (4 nests) was found on a stack off the mid-northern coast.

NEW ZEALAND PIGEON (*Hemiphaga novaeseelandiae*)

As plentiful as on Hen Island. One occupied nest was found.

NORTH ISLAND KAKA (*Nestor meridionalis*)

As plentiful as on Hen Island. They were heard throughout the day, and one pair was thought to be breeding in the mixed forest at the western end of the island.

RED-CROWNED PARAKEET (*Cyanoramphus novaeseelandiae*)

Present in greater density than on Hen Island. Apparently breeding in holes in the northern cliffs. Up to 8 were seen in the air together.

SHINING CUCKOO (*Chalcites lucidus*). Numerous.

MOREPORK (*Ninox novaeseelandiae*). Numerous.

NEW ZEALAND KINGFISHER (*Halcyon sancta*)

As numerous as on Hen Island.

NORTH ISLAND FANTAIL (*Rhipidura fuliginosa*)

As numerous as on Hen Island.

GREY WARBLER (*Gerygone igata*)

More plentiful than on Hen Island.

BLACKBIRD (*Turdus merula*)

As plentiful as on Hen Island. One occupied nest was found.

TABLE 1 — DISTRIBUTION OF BIRDS RECORDED ON THE HEN AND CHICKENS ISLANDS

(Data from Skegg (1964), Department of Internal Affairs file 46/29/410 and from our own records.)

Key to symbols used

Recorded: x Self-introduced European passerines: •
 Breeding confirmed: b Visitors, migrants and vagrants: v
 Birds introduced by man: I

Species	HEN	CHICKENS				
		South-western	North-western	Big (Marotiri)	Middle (Whaturipuke)	Eastern (Coppermine)
Northern Blue Penguin	xb			xb	xb	xb
Fairy Prion (i)						
Flesh-footed Shearwater	xb		xb	xb	xb	xb
Sooty Shearwater	xb			xb		x
Fluttering Shearwater	xb		xb	xb		x
Allied Shearwater	xb			xb		xb
Grey-faced Petrel	xb			xb	xb	
Pycrofts Petrel	xb			xb	xb	x
Northern Diving Petrel	x		xb			x
Pied Shag	xb			x	xb	x
Little Pied Shag	x			v	v	v
Blue Heron	x			v		
Mallard	v					
Australasian Harrier	x			xb	x	xb
New Zealand Falcon (ii)	x			x	x	x
Southern Black-backed Gull	xb	x	x	xb	x	x
Red-billed Gull	x	x	x	x	x	x
White-fronted Tern	xb			xb	x	xb
New Zealand Pigeon	xb			xb	x	xb
North Island Kaka	xb			x	x	x
Red-crowned Parakeet	xb	x	x	x	x	x
Yellow-crowned Parakeet	xb			x		
Shining Cuckoo	vb		v	v	v	v
Morepork	xb			xb	x	x
Kingfisher	xb			x	x	x
Fantail	xb		x	xb	x	x
Pied Tit	xb			xb	x	x
Grey Warbler	xb			xb	x	x
Song Thrush*	xb			x		
Blackbird*	xb			xb	x	xb
Duncock*	x			x	x	x
New Zealand Pipit	x	x	x	x	x	x
Bellbird	xb	x		xb	x	x
Tui	xb	x		xb	xb	xb
White-eye	xb	x	x	x	x	x
Chaffinch*	x			x		x
House Sparrow	v					
Starling*	x	x	x	x	x	xb
Corvus sp.	v					
North Island Saddleback (iii)	xb			I	Ib	
Totals:	39	8	11	35	28	31

(i) Alleged to breed on the Chickens, but confirmation required.

(ii) Last recorded on Hen 1924, Chickens 1880 and Eastern Chicken 1914.

(iii) But for several remnant males (c 9 in July 1967) of the South Island sub-species *P. c. carunculatus*, persisting on the rat-infested South Cape Islands off Stewart Island, Hen Island supports the last natural population of this endemic genus. Six from Hen introduced to Big Chicken Island in 1950 were not seen after 1953. However, a liberation of twenty-three to Middle Chicken in 1964 was completely successful, sixty being located four years later.

DUNNOCK (*Prunella modularis*)

Present in small numbers.

NEW ZEALAND PIPIT (*Anthus novaeseelandiae*)

Heard twice.

BELLBIRD (*Anthornis melanura*)

Abundant, as on Hen Island.

TUI (*Prosthemadera novaeseelandiae*)

Abundant, as on Hen Island. One occupied nest was found. Up to 15 were seen in the air together off the northern cliffs on 20 November 1965. Both Tui and Bellbirds were commonly seen visiting pohutukawa blossom.

WHITE-EYE (*Zosterops lateralis*)

Few present, as on Hen Island.

STARLING (*Sturnus vulgaris*)

Small numbers present and breeding in the northern cliffs.

NORTH ISLAND SADDLEBACK (*Philesturnus carunculatus rufusater*)

Although watched for particularly, none were seen or heard. Calls could be heard from across the narrow channel separating Coppermine from Middle Chicken Island where they were released in January 1964 (Merton 1965). It will be interesting to see if birds from Middle Chicken eventually cross this barrier and colonise Coppermine Island.

TABLE 2 — SUMMARY OF BIRDS RECORDED

Number of confirmed breeding species given in parenthesis	CHICKENS					
	HEN	South-western	North-western	Big	Middle	Eastern
Indigenous landbirds:	16(13)	5	4	15 (8)	14 (1)	14 (3)
Procellariiformes:	7 (6)	-	3 (3)	6 (6)	3 (3)	6 (2)
Other sea and coastal species:	7 (4)	2	2	5 (3)	5 (2)	5 (2)
Self-introduced European passerines:	5 (2)	1	1	5 (1)	3	4 (2)
Visitors, migrants and vagrants:	4 (1)	-	1	3	2	2
Birds introduced by man:	-	-	-	1	1 (1)	-
Totals:	39(26)	8	11 (3)	35(18)	28 (7)	31 (9)

It is unlikely that subsequent observers will increase greatly the numbers of species already recorded on the better known islands, i.e. Hen and Big Chicken, however significant additions can be expected to those of the remaining islands, all of which are little known. Further work is required before complete lists of breeding species can be compiled.

OTHER VERTEBRATES

Tuatara, both young and adults, appeared to be very common. Skinks and geckos, including *Hoplodactylus duvauceli*, were abundant. Kiore (*Rattus exulans*) were present in small numbers.

THE ISLAND AS A RESERVE

With the recent revival of interest in Coppermine's copper deposits and the scarcity of facts concerning its faunal attributes, the island's value as a public reserve has been questioned. Our records show the avifauna to be comparable with that of any other of the Chickens (see Tables 1 and 2), and a diversity of Procellariiformes greater than that of most islands off the New Zealand coast. Pycroft's Petrel is known to breed only on the Poor Knights, Hen and Chickens and Mercury Islands, but is nowhere abundant. However, it is the colony of Flesh-footed Shearwaters, perhaps the largest in New Zealand, which makes Coppermine so distinct from its neighbours. The only other large breeding colony known to us, in the New Zealand region, is on Karewa Islet (9 acres) in the Bay of Plenty. Beyond New Zealand waters this sub-species breeds only at Lord Howe Island, where, according to J. L. McKean* (pers. com.) the colony comprising a minimum of 50,000 breeding pairs, may soon be endangered by development.

There are at least three types of damage that must be guarded against:

1. Introduction of European rats.
2. Fire.
3. Trampling of burrows by visitors.

Rats, if introduced, would easily spread to the other Chicken Islands because of the short distances separating them. Their introduction would alter the plant, vertebrate and invertebrate communities of these islands, and, judging by the results of the rat (*Rattus rattus*) invasion of Big South Cape Island (Blackburn 1965), would lead to the disappearance of Saddlebacks from the Middle Chicken. Both tuatara and the smaller petrels and shearwaters breeding here would almost certainly share a similar fate. As far as rats and other predators are concerned, the Chicken group should be considered as a single island. At present the Chickens are among the few remaining islands without large browsing mammals or pigs, rabbits, opossums, cats, stoats, ferrets or European rats; this is in marked contrast to mainland communities.

Each of our offshore islands has its own distinct features and Coppermine Island is no exception. The intimate relation between rock composition, soils and burrowing seabirds is well exemplified here. Study of this may contribute to our understanding of the distribution and requirements of burrowing seabirds and may ultimately provide the knowledge necessary for new colonies to be established artificially. A film of the life of a Shearwater-reptile colony such as this would allow many more people to appreciate

* Division of Wildlife Research, C.S.I.R.O., Canberra

and enjoy the beauty and complexity of this island ecosystem. What the outcome of the current copper prospecting will be is unknown, but it must be made clear that from the viewpoints of both wildlife interest and scientific study the Chicken Islands are irreplaceable.

ACKNOWLEDGEMENTS

Our thanks are due to Drs. G. R. Williams and E. J. Godley and Mr. B. D. Bell for critically reading this account.

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SHORT NOTE

BLACK-FACED CUCKOO-SHRIKE IN SOUTH WESTLAND

On 14/9/67 I received a message from Mr. C. Eggeling that he had seen a strange bird near his home at Okuru on September 1st. He described it as follows. The bird had a body about the size of a Tui's; a short, thickish neck, a beak about the thickness of a Bush-pigeon's, but not quite as long. The tail was about as long as a Tui's or slightly longer. The colour on the breast and under the wings was a greyish white, and the back was a light blue or bluish grey, darkest towards the head, which was short and stumpy.

A short time afterwards, Mr. Eggeling's brother and his two sons saw a bird of the same description about one mile and a half from where the first sighting occurred. They followed it to the first corner from the bridge. It was making a number of short flights, several times crossing the road. It would flap its wings a little, then glide to a perch, at times making a piping call. They noted that the feathering about the head was dark or black; and they estimated its length as about a foot.

Later when Mr. Eggeling and his sons were shown a number of books, they all picked Kokako as the nearest; but the colouring was wrong. As I thought this bird could be a vagrant from Australia, I discussed it with H. R. McKenzie and B. D. Bell, both of whom suggested that it was an immature Black-faced Cuckoo Shrike (*Coracina novaehollandiae*). This was the species picked out by the Eggelings when I showed them a copy of Cayley's "What Bird is That?"

The weather before the sighting had been rough with strong north-westerly gales.

— ALAN WRIGHT

BIRDS OF THE TOKELAU ISLANDS

By *MAX C. THOMPSON and C. DOUGLAS HACKMAN*¹

Smithsonian Institution personnel C. Douglas Hackman, Lawrence N. Huber, Ralph D. Kirkpatrick, Richard W. Merrill, Max C. Thompson and Paul W. Woodward visited the Tokelau Islands from 26 February through 4 March, 1965. These islands lie between 8° to 10°S and 170° to 173°W. The atolls included in this report and time spent on each are as follows:

Fakaofu (= Fakaofu), 26 through 28 February, 46 hours

Nukunonu (= Nukunono), 28 February through 3 March, 66 hours

Atafu, 3 March through 5 March, 26 hours.

Some geographers (Weins, 1962) include Swain's Island as part of the Tokelau Group but it will not be considered here.

Atafu, the most northerly and smallest of the group, is composed of 42 islets with a land mass of about 550 acres (Macgregor, 1936:7). Presently about 300 people inhabit the atoll. As on all the Tokelau Islands, the main crop is copra and coconut palms have replaced the native vegetation. Since a limited amount of time was available we confined our investigations to one or two islets per atoll. On Atafu we concentrated on Fenulua Island.

Nukunonu is the central and largest of the Tokelau Islands. It has a circumference of 24 miles and is comprised of 24 islets constituting 1,350 acres (*Ibid*). Its population is about 500 persons. On Nukunonu we concentrated on Tokelau Island.

The most southerly of the atolls is Fakaofu which has about 60 islets of unknown acreage (*Ibid*). The village of Fakaofu is the most densely populated of any village in the Tokelau Islands with about 900 inhabitants. Nearly all our work was done on Matanga Island and nearby islets.

CLIMATE

The weather during our stay was characterised by sunshine with occasional rain squalls. Seelye (1943) has summarised the weather for the Tokelau Islands: "Easterlies predominate during the day all the year around, attaining their highest frequency (over 60%) in June, July and August, the lowest (24% to 29%) in December and February. Northeasterlies and northerlies are the next most common from October to April, southeasterlies in the remaining months. In the summer months most of the fresh or strong winds are from the west.

"The annual rainfall at Atafu is also rather high with a mean of 123.68 inches, but the variations from year to year are considerable. The wettest 12-monthly period was from November 1929 to October 1930, when 177.9 inches of rain fell; the driest commenced May 1933, and 58.33 inches fell.

"The mean temperature is 82.5°F., with little variation from month to month. . . The average annual extremes are 91°F and 72°F, the absolute extremes 95° and 65°F."

Hurricanes are reported infrequently. Only two have caused damage in the Twentieth Century (January, 1914, and January, 1966).

¹ Paper No. 24 — Pacific Ocean Biological Survey Program, Smithsonian Institution, Washington, D.C.

VEGETATION

A limited variety of species was observed on those islets visited on the three atolls. Coconut palms predominated in the interior section of most islets with such species as *Scaevola*, *Messerschmidia*, *Pandanus*, and *Morinda* common along the beaches. Ground cover consisted primarily of scattered *Boerhaavia*, *Triumfetta*, several species of grass, several species of sedge and several species of fern. A parasitic species, *Cassythia filiformes*, was in vigorous competition with the vegetation along the beaches of Fakaofu.

Remnants of a *Pisonia* forest were found on one islet at Fakaofu and on Tokelau Island, Nukunonu. Several of these trees exceeded eight feet in diameter. Ground cover on Fakaofu, under the *Pisonia*, consisted of a dense growth of *Polypodium* ferns.

A species of salt bush occurred on all three atolls but was most common on Tokelau Island, Nukunonu, where a narrow belt was found along the edge of the lagoon. On the other atolls the species was confined to isolated clumps.

Banana, taro and sugar cane were cultivated in pits located on several of the islets of Fakaofu. The soil in these pits was reported to have come from Samoa as ballast on copra ships. No pits were observed on the other two atolls but investigations there were not extensive.

BIRDS

The birds of the Tokelau Islands are little known. The first known specimen, collected by the Reverend S. J. Whitmee (Ramsay, 1878: 139), was deposited in the Australian Museum, Sydney. The present whereabouts of this specimen is unknown (Disney, pers. comm.). Apparently no other specimens were collected until 1924 when the Whitney South Sea Expedition stopped at Fakaofu Atoll from 2 April through 5 April. Correia, who was collecting for the Whitney Expedition at that time, said 78 birds were collected (J. G. Correia, unpub. field notes) but only 67 were catalogued at the American Museum of Natural History. Sixty-five of the 67 have been located or evidence of their whereabouts noted. Although all the Whitney material was never published under one cover, several of the specimens are mentioned in four papers (Amadon, 1943; Bogert, 1937; Mayr and Amadon, 1941; Stickney, 1943).

Smithsonian personnel collected 99 specimens during their visit. In addition, estimates were made of the bird populations on each of the atolls. The large size of Fakaofu and Nukunonu Atolls made it impossible to estimate populations of the whole atoll so estimates were made only for the islets actually visited. Estimates were made for the whole of Atafu Atoll.

The Tokelau avifauna is closely related to that of American Samoa, having many species in common including the Reef Heron, Pacific Fruit-pigeon, Black-naped Tern and New Zealand Cuckoo.

SPECIES ACCOUNTS

The following species accounts treat all specimens, sight records, or other evidence of occurrence known for the Tokelau Islands. The Tokelau name, if known, is given under each species heading. All specimens listed were verified by Thompson. Subspecific names have

not been used because several of the groups need taxonomic revision. Birds not previously reported in the Tokelau islands are marked with an asterisk. All USNM specimens were collected in 1965.

**Phaethon rubricauda*. Red-tailed Tropicbird

Tokelau: Tavake

One record of a bird in flight at Nukunonu 1 March 1965. The bird was identified by Hackman. A nun on Nukunonu Atoll had collected several Red-tailed Tropicbird feathers, indicating that it is probably a frequent visitor and may nest there.

**Phaethon lepturus*. White-tailed Tropicbird

Woodward saw one of this species flying over Fakaofu Atoll 27 February 1965. There are no other records.

**Sula leucogaster*. Brown Booby

Specimens — 2. *Fakaofu*: USNM 494394, m., testis minute, 1102 gms, moderate fat, immature, 27 February 1965. *Atafu*: USNM 494395, m., testis 12 x 4 mm, 1043 gms, heavy fat, 3 March 1965, heavy body moult.

The Brown Booby was uncommon on all of the islands. On 26 February, six came in to roost in *Pisonia* trees on Fakaofu. Two were observed the evening of 28 February and three on 1 March at Nukunonu. Three immatures were seen at Atafu on 3 March with five adults. We found no evidence of breeding.

Sula sula. Red-footed Booby

This Booby was seen only at Fakaofu where three were seen flying in to roost on Matanga Island, 28 February 1965.

Fregata ariel. Lesser Frigatebird

Tokelau: Katawha

Specimens — 8. *Fakaofu*: USNM 494378, m., testis 17 x 8 mm, 697.4 gms, heavy fat, 27 February; USNM 494379, m., testis 12 x 9 mm, 830 gms, heavy body moult, heavy fat, 27 February; USNM 494380, m., testis 10 x 4 mm, 725.6 gms, heavy fat, 27 February; USNM 494381, m., testis 14 x 7 mm, 711.6 gms, 27 February; USNM 494382, m., testis 11 x 7 mm, 700.4 gms, medium fat, 27 February. *Atafu*: USNM 494383, m., testis 11 x 5 mm, 739.7 gms, heavy fat, 3 March; USNM 494384, m., testis 12 x 7 mm, 834.3 gms, heavy fat, 3 March; USNM 494385, m., testis 15 x 8 mm, 802 gms, 4 March.

This was the only species of frigatebird observed in the Tokelau Islands. On Matanga Island, Fakaofu, we saw a flock of about 450 roosting in a grove of *Pisonia* trees. We saw no roosting flocks on Nukunonu but flocks were noted each evening flying northerly at a high altitude. Fenualoa Island on Atafu had a flock estimated at 500 birds, also roosting in *Pisonia* trees. We found no evidence of breeding on the islands although the residents said they have bred there.

The Whitney South Sea Expedition recorded this species but took no specimens (J. G. Correia, unpub. field notes).

Demigretta sacra. Reef Heron

Tokelau: Matuku.

Specimens — 10. *Fakaofu*: USNM 494402, f., largest ovum 6 mm, 4 collapsed follicles, old brood patch, 459.4 gms, light fat, 26 February; USNM 494403, f., ovary granular, 503 gms, little fat, 26 February; USNM 494406, m., testis 15 x 9 mm, 565.4 gms, no fat, 26 February; AMNH 205527, f., gonads small, 2 April 1924; AMNH 205526, f., gonads large, 3 April 1924; AMNH 205528, f., gonads large, 3 April 1924; AMNH 205504, m., gonads large, 4 April 1924; AMNH 205525, m., gonads large, 5 April 1924. *Atafu*: USNM 494404, f., largest ovum 15 mm, 508.2 gms, light fat, 3 March; USNM 494405, f., ova minute, 403 gms, 4 March.

The Reef Heron was common on all islands in the Tokelaus. We observed white, intermediate, and dark morphs. The specimen data indicate breeding occurs on the islands in February, March, and possibly in April. Population estimates were as follows: *Fakaofu*: 25 ±; *Nukunonu*: 15 ±; *Atafu*: 40 ±.

Duck sp.

Tokelau: *Toaloa*

There are no known specimens of ducks from the Tokelau Islands. Father Goldfinch, the Catholic priest on *Nukunonu*, said they are seen nearly every year in February and March. A nun on the island identified them as Gray Ducks, *Anas superciliosa*, but there is no proof the identifications were correct.

Pluvialis dominica. Golden Plover

Tokelau: *Kiakiao*

Specimens — 14. *Fakaofu*: USNM 494515, f., ovary minute, 137.5 gms, heavy fat, 26 February; USNM 494516, m., testis 9 x 6 mm, 118 gms, moderate fat, 26 February; *Nukunonu*: USNM 494517, f., ovary 12 x 7 mm, 124.6 gms, moderate fat, 28 February; AMNH 205667, m., gonads small, moulting in breeding plumage, 2 April 1924; AMNH 205673, m., gonads small, moulting in breeding plumage, 2 April 1924; AMNH 205672, m., gonads small, no moult, 2 April 1924; AMNH 205674, m., gonads small, moulting in breeding plumage, 2 April 1924; AMNH 205671, m., gonads small, moulting in breeding plumage, 2 April 1924; AMNH 205669, m., gonads large, moulting in breeding plumage, 3 April 1924; AMNH 205679, f., gonads small, 3 April 1924; AMNH 205680, f., gonads small, moulting in breeding plumage, 3 April 1924; AMNH 205675, m., gonads small, 4 April 1924; AMNH 205676, m., gonads small, moulting in breeding plumage, 5 April 1924.

The Golden Plover was common on all of the atolls. Populations were estimated as follows: *Fakaofu* (*Matanga Island*): 20 ±; *Nukunonu* (*Tokelau Islands*): 10 ±; *Atafu*: 40 ±. All specimens belonged to the subspecies *fulva*.

Arenaria interpres. Ruddy Turnstone

Tokelau: *Kolili*

Specimens — 15. AMNH 205635, m., gonads large, 3 April 1924; AMNH 205633, m., gonads small, 4 April 1924; AMNH 205640, f., gonads small, 3 April 1924; AMNH 205636, f., gonads small, 3 April 1924; *Fakaofu*: USNM 494518, f., ovary minute, 134.9 gms, heavy fat, 26 February; USNM 494519, m., testis minute, 124.4 gms, heavy fat, 26 February; USNM 494520, m., testis minute, 135.8 gms,

heavy fat, 26 February; USNM 494521, f., ovary minute, 119.6 gms, heavy fat, 26 February; USNM 494522, f., ovary minute, 99.3 gms, heavy fat, 26 February; USNM 494523, m., testis minute, 108.9 gms, heavy fat, 26 February; USNM 494524, m., testis minute, 108.6 gms, heavy fat, 26 February; *Nukunonu*: USNM 494525, f., ovary granular, no fat, starving, 1 March; *Atafu*: USNM 494526, m., testis 2 x 1 mm, 107.3 gms, heavy fat, 3 March; USNM 494527, f., ovary granular, 141.9 gms, 3 March; USNM 494528, f., ovary granular, 122 gms, 4 March.

The Ruddy Turnstone was seen in small flocks on all of the atolls. All turnstones collected were in various stages of moult. Population estimates were: Fakafo (Matanga Island): 100±; Nukunonu (Tokelau Islands): 10±; Atafu: 200±.

Crocethia alba. Sanderling

Specimens — 2. *Fakafo*: AMNH 205917, m., gonads small, 2 April 1924; AMNH 205918, f., gonads small, 2 April 1924.

All observations and specimens of the Sanderling are from Fakafo Atoll. Huber observed one on the beach at Fakafo (Matanga Island), 26 February 1965.

**Numenius tahitiensis*. Bristle-thighed Curlew

Tokelau: Tiawhe

Specimens — 2. *Fakafo*: USNM 494506, f., ovary granular, 580 gms, extremely heavy fat, 27 February. *Nukunonu*: USNM 494507, f., largest ovum 2 mm, 615.7 gms, heavy fat, 1 March.

We saw this curlew on all of the Tokelau Islands but it was not common on any of them. The specimens collected were in heavy moult. The primaries on one specimen had just emerged from the sheath. Population estimates were: Fakafo (Matanga Island): 1; Nukunonu (Tokelau Islands): 2, atoll population probably not more than 25; Atafu Atoll: 10±.

Heteroscelus incanum. Wandering Tattler

Tokelau: Vahavaha

Specimens — 9. *Fakafo*: USNM 494398, m., testis 2 x 1 mm, 83 gms, little fat, 26 February; USNM 494399, m., testis 2 x 1 mm, 114 gms, medium fat, 26 February; AMNH 205626, f., gonads small, in breeding plumage, 3 April 1924; AMNH 205627, f., gonads small, 3 April 1924; AMNH 205628, f., gonads small, 3 April 1924. *Atafu*: USNM 494400, m., testis 3 x 2 mm, 130 gms, heavy fat, 4 March; USNM 494397, m., testis 2 x - mm, 123 gms, heavy fat, 4 March.

The Wandering Tattler was fairly common on reef edges on all of the atolls. Population estimates were: Fakafo (Matanga Island): 5±; Nukunonu (Tokelau Islands): 5±; Atafu Atoll: 80±.

**Anous tenuirostris*. Black Noddy

Specimens — 29. *Fakafo*: USNM 494481, m., testis 10 x 5 mm, 120.2 gms, light fat, 27 February; USNM 494480, m., testis 4 x 3 mm, 122 gms, little fat, 26 February; AMNH 205734, f., gonads small, 5 April 1924; AMNH 205738, f., gonads small, 2 April 1924; AMNH 205737, f., gonads small, 4 April 1924; AMNH 205735, f., gonads small, 5 April 1924; AMNH 205741, f., gonads large, 5 April 1924; AMNH 205736, f., gonads small, 5 April 1924; AMNH 205733,

f., gonads small, 5 April 1924; AMNH 205731, m., gonads large, 5 April 1924; AMNH 205729, m., gonads small, 5 April 1924; AMNH 205740, f., gonads small, 2 April 1924; AMNH 205732, f., gonads small, 6 April 1924; AMNH 205728, m., gonads small, 4 April 1924; AMNH 205739, f., gonads small, 5 April 1924. *Nukunonu*: USNM 494485, f., largest ovum 2 mm, 123 gms, little fat, 28 February; USNM 494482, m., testis 7 x 6 mm, 98.7 gms, medium fat, 28 February; USNM 494483, f., ovary granular, 140.4 gms, little fat, 28 February; USNM 494484, m., testis 10 x 7 mm, 125.2 gms, medium fat, 28 February; USNM 494487, f., largest ovum 1 mm, 121.1 gms, 28 February; USNM 494486, m., testis 8 x 5 mm, 121.8 gms, medium fat, 28 February; USNM 494488, m., testis 13 x 7 mm, 127.5 gms, little fat, 28 February. *Atafu*: USNM 494490, m., testis 1 mm, 111.8 gms, heavy fat, 3 March; USNM 494489, m., testis 1 mm, 108.8 gms, medium fat, 3 March; USNM 494492, f., largest ovum 5 mm, 106 gms, medium fat, 4 March; USNM 494494, f., largest ovum 2 mm, 110 gms, light fat, oviduct greatly enlarged, 4 March; USNM 494493, m., testis 10 x 5 mm, 105 gms, medium fat, 4 March; USNM 494491, f., ovary granular, 134.2 gms, 3 March; USNM 494495, m., testis (right) 8 x 5 mm, 105 gms, light fat, 4 March.

This tern was the most common breeding bird in the Tokelau Islands. Although we found no nests on Fakaofu, we saw several birds catching fish and carrying them inland. The roosting population on Fakaofu (Matanga Island) was about 840±. On Nkunonu (Tokelau Island), we found a nesting colony numbering about 150 pairs on the north end of the island. The nests were in a *Pisonia* tree estimated to be 60 feet high. We were unable to tell whether there were young or eggs in the nests. The total roosting population on Nkunonu (Tokelau Island) was about 4,000±.

On Atafu Atoll many birds were constructing nests. This atoll had the largest population, about 5,000±. On this atoll one of the residents found a Black Noddy previously banded by Smithsonian personnel on Cook Island, Christmas Atoll, Pacific Ocean. Another band had been found on Nkunonu Atoll (species unknown) but had been lost before it could be reported.

Anous stolidus. Brown Noddy

Specimens — 22. *Fakaofu*: USNM 494470, m., testis 9 x 5 mm, 192 gms, no fat, 27 February; AMNH 205761, ?, gonads small, 4 April, 1924; AMNH 205764, f., gonads small, 3 April 1924; AMNH 205765, f., gonads small, 5 April 1924; AMNH 205756, m., gonads small, 5 April 1924; AMNH 205757, m., gonads small, 5 April 1924; AMNH 205759, ?, gonads small, 5 April 1924; AMNH 205767, gonads small, ?, 5 April 1924; AMNH 205763, f., gonads small, 2 April 1924; AMNH 205758, m., gonads small, 2 April 1924; AMNH 205760, f., gonads small, 2 April 1924; AMNH 205762, ?, 3 April 1924; AMNH 205766, f., 5 April 1924. *Nukunonu*: USNM 494471, f., largest ovum 3 mm, 173.4 gms, light fat, 28 February; USNM 494472, f., largest ovum 4 mm, 181.8 gms, light fat, old brood patch, 28 February; USNM 494473, m., testis 4 x 3 mm, 214.1 gms, medium fat, 28 February; USNM 494474, f., one ovum enlarged, 202.2 gms, heavy fat, 28 February. *Atafu*: USNM

494475, f., ovary 5 mm, 166.7 gms, medium fat, 3 March; USNM 494476, f., ovary 1 mm, 185.2 gms, medium fat, 3 March; USNM 494477, m., testis 10 x 5 mm, 219.1 gms, heavy fat, 3 March; USNM 494478, m., testis 6 x 2 mm, 184 gms, light fat, 4 March; USNM 494479, f., largest ovum 2 mm, 176 gms, medium fat, 4 March.

Small numbers of the Brown Noddies were roosting on Fakaofu (Matanga Island) and Nukunonu (Tokelau Island). These populations were estimated at $200 \pm$ for each island. The state of the gonads of the specimens indicated that the species probably nested on the two atolls although nests were not found. Munro (1941:2) stated they were present in the Tokelau Islands in 1938. We estimated their population on Atafu Atoll at 3,000 birds. On Atafu, large flocks were roosting on the edges of the reef on the leeward shore.

Procelsterna cerulea. Blue-gray Noddy

This species was not observed by us on the islands but was reported by Ramsay (1878: 139) from the island of "Tokelov."

Sterna sumatrana. Black-naped Tern

Specimens — 16. *Fakaofu*: AMNH 205710, m., gonads large, 4 April 1924; USNM 494451, m., testis 4 x 4 mm, 101 gms, little fat, 26 February; USNM 494452, f., largest ovum 2 mm, 99 gms, little fat, 26 February; USNM 494453, f., largest ovum .5 mm, 98 gms, little fat, 26 February. *Nukunonu*: USNM 494454, m., testis 4 x 3 mm, 103 gms, medium fat, 2 March; USNM 494455, ?, immature, 96 gms, 1 March; USNM 494456, f., largest ovum 1 mm, 92 gms, 2 March; USNM 494457, m., testis 6 x 4 mm, 96 gms, medium fat, 2 March. *Atafu*: USNM 494458, f., immature, 106.2 gms, heavy fat, 3 March; USNM 494459, ?, immature, 109.4 gms, heavy fat, 3 March; USNM 494460, m., testis 7 x 5 mm, 112.3 gms, medium fat, 3 March; USNM 494461, f., largest ovum 4 mm, oviduct enlarged, 95.5 gms, medium fat, 3 March; USNM 494462, m., testis 6 x 7 mm, 97.8 gms, light fat, 3 March; USNM 494463, m., testis 8 x 6 mm, 99.7 gms, medium fat, 3 March; USNM 494464, f., largest ovum 2 mm, enlarged oviduct, 110.4 gms, medium fat, 3 March; USNM 494465, m., testis small, 112.4 gms, heavy fat, 3 March.

This tern was fairly common in the Tokelau Islands. The small size of the gonads and flying young suggest the breeding season had just ended.

The Black-naped Tern population on each atoll was about $40 \pm$.

Sterna fuscata. Sooty Tern

Tokelau: Talo-gogo.

Specimens — 5. *Fakaofu*: USNM 494437, m., testis 11 x 6 mm, 194 gms, little fat, 26 February. *Nukunonu*: USNM 494438, f., largest ovum 8 mm, 196.8 gms, heavy fat, 28 February. *Atafu*: USNM 494439, m., testis 13 x 6 mm, 194.5 gms, heavy fat, 3 March; USNM 494440, m., testis 11 x 4 mm, heavy fat, 199.8 gms, 3 March; USNM 494441, m., testis 10 x 5 mm, 198 gms, medium fat, 4 March.

This species was uncommon around Fakaofu and Nukunonu Atolls but common at Atafu. The residents stated that the Sooty Tern nests on Fakaofu and Atafu. Although we saw little prime habitat on these islands, a specimen taken on Nukunonu showed

evidence of coming into breeding condition. There was a flock of several thousand Sooty Terns near Atafu. The residents, using live birds as decoys, capture for food up to sixty per day with long nets from their canoes.

Gygis alba. White Tern

Tokelau: Akiaki

Specimens — 12. *Fakaofu*: USNM 494413, f., ovary granular, 99 gms, medium fat, 26 February; USNM 494414, f., ovary granular, 112 gms, no fat, 26 February; USNM 494415, f., largest ovum 2 mm, 118 gms, 26 February; USNM 494416, f., 26 February. *Nukunonu*: USNM 494417, f., ovary granular, 108.5 gms, no fat, 28 February; USNM 494418, m., testis 7 x 5 mm, 126.8 gms, medium fat, 1 March; USNM 494419, f., largest ovum 2 mm, 102 gms, little fat, 1 March. *Atafu*: USNM 494420, f., 1 collapsed follicle, brood patch, 125.6 gms, moderate fat, 3 March; USNM 494421, m., testis small, 101 gms, heavy fat, 3 March; USNM 494422, m., testis 5 x 4 mm, 119.7 gms, 3 March; USNM 494423, f., ovary granular, 102.3 gms, little fat, 3 March; USNM 494424, m., testis 5 x 3 mm, 112 gms, medium fat, 4 March.

This was a common breeding bird on all of the atolls. On Fakaofu we observed 500± in a feeding flock over the ocean along the eastern shore of the atoll. We estimated the population on Nukunonu to be over 1,000 birds and on Atafu, 500±. Nests and young birds were seen on all of the islands.

Although the Whitney Expedition reported this species, no specimens were taken (J. G. Correia, unpub, field notes).

Ducula pacifica. Pacific Fruit-pigeon

Tokelau: Lupe

Specimens — 8. *Fakaofu*: USNM 494407, f., largest ovum 3 mm, 369.8 gms, light fat, 27 February; AMNH 205335, f., gonads large, 3 April 1924; AMNH 205337, f., 3 April 1924; AMNH 205336, f., 3 April 1924. *Nukunonu*: USNM 494408, m., testis 14 x 7 mm, 457.2 gms, heavy fat, 1 March. *Atafu*: USNM 494410, ?, 210.8 gms, medium fat, 3 March; USNM 494409, f., largest ovum 3 mm, 351.1 gms, medium fat, 3 March; USNM 494411, m., testis 14 x 7 mm, 392.8 gms, heavy fat, 3 March.

This pigeon was common on all of the atolls. One specimen taken on Fakaofu had been producing crop milk, indicating the bird was feeding young. These records extend the known range of this species northward into the central Pacific from Samoa.

Urodynamis taitensis. New Zealand Long-tailed Cuckoo

Tokelau: Kaleua

Specimens — 4. *Fakaofu*: AMNH 205929, m., gonads small, 2 April 1924; AMNH 627555, m., gonads small, 3 April; AMNH 205932, f.?, 4 April 1924. *Atafu*: USNM 494425, m., testis minute, 124.6 gms, light fat, heavy body moult, 3 March.

This is apparently a regular migrant to the Tokelau Islands as the residents know it well. The one specimen taken was the only record during our week's stay on the islands.

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BIOLOGICAL OBSERVATIONS FROM THE RENNICK GLACIER REGION, ANTARCTICA 1967 - 68

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The 1967-68 New Zealand Antarctic Research Expedition carried out reconnaissance geology of 6,000 square miles of territory in Northern Victoria Land. The six man party with three motor toboggans and six sledges were landed south of Latitude 72°S between the Quartzite Ranges and then worked northeastwards to the Rennick Glacier and to Frolov Ridge. The expedition then detoured to the Morozumi Range in the west and there recorded a number of bird sightings and lichen localities.

Bird Sightings

Three species were observed, all early in the expedition. The birds were sighted from Latitude 70°45'S in the north, to Latitude 71°58'S in the south, and observation points varied from 500 to 7,000 feet above sea level. Skua (*Catharacta macormicki*) were observed on three occasions. Snow Petrels (*Pagodrona nivea*) four times and ? the Antarctic Tern (*Sterna vittata*) once.

The sighting of *Sterna vittata* can be regarded as only tentative because of the inexperience of the observers. The bird observed was of small size, with a black crown to the head, red bill and a distinct forked white tail. Only the Antarctic tern fits this description.

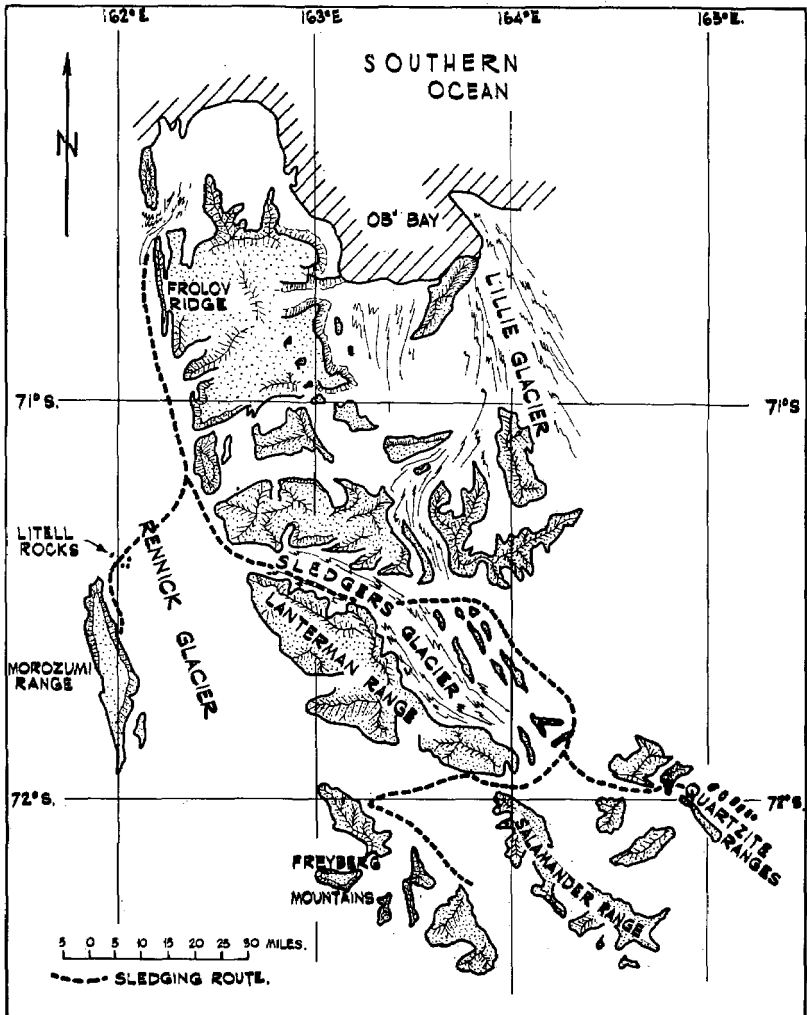
A large variety of lichen forms have been found throughout the area investigated. Mosses were found growing on weathered

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granite rock meal at Litell Rocks. Algae were also found growing there in melt pools. Such a flora developed on primitive soils in the centre of the Rennick Glacier, at about an altitude of 500 feet, is worth further investigation.

Minute arthropods were observed at Frolov Ridge and Mt. Soza but they eluded capture.



Details of sightings are as follows:—

Date 1967	N.Z. Standard Time Hrs.	Species	Locality	Details
16 Nov. 1400		<i>P. nivea</i> Single bird	71°58'S 164°55'E East Quartzite Range	Heading south
21 Nov. Afternoon		<i>C. maccomicki</i> Single bird	71°55'S 164°20'E West side of Letich Massif	
2 Dec. 1000		<i>C. maccomicki</i> A pair	71°12'S 162°24'E Rennick Glacier, west of Mt. Soza	As party was leaving camp, they circled around pecking at rubbish
5 Dec. 2230		<i>C. maccomicki</i> Single bird	70°45'S 162°05'E Rennick Glacier, west of Frolov Ridge	Circled after rubbish and then headed south
8 Dec. 1100		<i>P. nivea</i> Single bird	71°28'S 161°45'E North end of Morozumi Range	Circled party and then retired
9 Dec. 0015		<i>Sterna vittata</i> ? Single bird	71°26'S 161°50'E Camp east of north end of Morozumi Range	Heading south into strong katabatic wind
9 Dec. 1600		<i>P. nivea</i> Single bird	71°29'S 161°45'E El Pulgar, Morozumi Range	Circling at height
9 Dec. 1630		<i>P. nivea</i> Four birds	As above	*These birds may well be nesting in the Morozumi Range
13 Dec. 1600		<i>P. nivea</i> Single bird	71°12'S 162°27'E West flank of Mt. Soza	Circled low, then climbed away to the south in spiral flight

* Located 60 miles from the sea, the birds continually circled the party for over an hour, and were not observed flying away in any particular direction.



Ilan L. McVinnie

Plate XIX — White-chinned Petrel (*P. aequinoctialis*) found in a garden 200 yards from the sea at Oamaru, early in November, 1967.



[Ian L. McVinnie

Plate XX — Sooty Shearwater (*P. griseus*) cleaning out burrow on Cape Wambrow, mid-November, 1967.

SHORT NOTES

BANDED FAIRY PRION — FIRST OVERSEAS RECOVERY

Since Bird Banding in New Zealand was officially organised in 1951 by the Ornithological Society, some 12,500 Fairy Prions (*Pachyptula turtur*) have been banded up to 31st December, 1967.

The first recorded banding of Fairy Prions seems to have been by Dr. P. C. Bull in October 1940, when 20 bands made from a cigarette tin were applied at the Poor Knights Islands.

On 1/12/67 the banded leg only of a Fairy Prion banded D-28026 was recovered by Robert Dyball, lighthouse-keeper, at the feeding-place of a Peregrine Falcon (*F. peregrinus*) on a cliff ledge facing the eyrie, at Montagu Island 36° 16'S 150° 12'E, 180 miles South of Sydney. This bird was banded by B. D. Bell as an adult on 7/9/66 at Stephens Island, Cook Strait.

Mr. Bell has been banding at Stephens Island since 1958 and apart from two recoveries in the Cook Strait area and one from 90 mile Beach, 380 miles NNW, 5% of the birds have been retrapped at the banding locality. This is the first overseas recovery and raises the question whether this occurrence indicates a regular pattern of migration or casual vagrancy.

— C. J. R. ROBERTSON

Banding Officer

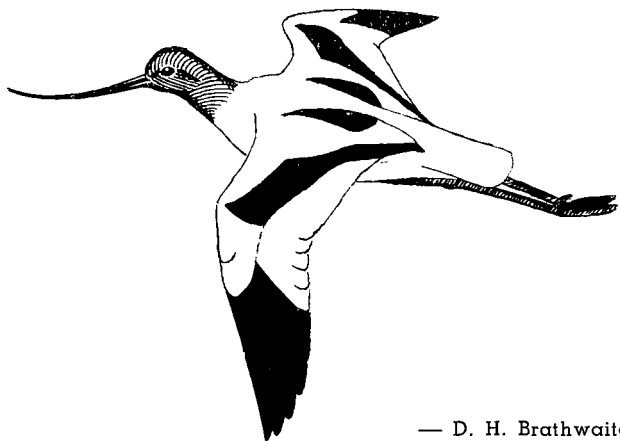


SANDERLINGS IN THE BAY OF PLENTY

For some years Hamish Lyall and I have been visiting the old Kaikuna streambed, west of Maketu, where several species of waders may often be seen. On 2/12/67 we went to the widest part of the streambed, as this appeared to hold the main concentration. While we were counting and checking Knots (*C. canutus*) and Godwits (*L. lapponica*), a sandpiper rose and flew up the lagoon in the direction of the car-park. We followed in order to check its identity. When we had set up telescopes, there appeared in my field of view several small waders and I exclaimed "That's funny. There are some Wrybills." The five birds I was watching, at first sight appeared very similar to Wrybills (*A. frontalis*) which are known to be winter visitors here. However, it was soon apparent that they were not Wrybills, though they looked and behaved rather like them, as they walked briskly along prodding the mud. Bill and legs were black; forehead and underparts were white; crown and upperparts were pale grey; and there were faint brown streaks on the back. I made a quick sketch.

On returning home we consulted various books on waders and were puzzled about the apparent lack of the black shoulder patch. But according to the Handbook of British Birds this is not necessarily noticeable. We then studied the plate in Thorburn's "Birds of Britain"; and there was not the slightest doubt in our minds that we had seen five Sanderlings (*C. alba*).

— RAYMOND JACKSON



— D. H. Brathwaite

RED-NECKED AVOCET IN WESTLAND

My wife and I were on a visit to New Zealand. On 26/2/68 we found a Red-necked or Australian Avocet (*Recurvirostra novaehollandiae*) in the Orowaiti Lagoon, Westport. Somewhat larger than the Pied Stilts with which it was feeding, it had a white body with a black stripe along the mantle on each side, chestnut head and neck, slim black upcurved bill and greenish legs. It fed by means of a back and forth sideways sweeping motion of its bill in the shallows of the tidal flat. The first observation was from about 4 to 4.30 p.m. at a distance of 75 yards or less. The weather was clear and the tide was low. A later check was made at dusk after 6 p.m. We found the Avocet in the same locality and all points were confirmed.

— C. G. KAIGLER

[This is the first acceptable report of the sighting of an Australian Avocet in New Zealand since 1912, when a specimen, now in the Canterbury Museum, was shot at Lake Ellesmere. Further observations were made during April and May by B. A. Ellis, T. Hartley-Smith, R. Veitch, P. Grant, H. C. Hooper and G. Harrow. — Ed.]

★

A GOOD SUMMER FOR TEREK SANDPIPERS

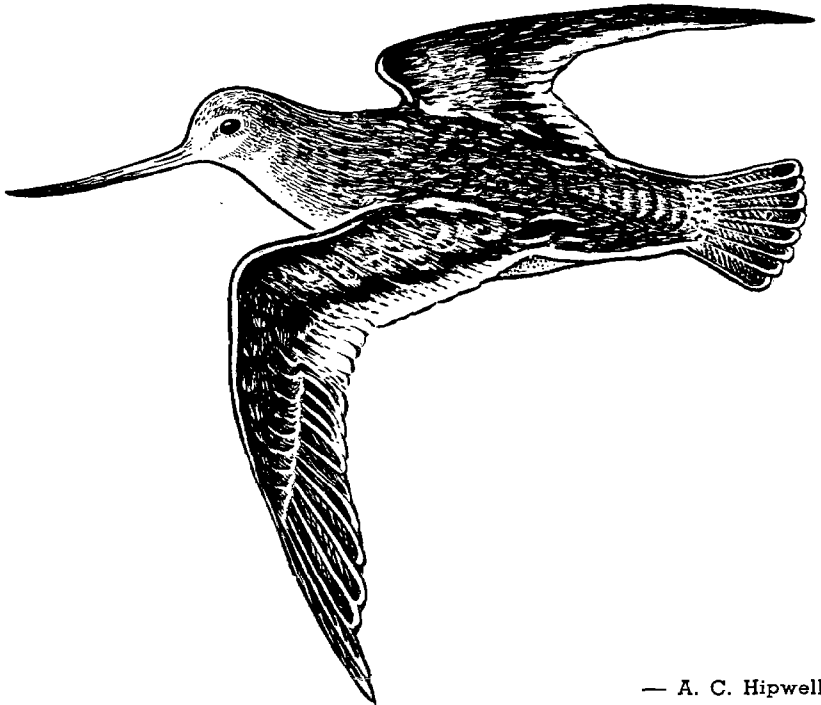
Reports from three separate localities and overlapping dates show that at least six Terek Sandpipers (*Tringa cinerea*) spent the summer of 1967-68 in New Zealand.

In the Firth of Thames, where H. R. McKenzie added the species to the New Zealand list in 1951 and where it is now recorded almost annually, three were found together on 23/12/67. (H.R.McK., R.B.S.) At full tide they were resting conspicuously on the top of a tangle of driftwood a little apart from other small waders, on the shellbank near the old limeworks. On 25/2/68 three were seen again, but not together; two being near the Miranda limeworks again; and one south of Kairitoi Creek on the edge of a big flock of

Wrybills, where it was startled into sudden activity by a Little Tern (*S. Albifrons*) which dropped out of the sky and alighted almost on top of it. (H.R.McK., R.B.S.) On 6/4/68 all three were reunited at the limeworks roost. (H.R.McK., M. J. Hogg) and two were still there on 18/4/68. (Mrs. P. Fooks).

In Kapara Harbour a Terek Sandpiper was found on 18/2/68 by Mrs. P. Fooks and Mrs. S. Reed. As the tide fell it was feeding among Wrybills and Dotterels in Ngapuke Creek just to the south of Jordan's farm. A month later on 17/3/68, presumably the same bird was found resting with about forty Red-breasted Dotterels (*C. obscurus*) and one Large Sand Dotterel (*C. leschenaulti*) in a grassy paddock. It was ceaselessly alert, with its long thin upturned bill very much in evidence as it moved about on the further side of the loose-knit flock of rather phlegmatic dotterels. Only when it jumped into flight did I realise how vividly yellow were its legs which had been screened by the grass. As it headed for Ngapuke Creek, it repeated a clear ringing call which seemed to me louder than that of any other Terek Sandpiper I have heard.

It is only to be expected that northern shanks and sandpipers should be noisier in March and April than during the earlier months of their stay in the southern hemisphere. The timbre of the calls which this bird made seem to me to indicate a close relationship with other typical 'tringas' and to strengthen the case for not placing the Terek Sandpiper in a monotypic genus (*Xenus*).



On the blowy and rather wet afternoon of 20/4/68, Professor J. E. Morton and John Jenkins accompanied me to Jordan's farm. About four o'clock after the ebb set in hundreds of waders — nine species were identified — were scattered over the comparatively sheltered shallows of Ngapuke Creek. Many were already busily feeding; others were breaking away from their roosting flocks. A Longbilled Curlew (*N. madagascariensis*) was conspicuous near a group of S.I. Oystercatchers (*H. o. finschi*). The Terek Sandpiper was found rather apart, darting this way and that in an eager search for food, its nearest neighbours being two Red-breasted Dotterels.

Some 200 miles to the south, Dr. Ian Andrew has supplied details of two Terek Sandpipers which frequented the Manawatu estuary during the summer. One was first seen on 12/11/67; and was still on its own on 23/12/67; but by 18/2/68 it had been joined by another and the two were still present on 16-17/3/68.

— R. B. SIBSON

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SIGHTING OF SOUTH ISLAND BUSH WREN

When ascending the west side of Moss Pass, a 6000 ft. pass connecting the Sabine and D'Urville Valleys in the Nelson Lakes National Park, on 17/1/68, I was surprised to see two wren-like birds alight on a rock some ten yards ahead. This was at an altitude of approximately 5500 ft., at a spot where the low beech forest gives way to scrub and tussock, with boulders and large slabs of rock, marked by a large direction arrow of stones laid on the rock. At once I saw that they were not Rock Wrens (*Xenicus gilviventris*) with which I am familiar, on account of their slightly heavier build, longer legs and toes, and more sedate movements, not the restless zig-zag hopping of the Rock Wren. A companion having joined me, and the two birds remaining on the rock for about two minutes, we made careful notes of the plumage and soft parts, which are given below in some detail, as there appear to be some important variations from descriptions of the Bush Wren (*X. longipes*) given in the literature. Crown, brownish grey, merging into green on the back; a pale buff streak above the eye, and under the eye, and also above, a broad rich brown patch; at the carpal flexure, a yellow streak bordering a deep brown patch which merged into olive-brown wing quills; darker secondaries without spots; back green; tail darker green, short; breast plain brownish grey; bill black, straight; eye dark; legs and toes long, slaty-black. Conditions at the time were light rain and mist, and generally gloomy; but we both agreed on all the above details, and in particular on the pale buff eye-stripe, given as white in the literature, and on the slaty-black legs and feet, whereas Oliver (N.Z. Birds 1955) describes the toes as pale brown, and Buller (A History of N.Z. Birds 1888) gives the legs and feet as pale brown. Both birds were identical in plumage, being apparently two males; and on flying away gave a call which I would describe as a rapid succession of merging 'cheeps,' rather like the whirring call of the Rock Wren.

— R. A. CRESWELL

[Since his return, R.A.C. has examined skins in the Dominion Museum and discussed his observations with Mr. F. C. Kinsky. The accuracy of his identification of a very rare bird does not appear to be in doubt. — Ed.]

ANNUAL GENERAL MEETING

Wellington, 17th - 19th May, 1968

Once again the A.G.M. week-end attracted a gathering of members from the length and breadth of New Zealand. Between the programmed activities, members were able to make the most of the opportunity to renew old acquaintances and to make new ones, and to share experiences of the past year.

Over 70 members attended the Annual General Meeting on Saturday, 18th May. The President, Dr. G. R. Williams, welcomed those attending and explained that he would not make a full or formal presidential address, but he noted highlights in the development of the Society. In the coming year membership will reach 1000, another landmark of achievement. The Society is applying for affiliation to the Royal Society of New Zealand, which should bring considerable advantages. A full colour copy of the film of the Anniversary Expedition to the Kermadec Islands is to be ordered for the Society's records, and the use of interested groups of members.

Annual reports from the Society's schemes were read to the meeting. The Bailey Prize for the best contribution to the Nest Records Scheme by a Junior member was awarded to Bob Cowan, of Broadwood, Northland. The meeting carried a vote of thanks to Miss M. Neill, who has resigned from the position of Convener of the Nest Records Scheme. Mr. F. C. Kinsky reported progress on the revised Checklist of New Zealand Birds, which will soon be ready for publication. No report was available from the Beach Patrol Scheme, but it is hoped that this will shortly be prepared. Beach Patrol cards were offered to members, and it was announced that Mr. M. J. Imber, of Wellington, has been appointed Convener of this scheme.

While scrutineers left the meeting to count votes in the election of two members of the council, there was some discussion on the method of conducting elections where these were necessary. The secretary thanked members for their comments, which would be considered for incorporation into the constitution which was now being revised. Messrs. B. D. Bell and A. Blackburn were declared elected to the two vacancies, and Dr. G. R. Williams and Mr. F. C. Kinsky were declared elected unopposed to the positions of President and Vice-President, respectively.

The Treasurer, Mr. J. P. C. Watt, circulated copies of the audited Balance Sheet, and reported on the continued financial soundness of the Society. He drew members' attention to the fact that this state of affairs would continue only so long as the Society had the benefit of honorary workers in positions which frequently called for long hours of work. The handsome surplus in this year's accounts would be turned into a deficit of \$22 if only subscription income was considered, and the Society is deeply indebted to the Christmas Card scheme and to the editors of the Field Guide, who have made over their entire copyright interest to the Society. Mr. Watt proposed a clause for incorporation in the constitution of the Society, to provide for disposal of assets in the event of dissolution, and this was carried by the meeting as a recommendation to the Council. Its purpose is to establish more definitely the non-profit nature of the Society so that it will not be subject to income tax.

Two amendments to the constitution were put to the meeting. Mr. A. Blackburn moved that "the Society shall have power to make statements of fact and to offer advice on matters concerning the conservation of birds." Mr. J. M. Cunningham opposed the motion on the grounds that it was contrary to the intention of the original founders of the Society; it was also stated that the views of the Royal Forest & Bird Protection Society were not known, and it was considered that they should be consulted. Dr. R. A. Falla warned that the proposal was at the same time most attractive and yet most dangerous. We are all conservationists at heart, but the Society's contribution, he stated, can be in the encouragement of scientifically sound, unbiassed research. He said that the information which had been of such value to the Nature Conservation Council last year in regard to Lake Tuakitoto was based on independent research of an individual member, and would not have been so effective had it been put forward by a Society involved with conservation. The motion was firstly amended, and then when put to the meeting, was lost on a show of hands.

Mr. D. G. Dawson proposed an amendment to remove from the Council the power to co-opt members. After some discussion, the motion was lost on a show of hands.

Mr. Murray Williams asked members to co-operate more with organisers of future meetings in the return of slips notifying intention to attend. N.A.C. group discount was not available this year because less than ten members advised that they were travelling by air, although in fact many more did so. The President explained his disappointment that the Society's session at the ANZAAS Conference had to be cancelled as no papers were received. There was some discussion on the presentation of tables in "*Notornis*," reports of current banding results were asked for, and a suggestion was made that future meetings should set aside time for the presentation of papers. It was agreed that papers offered by any members would be a valuable addition to the programme of future annual meetings.

Members endorsed Dr. R. A. Falla's vote of thanks to Regional Representatives, and the meeting closed at 10.42 p.m. for a light supper served by Wellington members.

There was general disappointment that bad weather caused the cancellation of the trip across Cook Strait, but about 30 members and friends viewed films on Saturday afternoon at the Dominion Museum. Most appreciated of these was the black-and-white copy of the film of the Kermadecs Expedition.

A well-attended meeting of Regional Representatives was held on Sunday morning, and a wide variety of topics were discussed. The position of Regional Representative is demanding of both time and effort, and this annual gathering presents the only opportunity to discuss methods, share problems, and generally learn from the experience of those in other regions.

At 34 Kelburn Parade on Sunday morning, approximately 30 members accepted the President's invitation to a 'Wine and Cheese' party, and this provided a very pleasant atmosphere for conversation and discussion.

The thanks of all members go to Murray Williams for the organisation which went into making this a very enjoyable week-end.

TREASURER'S REPORT

For Year Ended 31/12/67

PRESENTED AT THE ANNUAL GENERAL MEETING
OF THE O.S.N.Z., WELLINGTON, 18/5/68

It is my pleasure to report the continued buoyant state of the Society's finances for the year ended 31/12/67. The excess of income over expenditure of \$2456 is most gratifying, though I would point out that this is wholly attributed to the receipt of royalties from the 'Field Guide' and to a \$651 profit from the sales of Christmas Cards. Taxation has yet to be deducted from the royalties and total taxation payable in 1968 may amount to a figure in the order of \$460. We are currently negotiating with the Inland Revenue Department in regard to this matter.

The only reason why the Society continues in a relative state of affluence is due to the fact that members of your Council, the Journal Despatch Officer, Convenors of special schemes, Regional Representatives, and members of the Christmas Card Committee, perform prodigious voluntary efforts at no cost to the Society.

Our deep appreciation to the co-authors of the Field Guide, Dr. R. A. Falla, Messrs. E. G. Turbott and R. B. Sibson, for their generosity in assigning royalty rights to the Society must also be recorded. The royalty payment represents 10% on 3830 copies sold as at 31/12/66. For the year ended 31/12/67 a further 1240 copies were sold in New Zealand together with 140 overseas. These returned a royalty of \$611.93 which will be shown in the accounts for 1968.

Sources of income other than royalties and Christmas cards are slightly down from last year's figures despite a 5.4% increase in membership. These sources of income (subscriptions, donations, sale of back numbers, interest and dividends) failed to meet the year's expenditure by the small margin of \$22. Expenditure for the year has increased by \$502 over that for 1966, and by \$456 over that for 1965. Publication costs of 'Notornis' have not altered significantly over the last three years but distribution costs have risen. General expenses have shown a sharp rise over those for last year, but are practically the same as those for 1965. Two non-recurring expenditures appear; printing of nest record cards, and the publication of the pamphlet 'Bird Study.'

Membership of the Society increased 5.4% during the year to a total of 948. (Ordinary 649, Junior 56, Husband and Wife 18, Endowment 30, Bodies and Clubs 47, Life 78.) New members totalled 100; there were 23 resignations and 24 members were written off as unfinancial, having been given three months notice of intention.

Unfortunately it has not been possible to bring the 'Biology of Birds' account to audit for this meeting. The receipts and expenses will come to charge this year and will be accounted for in full for the year ending 31/12/68. A loan to this account of \$2111.09 has been made out of the accumulated funds of the Society.

The Kermadec Account shows an excess of income over expenditure of \$266 and the loan from the Society's accumulated funds remains at \$1440. This account has now served its purpose and will be closed this year.

The investments of the Society are of some concern. The shares in public companies are shown at cost in the Balance Sheet, but at 31/12/67 were valued at only \$3282. Their value at 15/5/68 stood at \$4215, which shows an upward trend. The overall interest for the year amounted to 3.7% of cost price. On the recommendation of legal and sharebroker advice your Council's Finance Committee advised investment of the \$2000 matured Dunedin City Council debentures in short-term trustee securities. This has been invested together with a further \$1000 since the books closed on 31/12/67 as follows:

	Amount	Cost Price	Interest Rate	Yield	Date of Maturity	Date of Investment
Southland Harbour Brd.	\$1000	\$958	5 %	6.2%	30/6/72	12/2/68
Auckland Hospital Brd.	\$1000	\$970	5½%	6½%	17/6/73	9/2/68
Otago Harbour Brd.	\$1000	\$971	5½%	6.2%	1/9/71	8/4/68
Also invested (Life Subs. etc. Reserve) is:						
Auckland Elect. Pwr. Brd.	\$400	-	5 %	5 %	1/4/69	26/2/58
" " " "	\$400	-	5 %	5 %	1/4/70	25/8/58
" " " "	\$600	-	5½%	5½%	15/2/71	27/12/67

These investments have been deliberately programmed to fall due on succeeding years, thus ensuring that the Society has funds available each year to meet any special commitments that should arise.

I would like to thank Jill Hamel and Bob Smith, whose assistance at various times during the year has greatly reduced the volume of work. I am also indebted to Mr. A. Richards for assistance with the final balance, and to Messrs. J. Lang (auditor) and H. R. Wilson (sharebroker) for their interest and courtesy in handling the affairs of the Society. My thanks also to Mr. A. Blackburn for compiling the Kermadec Account.

JAMES P. C. WATT,
Hon. Treasurer

15/5/68

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DONATIONS

The following donations of \$1.00 or more were received during the year ended 31/12/67. Several donations of amounts less than \$1.00 were also received from a number of members, and 30 members contributed an extra dollar through their Endowment subscription. The Society gratefully acknowledges these sources of income which contributed \$68.45 in total last year.

G. Wightman (\$1.00); J. A. Fagan (\$1.00); Anon. (\$5.60); C. F. Parsonson (\$2.20); M. Pick (\$2.00); E. St. Paul (\$2.00); W. H. Gummer (\$2.00); Miss McDougall (\$4.20); D. Braithwaite (\$1.00); I. McLaren (\$1.00); Miss A. Wilson (\$1.00); A. A. Savell (\$2.05); Dr. A. Thoresen (\$1.25).

STATEMENT OF ACCOUNTS

For the Year Ended 31st December, 1967

1966		1967
	Our Income was derived from —	
1737	Subscription (including arrears paid)	1724
55	Donations	38
	Christmas Card Sales	1215
	Less Costs	564
720		651
—	Field Study Course	103
268	Sales of back Numbers of Notornis	267
2780	TOTAL ORDINARY INCOME	2783
	INVESTMENT INCOME:	
238	Interest	190
182	Dividends	184
—	Royalty "Field Guide"	1724
420	TOTAL INVESTMENT INCOME	2098
\$3200	TOTAL INCOME	\$4881
	LESS EXPENSES:	
1506	Notornis Printing & Distribution	1761
95	Postages	52
115	Printing & Stationery	145
62	General Expenses	193
—	Annual General Meeting	29
90	Travelling Expenses	84
—	Nest Record Scheme	29
—	Bird Study Pamphlet	82
54	Taxes Paid	50
1922	TOTAL EXPENDITURE	2425
\$1278	SURPLUS FOR YEAR TRANSFERRED TO ACCUMULATED FUNDS (Note A)	\$2456
PUBLICATION ACCOUNT		
	Transfer from Publication Reserve (Note B)	1000
	Less Expenses Paid —	
	Checklist Typing & Draft	104
	BALANCE AS AT 31/12/67	\$896
"BIOLOGY OF BIRDS" ACCOUNT		
	Printing Costs to Date (Note C)	\$2111

BALANCE SHEET

As at December 31st, 1967

1966		1967
	CURRENT ASSETS:	
3586	Cash at Bank of New Zealand (Note D)	5400
72	Sundry Amounts Owed to the Society	66
600	Stocks of "Notornis" on Hand (Note E)	600
1440	Loan to Kermadec Account	1440
-	Loan to "Biology of Birds"	2110
5698	TOTAL CURRENT ASSETS	9616
	INVESTMENTS AT COST:	
5001	Shares in Public Companies (Note F)	5050
3400	Stocks in Dunedin City Corporation (\$2000), & Auckland Electric Power Board (\$1400)	-
	SPECIAL FUNDS:	
	MINOR EXPEDITIONS RESERVE:	
-	B.N.Z. Savings Account	300
	LIFE SUBS. ETC., RESERVE:	
-	Auckland Power Board	1400
-	B.N.Z. Savings Account	120
8401	TOTAL SPECIAL FUNDS	1820
1000	LIBRARY AT VALUATION (Note E)	1000
\$15099	TOTAL ASSETS	\$17486
	LESS LIABILITIES:	
459	Sundry Amounts Owed by the Society	480
199	Subscriptions in Advance	212
	RESERVE FUNDS:	
1520	Life Subs, Etc.	1520
300	Minor Expeditions	300
-	Publication Account	896
1000	Special Publications Reserve	-
		3408
	VALUE OF ACCUMULATED FUNDS	
	AS BELOW	\$14078
	ACCUMULATED FUNDS:	
10344	Balance 1/1/67	11622
1278	Plus Excess Income over Expenditure	2456
\$11622	BALANCE OF FUNDS AS AT 31/12/67	\$14078

NOTES TO THE ACCOUNTS

Note A: The Society may be liable for taxes amounting to \$466 on the profits of the Field Guide, Interest and Dividends.

Note B: The transfer to the account was made in accordance with the council decision 19/5/67.

Note C: The printing costs paid represent a loan to this account to be recouped from income brought to charge during 1968.

Note D: The cash at the Bank includes the matured investment with the Dunedin City Corporation not reinvested as at 31/12/67.

Note E: No new valuation of the stocks of "Notornis" or the Library have been made. The values stated are as in previous years.

Note F: The shares owned are as follows:

Andrews & Beaven Ltd.	400	\$1.00
Farmers Trading Co. Ltd.	500	\$0.50
General Foods Corpn. Ltd.	594	\$0.50
Alex. Harvey Ltd.	140	\$0.50
N.Z. Forest Products Ltd.	400	\$1.00
Wilsons Cement Ltd.	500	\$1.00

These shares had a cost price of \$5049.60, but only had a market value at 31/12/67 of \$3281.86. The market has risen slightly since then (\$4215 at 15/5/68).

AUDITORS' REPORT TO THE MEMBERS

For the Year Ended 31st December, 1967

We report that, in our opinion, the foregoing accounts of **The Ornithological Society of N.Z. (Inc.)** for the year ended December 31st, 1967, are in agreement with the books and records of the Society and give a true and fair view of the Society's position at that date and of the results of its transactions for the year. The Society has kept proper books and supplied all the information required.

An audit certificate from Messrs. Bain & Sheppard has been received for the Kermadecs Expedition Account.

THOMPSON & LANG, Public Accountants,

Auditors

Dunedin, 13th May, 1968

KERMADECS EXPEDITION ACCOUNT

INCOME AND EXPENDITURE FOR THE YEAR ENDED 31st DECEMBER, 1967

INCOME

	\$
Sponsors' Contributions and Donations	132.00
Interest	41.84
Stores sold	63.44
Equipment sold	60.50
	\$297.78

EXPENDITURE

General Expenses	4.07
Travelling Expenses	28.00
Excess Income over Expenditure	265.71
	\$297.78

BALANCE SHEET AS AT 31st DECEMBER, 1967

LIABILITIES

Ornithological Society Loan	1440.00
Accumulated Funds:	
Excess Income to 31/12/67	265.71
Less Deficiency Account 31/12/66	175.94
	89.77
	\$1529.77

ASSETS

Cash at Bank of New Zealand	1429.77
Tentage at depreciated value	100.00
	\$1529.77

Auditors' Report

We report that we have examined the Books, Accounts and Vouchers of the Kermadecs Expedition Account for the year ended 31st December, 1967. In our opinion, and according to the best of our information and explanations given to us and as shown by the said Books, the Balance Sheet and Income and Expenditure Account are properly drawn up so as to give respectively a true and fair view of the state of the Kermadecs Expedition Account as at 31st December, 1967, and the income and expenditure for the year.

Gisborne, 6th May, 1968

BAIN & SHEPPARD, Public Accountants
Hon. Auditors

The following donations made to the Kermadecs Expedition Fund since the last list of sponsors was published are gratefully acknowledged:

	\$		\$
Edgar, A. T.	20	Entomology Div., D.S.I.R.	100
Sykes, W. R.	14	Nuttall, A.	10
Watt, Dr. J. C.	10	Veitch, C. R.	20
Fooks, Mr. & Mrs. L.	10	Peart, J. A.	12
Crockett, D. E.	10	Anton, J. F.	100

LIBRARY REPORT

1st January to 31st December, 1967

The past year has again proved satisfactory. Journals, separates and inter-loans have been in demand and despatched. In all there have been over forty borrowings. Requests for inter-loans are increasing. Again we are indebted to the Museum Council and Director for our room, and to Miss Evans and her staff for friendly helpfulness.

— HETTY MCKENZIE, Hon. Librarian

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REPORT OF THE NEST RECORD SCHEME

For the Year Ended April 30th, 1968

For the year ending April 30th, 1968, we have received 624 nest record cards from 21 contributors. Observations have been made for 46 species. The largest contribution by a junior member is that of Bob Cowan of Broadwood, who recorded 212 observations of nesting of 30 species. The most detailed observation of an individual nest was made by Kathy Pullen of Kingseat Farm, who has recorded daily visits to a Grey Warbler's nest from November 18, 1967, to January 3rd, 1968.

Once again several members have made use of the nest record cards for information on breeding behaviour. We would be grateful if those availing themselves of this service could, where practicable, make available to the Society the results of their analyses, as the information would then be available to others on request. This does not apply, of course, to those whose results are published in *Notornis* or elsewhere. Although all the information furnished by observers is of use, the most valuable that can be given, particularly from the point of view of population dynamics, is the number of young hatched from each nest. This is the part of the breeding period about which least is known and about which information is needed.

Our good wishes go to all those who are planning to participate in the scheme next year.

— MARGARET M. NEILL,
Nest Record Organiser

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LIST OF CONTRIBUTORS

J. S. Bartle, J. Bell (24), M. Bysouth (11), Robert Cowan (212), J. A. Cowie (12), P. S. Crozier, M. Douglas, A. T. Edgar (10), Mr. and Mrs. E. L. Fooks, Mrs. D. Gainey, D. W. Haddon (260), G. Harrow, T. R. and H. A. Harty (10), J. E. Hilton (35), J. R. Jackson, E. B. Jones, G. Leitch, Kathy Pullen, H. L. Secker, J. G. Smith, J. Taylor.

SPECIES LIST OF NEST RECORD CARDS

SPECIES	Previous Total	1967-68 New Total	SPECIES	Previous Total	1967-68 New Total	
North Island Kiwi	2	-	2	32	-	32
Stewart Island Kiwi	1	1	2	159	4	163
Great Spotted Kiwi	1	-	1	52	1	53
Yellow-eyed Penguin	11	-	11	9	-	9
Little Blue Penguin	57	-	57	184	17	201
White-flipped Penguin	12	-	12	6	-	6
N.Z. Crested Penguin	2	-	2	2	-	2
Southern Crested Grebe	2	-	2	209	2	211
N.Z. Dabchick	1	-	1	62	34	96
Wandering Albatross	11	-	11	100	-	100
Light-mantled Sooty Albatross	4	-	4	206	1	207
Fairy Prion	16	-	16	19	-	19
Flesh-footed Shearwater	1	-	1	3	-	3
Sooty Shearwater (Mutton bird)	4	-	4	8	1	9
Fluttering Shearwater	7	-	7	33	12	45
Allied Shearwater	3	-	3	1	-	1
Black Petrel	1	-	1	5	-	5
Grey-faced Petrel	14	-	14	24	-	24
Kermadec Petrel	1	-	1	59	-	59
Pycroft's Petrel	3	2	5	9	-	9
White-faced Storm Petrel	5	-	5	51	-	51
Diving Petrel	51	-	51	7	-	7
Gannet	4	-	4	3	-	3
Black Shag	46	6	52	4	-	4
Pied Shag and Bronze	19	-	19	8	-	8
Little Black Shag	1	-	1	13	1	14
White-throated Shag	11	-	11	51	9	60
King Shag	18	-	18	44	-	44
Spotted Shag	5	-	5	11	-	11
Blue Heron	24	7	31	89	4	93
White-faced Heron	11	1	12	106	44	150
Bittern	2	-	2	119	13	132
Canada Goose	21	1	22	12	2	14
Domestic Goose	-	-	-	22	-	22
(presumed farm escape)	1	-	1	7	1	8
Mute Swan	9	-	9	15	-	15
Black Swan	39	-	39	5	-	5
Paradise Duck	6	1	7	9	-	9
Grey Teal	9	-	9	2	-	2
Brown Teal	2	-	2	6	-	6
Grey Duck	71	6	76	13	-	13
Grey Duck/Mallard Cross	-	1	1	65	16	82
Mallard	45	1	46	904	175	1079
Shoveller	11	-	11	820	117	937
Black Teal	6	-	6	120	13	133
HARRIER	48	-	48	29	1	30
N.Z. Falcon	5	-	5	16	1	17
Pheasant	16	2	18	22	1	23
Brown Quail	2	1	3	93	6	99
Californian Quail	16	2	18	72	2	74
Chukor	1	-	1	283	3	286
Banded Rail	4	-	4	46	1	47
Spotless Crane	2	-	2	144	9	153
North Island Weka	4	-	4	25	2	27
South Island Weka	6	1	7	401	57	458
Rukeko	83	12	95	180	17	197
Australian Coot	4	-	4	13	6	19
South Island Pied Oystercatcher	101	-	101	16	-	16
Northern (Variable) Oystercatcher	22	6	28	6	-	6
Black Oystercatcher	31	-	31	7	-	7
Spur-winged Plover						
Banded Dotterel						
N.Z. Dotterel						
Wrybill						
Pied Stilt						
Black Stilt						
Southern Skua						
Black-backed Gull						
Red-billed Gull						
Black-billed Gull						
Black-fronted Tern						
Caspian Tern						
Antarctic Tern						
Fairy Tern						
White-fronted Tern						
White Tern						
Grey Ternlet						
N.Z. Pigeon						
Rock Pigeon						
Kaka						
Kea						
N.Z. Parakeet (Red-crowned)						
Yellow-crowned Parakeet						
Shining Cuckoo						
Morepork						
Little Owl						
Kingfisher						
South Island Rifleman						
Rock Wren						
Skylark						
Welcome Swallow						
Fantail						
North Island Tomtit						
South Island Tomtit						
North Island Robin						
South Island Robin						
North Island Fern Bird						
South Island Fern Bird						
Brown Creeper						
Whitehead						
Yellowhead						
Grey Warbler						
Song Thrush						
Blackbird						
Hedge Sparrow						
N.Z. Pipit						
Bellbird						
Tui						
White-eye						
Greenfinch						
Goldfinch						
Lesser Redpoll						
Chaffinch						
Yellowhammer						
House Sparrow						
Starling						
Myra						
White-backed Magpie						
Magpie (Species not indicated)						
North Island Saddleback						
TOTALS	6039	624	6663			

RECORDING SCHEME

Report for 1967/68

Much more use has been made of the scheme this year. Ten species files have been sent out to members (1965/66, 4 files; 1966/67, 3 files).

Now that the scheme is being increasingly used, I look forward to receiving more material from Regions which so far have contributed very little. The more information that comes in, the more useful the files will be to members working on individual species. I am again grateful to my regular correspondents for the trouble they have taken to write up their notes, and to all those others who have contributed in varying degrees.

Locality reports from Firth of Thames, Manukau, Washdyke Lagoon and Kaimanawa Ranges have been received. Newsletters from Southland and Otago, and minutes of Taranaki meetings contain much useful material which has been added to the files. Please let me have a copy of any such documents from other regions. The usefulness of the scheme depends on the co-operation and support of Regional Representatives.

List of Contributors:—

Southland — Mrs. Barlow, P. Muller, R. R. Sutton.

Otago — J. Allan, Mrs. Anderson, J. Aspinall, G. Chance, R. Cunningham, R. Gray, Mrs. Hamel, Mrs. Hannah, A. R. Harris, M. W. M. Hogg, Mrs. B. Kelly, D. Kelly, I. McVinnie, B. McPherson, W. T. Popplewell, M. P. Schweigman, E. Sheat, Mrs. I. Smith, R. F. Smith, M. F. Soper, J. Watt, K. Westerskov.

Canterbury — C. N. Challies.

West Coast — P. Grant.

Nelson —

Marlborough — J. A. Cowie.

Wellington — B. D. Bell, P. C. Harper, F. C. Kinsky, D. V. Merton,
Miss M. M. Neill, M. Williams.

Wairarapa —

Manawatu — E. Dear, E. B. Jones.

Wanganui — R. W. Macdonald.

Taranaki — D. Medway.

Hawkes Bay — Dr. Bathgate, N. B. Mackenzie.

Gisborne — A. Blackburn.

Volcanic Plateau — A. E. Beveridge, P. J. Howard, R. W. Jackson,
H. Lyall, M. G. Macdonald.

Bay of Plenty — P. Densem, H. D. London, Mrs. McLintock, R. Weston.

Waikato —

South Auckland — J. F. Bell, Mrs. B. Brown, Miss K. Browne,
S. Chambers, D. A. Lawrie, Miss P. J. Lane, D. McKenzie,
Mr. and Mrs. H. R. McKenzie, M. Ross, A. Todd.

Auckland — Miss J. H. Goulding, P. Gross, G. D. Leitch, Mrs. S. Reed,
R. B. Sibson, E. G. Turbott, Mrs. L. Wagener.

Northland — F. P. Hudson, Mrs. K. Reynolds.

Far North — D. E. Calvert, T. R. Calvert, R. Cowan, A. T. Edgar,
Miss E. Madgwick.

(E. & O. E.)

— A. T. EDGAR, Recorder

CHRISTMAS CARD REPORT

The second Christmas card in the historical series has again proved the success of using this style of card. The Council decided on a printing of 20,000 cards and 1402 dozen (16,824) were sold. This is a small increase (90 dozen) on last year's sales. A few 1966 cards were also sold. This gave a net profit for the year of \$871.05. We have on hand 50 dozen 1966 cards and 317 dozen 1967 cards. These can be regarded as assets which can be utilised in mixed packages at a later date.

As most know the card used this year was the painting of the White-fronted Tern by Josef Wolf which appears in the volume by J. Richardson and G. Gray of mammal and bird paintings in the series *The Voyage of the Erebus and Terror* published in 1845. Mr. A. A. St. C. M. Murray-Oliver of the Alexander Turnbull Library kindly supplied the historical notes which were used inside the card.

A number of historical publications have been examined to find a suitable painting for the coming year. I recommend the use of the painting of a Saddleback by John Latham from "A General Synopsis of Birds" published in 1783.

On the Society's behalf I would like to thank the Turnbull Library, Mr. Murray Oliver, Bryce Frances Limited (printers), the Royal Forest and Bird Protection Society and the volunteers who assisted with the counting and packaging of the cards.

— BRIAN D. BELL

— ★ —

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

Members will be aware that the Wildlife Branch of the Department of Internal Affairs took over the National Banding Scheme from the Dominion Museum on 1st April, 1967. The Controller is advised by two committees (1) a Departmental committee, consisting of the Head of Wildlife Research, the Banding Officer and the Senior Conservation Officer and (2) a Banding Advisory committee consisting of 7 representatives of various interested bodies. Messrs. J. M. Cunningham and G. Harrow were appointed to represent the O.S.N.Z. and meetings were held on 23rd June and 28th July. A number of proposals was before the committee including 3 classes of permits, annual permit fees of from \$2 to \$10, the charging of rings for certain programmes, and considerable tightening of the circumstances under which permits would be issued.

The society's representatives took full part in the long discussions of these topics and wish to record their appreciation of the sympathetic hearing accorded them by the Department. In these discussions your representatives took fully into account the interests of members and the society as well as their own viewpoints, and are happy to report that the Department has concurred with many opinion expressed. As a result, there will be no permit fees nor, in most cases, any charge for rings. It is recognised that if a study is worthy of being carried out and a permit issued, the operator should not be charged for the privilege of doing it.

Most approved applicants will be issued with a "restricted" rather than a "general" permit, in which the species or groups of species to be ringed are listed, and/or the localities in which ringing may be carried out. For example, a member may be authorised to ring White-fronted Tern anywhere in New Zealand, or perhaps in a particular colony only, while another may be permitted to ring any species trapped in his town garden. While there will be no "holus bolus" ringing of all birds, we feel the Department will be liberal in its policy and will not refuse any application which is based on a sound programme of research involving ringing. All applications for "general" permits are to be referred to both the Departmental and Advisory committees, and the Department has agreed that any applicant who is refused a permit of the kind he wanted has the right to have his application referred to the Advisory Committee for reconsideration, and this is a safeguard of great potential value to members. So far no applications have been referred to the committee.

It is now up to members and the Society to arrange suitable schemes based on more serious consideration thus providing an enjoyable week-end occupation.

Appended hereto is a notice of the Department's policy. Applicants should apply to the Banding Officer, Wildlife Branch, Department of Internal Affairs, Private Bag, Wellington, setting out previous banding experience and the proposed programme including species, localities, trapping methods, etc. The reason for the project and what is hoped to be gained from it should be given in as much detail as possible.

— J. M. CUNNINGHAM
G. HARROW

3/4/1968

POLICY FOR THE ISSUE OF PERMITS

There shall be two types of permit:—

1. Restricted (R)
2. General (G)

Prospective operators shall apply for permits to be issued according to the following policy:—

A. Application

1. For the proposed band project, all applicants shall set out a detailed statement of their aims, the methods (including trapping methods) they intend to use, the species they intend banding and the locality in which the work is to be done.
2. All prospective operators shall be asked for a reference from a referee who must be any *one* of the following:—

An active banding operator of more than 3 years experience.

A regional representative of a local or regional ornithological organisation.

A senior officer of the Wildlife Service.

An ornithologist known to a member of the Departmental or Advisory Committee.

B. *Determination of Type*

All applications will first be considered by the Departmental Committee.

1. When an operator wishes to study a particular species (or more than one) then a 'Restricted' permit setting out *only* those which may be banded will be issued. Such a permit may include a locality restriction.
2. When a 'General' permit is required to cover a number of species, or a number of localities, or both, the application shall be referred directly to the Advisory Committee with an indication from the Department about what restrictions if any are likely to be imposed. (Such action will be dependent on policy from time to time.)
3. General permits when issued, will automatically be reviewed by both Committees annually.
4. *An operator may apply to band any bird in New Zealand or under permit, elsewhere (Antarctic, Pacific Islands, etc.). Each application will be treated on its merits and in the light of Departmental policy at that time.*
5. Should the project applied for be not approved (e.g. previous comprehensive studies having been done) the Department reserves the right to allow a suitably qualified operator to proceed provided bands are paid for by the operator.
6. Only 'Restricted' permits will be issued to Acclimatisation Societies and operators with less than 2 years experience.
7. All bands for approved projects will be issued free of charge with the proviso that Acclimatisation Societies, Universities, Government Departments or such other Organisations as the Department may deem fit may be charged.

C. *Provisions of Issue*

The Department, before it gives permission to band, must be satisfied:—

- (a) That the operator will adhere to the rules and instructions as laid down from time to time.
- (b) That the operator is competent to recognise all species he desires to band.
- (c) That the operator will exercise due care in trapping, and in placing or replacing bands on birds.
- (d) That colour markers, streamers, or tags will not harm the birds or conflict with other studies.

D. *Rights of Appeal*

Should an application be refused, a project not be approved, or the type of permit be disputed, then the applicant shall be given the grounds for refusal and be told that if he so desires the matter will be referred to the Advisory Committee for further consideration.

E. *Membership of O.S.N.Z.*

All banding operators are strongly recommended to become members of the O.S.N.Z. (if not already members) so that up-to-date contact may be maintained with ornithological research in New Zealand.

LETTER

The Granivorous Birds Group of the International Biological Programme plans a world wide study of the breeding of House Sparrows during 1968. The information required includes breeding dates, clutch size and mortality of eggs and young; those participating are asked to undertake weekly inspections of at least 50 nests during the 1968 season.

So far, no one has been found to undertake this work in New Zealand, so I would be grateful if you would publish the above information together with a request for volunteers.

Our House Sparrows seem to use nest boxes rather sparingly, and nests in trees, if they can be reached, are usually difficult to inspect without causing undue disturbance.

Since it appears unlikely that anyone in New Zealand can comply fully with the request for weekly inspections of 50 nests, I appeal to all your readers to make a special effort to complete as many nest record cards for House Sparrows as possible this season. If everyone does his bit, even if he can only watch one or two nests, New Zealand will be making a very worthwhile contribution to this important international undertaking.

I would be glad to supply additional information to anyone who requires it.

— P. C. BULL

Animal Ecology Division, D.S.I.R.,
P.O. Box 30466,
Lower Hutt.

————— ★ —————

NOTICE

III PAN AFRICAN ORNITHOLOGICAL CONGRESS ANNOUNCEMENT

The South African Ornithological Society intends to organise the Third Pan African Ornithological Congress from 15th to 19th September, 1969. The Congress will be held at Pretoriuskop, in the Kruger National Park, South Africa. Further particulars will be announced later. Interim enquiries may be addressed to:

The Hon, Secretary,
South African Ornithological Society,
C/o Percy Fitzpatrick Institute,
University of Cape Town,
RONDEBOSCH, CAPE TOWN,
South Africa.

————— ★ —————

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Telescope 2" x 3', by Broadhurst, Clarkson & Co. Ltd.

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Birkenhead,
Auckland 10.

NOTICE TO CONTRIBUTORS

Contributions should be type-written, double- or treble-spaced, with a wide margin, on one side of the paper only. They should be addressed to the Editor, and are accepted on condition that sole publication is being offered in the first instance to "Notornis." They should be concise, avoid repetition of facts already published, and should take full account of previous literature on the subject matter. The use of an appendix is recommended in certain cases where details and tables are preferably transferred out of the text. Long contributions should be provided with a brief summary at the start.

Reprints: Twenty-five off-prints will be supplied free to authors, other than of Short Notes. When additional copies are required, these will be produced as reprints, and the whole number will be charged to the author by the printers. Arrangements for such reprints must be made directly between the author and the printers, Te Rau Press Ltd., P.O. Box 195, Gisborne, prior to publication.

Tables: Lengthy and/or intricate tables will usually be reproduced photographically, so that every care should be taken that copy is correct in the first instance. The necessity to produce a second photographic plate could delay publication, and the author may be called upon to meet the additional cost.

Illustrations: Diagrams, etc., should be in Indian ink, preferably on tracing cloth, and the lines and lettering must be sufficiently bold to allow of reduction. Photographs must be suitable in shape to allow of reduction to 7" x 4", or 4" x 3½".

Proofs: First proofs of papers will be sent to authors at the discretion of the Editor, or upon request. They should be returned without delay.

Nomenclature: Contributors should follow the Checklist of N.Z. Birds for both the scientific and vernacular names. Scientific names of species and genera are printed in italics, and in the script should be underlined; and the specific or subspecific name should be enclosed in brackets if following the vernacular name, thus: Stewart Island Kiwi (*Apteryx australis lawryi*). It is necessary to give the scientific name as well as the vernacular the first time the latter is mentioned, but thereafter only one of the names. Capital letters should be used for vernacular names.

References: If listed, these should be in the form of the following examples:

1. Atkinson, I. A. E., 1964: Feeding stations and food of the North Island Saddleback in August. *Notornis* 11, 2, 93-97.
2. Buller, W. L., 1888: A History of the Birds of New Zealand (2nd ed.) 2 vols., the author, London.

The references should be serially numbered, and in the text, should be shown thus: Atkinson 1964 (1), and Buller 1888 (2). If references are cited in the text, the following shortened form may be used: Atkinson 1964, *Notornis* 11, 2: 93-97.

Publication: Contributions will normally be published approximately in the order in which they are received by the Editor, but at his discretion. He may seek the opinion of the Editorial Committee, appointed by the Council of the Society, on any matter including the general suitability of the contribution for publication.

Authors are requested to take care that the submitted text is correct. Only too often the Editor is asked to make a number of alterations or additions, which are not always clearly expressed or tidily presented.

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

AUCKLAND: M. J. Hogg, 27 Woodside Crescent, Auckland 5

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

WAIKATO: Vacant.

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

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

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WELLINGTON: Murray Williams, Wildlife Branch, Dept. of Internal
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NELSON: Vacant

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WESTLAND: P. Grant, 10 Hinton Road, Karoro, Greymouth

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

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