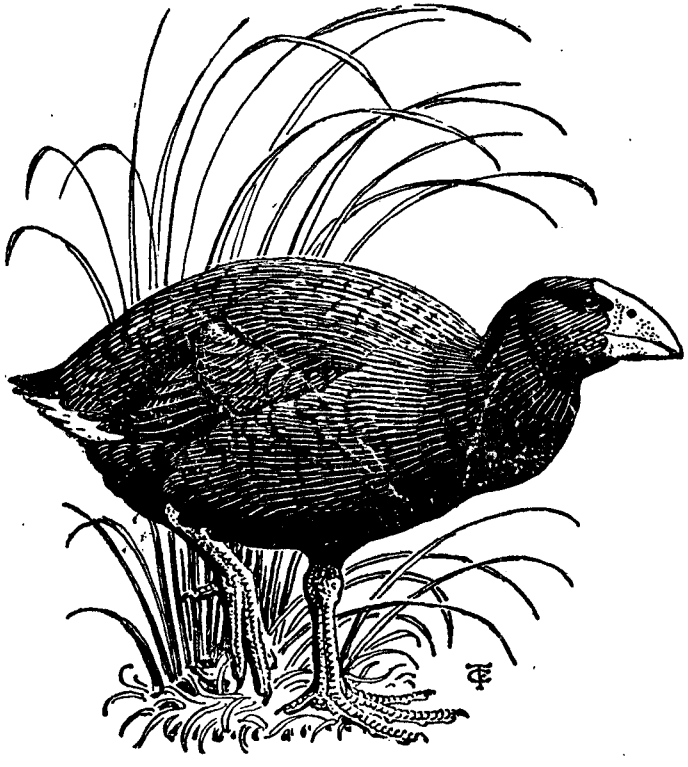
NOTORNIS



QUARTERLY JOURNAL

of the

Ornithological Society of New Zealand

(Incorporated)

Volume Eighteen, Number Two, June, 1971

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".

Abstracts: All papers exceeding 500 words are to be preceded by an abstract, briefly indicating the contents of the paper.

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

NOTORNIS

In continuation of New Zealand Bird Notes

Volume XVIII, No. 2 - - - JUNE, 1971

JOURNAL OF THE ORNITHOLOGICAL SOCIETY OF NEW ZEALAND
(Incorporated)

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

Edited by R. B. SIBSON, 26 Entrican Avenue, Remuera, Auckland 5

Annual Subscription: Student Membership, $2 (to age 18); Ordinary Membership, $4; Endowment Membership, $5; Husband/Wife Membership, $5; Life Membership, $80 (age over 30).

Subscriptions are payable on a calendar year basis at the time of application for membership and on receipt of invoice each January thereafter.

Applications for Membership, Changes of address and Letters of Resignation should be forwarded to the Hon. Treasurer.

Contents of Volume 18, No. 2: June, 1971

THE DISTRIBUTION AND ABUNDANCE OF THE PARADISE SHELDUCK (Tadorna variegata, Gmelin) IN NEW ZEALAND FROM PRE-EUROPEAN TIMES TO THE PRESENT DAY

By MURRAY WILLIAMS
Wildlife Service, Department of Internal Affairs, Wellington

Captain James Cook, R.N., on " Resolution " in Dusky Sound, wrote in his diary on 11 May 1773, descriptions of the five species of waterfowl he had encountered in New Zealand. He recorded " the largest are as big as a Muscovy Duck with a very beautifull variegated plumage, both male and feemale have a large white spot on each wing, the head and neck of the latter is white but all the other features as well as those on the head and neck of the drake are of a dark variegated colour." (Beaglehole, 1959). J. R. Forster (1843), the naturalist with Cook on the voyage, wrote on 7 April 1773, " I always observed them in pairs, from which I believe them to be monogamous. The male makes a rattling noise like a castanet. They are difficult of access. Always found at the mouths of streams and fresh waters."

These were the comments of the first Europeans to document the existence of the Paradise Shelduck *Tadorna variegata.* But it was well known to Polynesian man long before Cook and Forster. It formed part of the diet of the Maori and probably the earlier colonisers as well.

The species is of comparatively recent origin. It is a member of a widely distributed genus, its plumage and general behaviour are similar to those of the Cape Shelduck *T. cana* and the Australian Shelduck *T. tadornoides* and Johnsgard (1965) suggests its evolutionary position is between these two, despite their geographic distribution. Fleming (1962), with reference to a group of species of which the Paradise Shelduck was one, commented, " Using the yardstick of strong sub-speciation in about 15,000 years, I see no need to push their origin further back than the early Pleistocene a million years or so." The 'originals' probably invaded New Zealand at a time when the grazing niche normally occupied by geese was incompletely filled by the now extinct flightless geese, or at a time when these geese were already extinct. The Paradise Shelduck is very goose-like in its feeding behaviour and general ecology, and reflects the availability of that niche not only during the course of its evolution but also to-day.

PRE-EUROPEAN TIMES

The distribution of the species in pre-European times is uncertain but it is not unreasonable to suggest that it was closely associated with lowland short-tussock grasslands and, to a lesser extent, with swamplands. The paucity of this habitat-type prior to Polynesian colonization would suggest that the species was never widespread nor numerically strong but rather had a clumped distribution, being locally plentiful around Lake Grassmere and the Wairau River mouth, for example. Evidence on distribution during Polynesian occupation is derived from semi-fossil bones found in swamps or from Maori

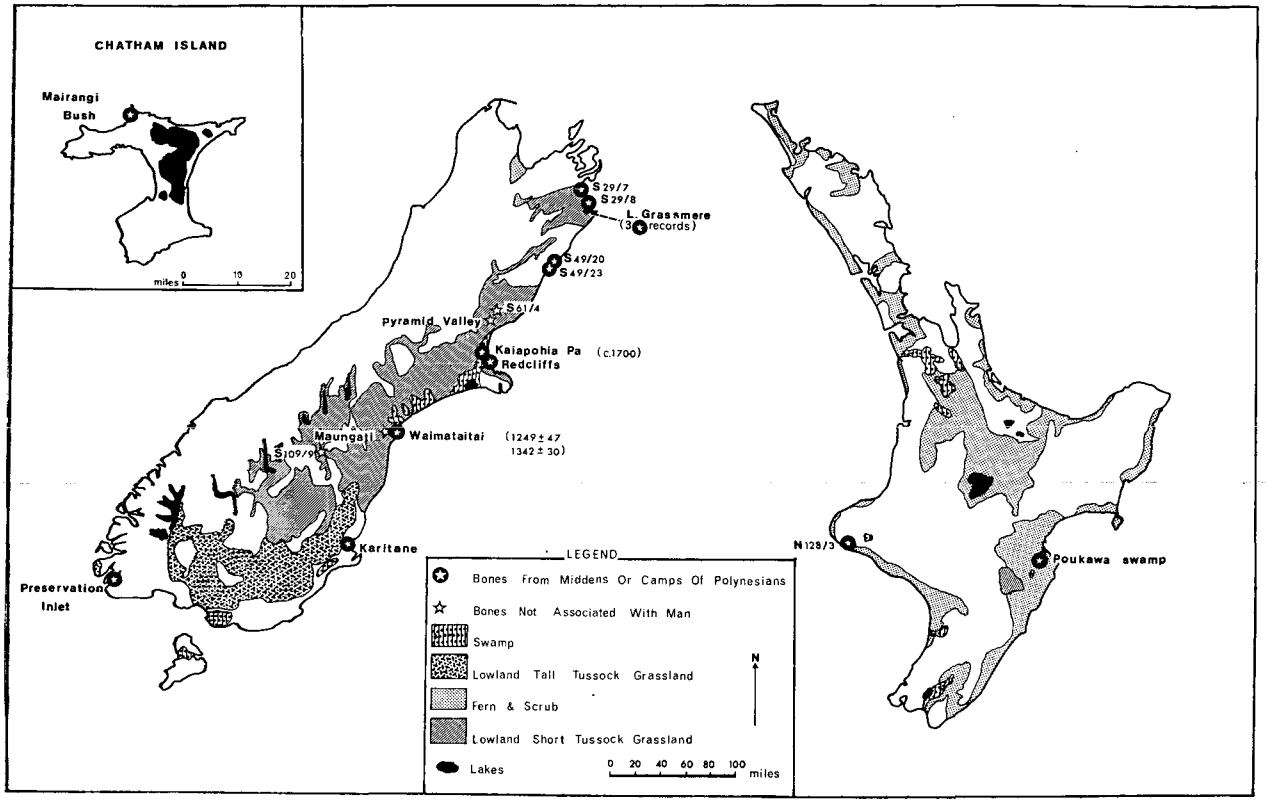


FIGURE 1 — Distribution of semi-fossil remains of Paradise Shelduck in relation to pre-European vegetation. (Vegetation map after Holloway, 1959.) Numbers thus, S109/9, refer to site numbers in the N.Z. Archaeological Association site record files. Additional finds, not shown on map because precise localities are unknown, are: Otatara (S136/2), dated at A.D. 1422 ± 32, 1483 ± 70 and Tai Rua (1407 ± 32, 1447 ± 32, 1465 ± 32) both midden sites in North Otago (Zander, 1967); Te Wairaki Beach, Northland, (recovered from dunes); Te Ana a Moe Cave (midden) and an unspecified dune site, both on Chatham Island.

and Moa-hunter middens. When bones occur in association with Man's activities, one cannot rule out the possibility that birds were carried a considerable distance from their place of origin before being eaten. The distribution of bone-finds is illustrated in Figure 1 together with the distribution of lowlands short-tussock grasslands and swamplands in pre-European New Zealand. (I am indebted to Mr. R. Scarlett, Canterbury Museum, for making available to me his records of Paradise Shelduck remains now lodged in the Canterbury and Otago Museums.) The majority of finds have been in the South Island and their locations agree closely with the suggested habitats. The most interesting finds are three from the Chatham Islands, 500 miles east of the South Island. Paradise Shelduck have never been recorded on the Chathams in European times although B. D. Bell (pers. comm.) reported unconfirmed sightings by local inhabitants of vagrants from time to time. In 1949 Paradise Shelducks straggled to Lord Howe Island, 850 miles north-east of New Zealand (Oliver, 1955). While the Chatham Island bone finds may have been the result of man transporting carcases from the South Island, the existence of a small local population exterminated by Polynesian man seems more likely. Until 1960, sightings of Paradise Shelduck in Northland were very rare indeed. The specimen recovered from dunes on Te Wairaki Beach may well have been taken there by early Polynesians.

That birds were not exclusively confined to grassland and swampland is emphasized by Cook and Forster encountering them in Fiordland.

Polynesian man may have helped to increase the range and numerical strength of Paradise Shelduck. He is known to have burned large areas of original forest (Holloway, 1959) and to have prevented its re-establishment. In its place, tussock grassland, scrub and fernlands arose and this must have favoured an extension of range. The eastern parts of the South Island, according to Holloway, were very extensively changed by Maori fires, and it was here that the species was most numerous when European colonists arrived. Similarly, land clearance along the east coast of the North Island probably accounted for the distribution recorded by Buller (1868).

EUROPEAN SETTLEMENT TO 1900

Documentation of this period of the species' history is very good and major references in the New Zealand literature are summarized by Oliver (1968).

Buller (1868) provided the first reliable comment on the distribution of the species stating, " It is very common in the South Island and in some parts of the Wellington province but is rarely met with further north." In 1877 Buller documented three sightings of Paradise Shelducks north of Petane (Napier) in the North Island.

Combining all references known to me, I have summarized in Figure 2 the distribution of the Paradise Shelduck from the period of European settlement to 1900. This distribution is probably similar to that of pre-European times — numerically the species became stronger but it is doubtful if its range was extended to any great extent. Throughout the eastern foothills of the Southern Alps and extending down various river valleys, particularly the Clutha and Waitaki onto the lowland plains and into Southland, the bird was

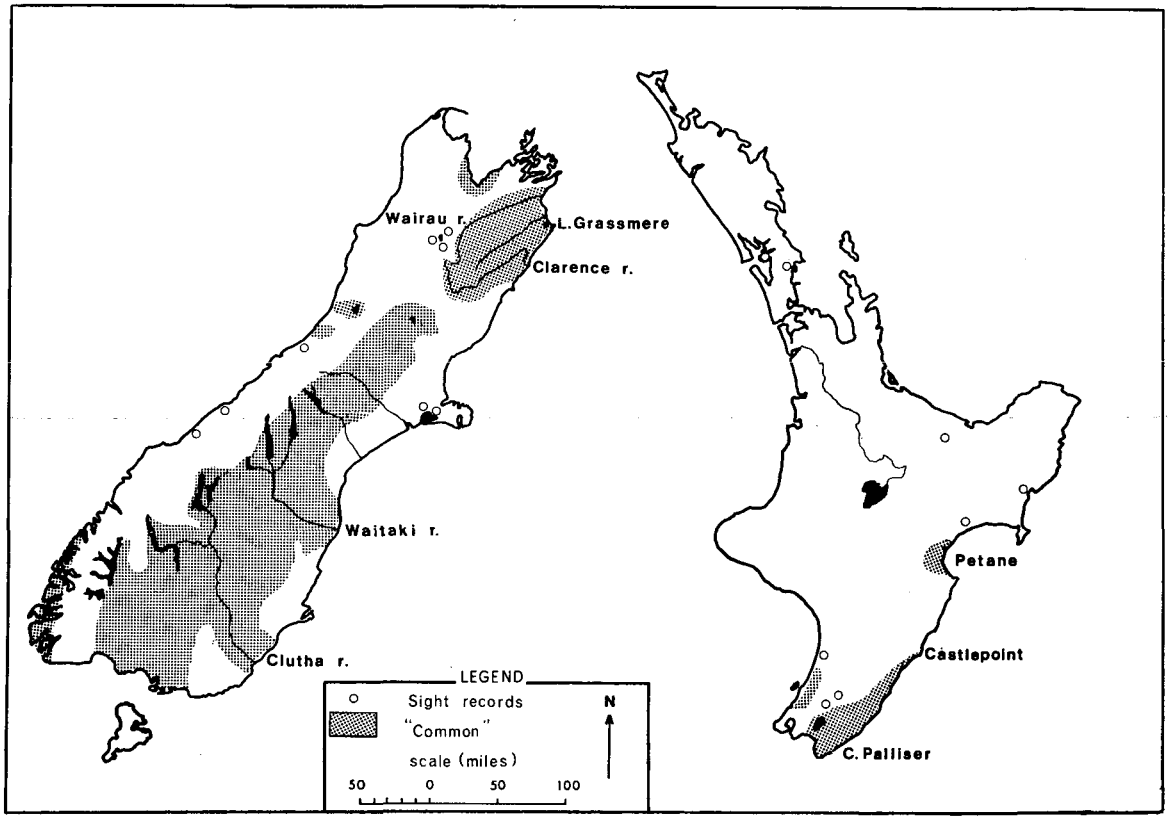


FIGURE 2 — Distribution of Paradise Shelduck, 1840 - 1900.

considered common. The Clarence, Awatere and Wairau Valleys in Marlborough supported large numbers and they were very abundant in the vicinity of Lake Grassmere. Around the coastal regions of Tasman Bay birds were frequently seen. Isolated pairs or small groups were to be found throughout most of the southern fiords while elsewhere on the West Coast (S.I.) distribution was scattered.

In the North Island, there were apparently three areas of local abundance — around the Petane area, in eastern Wairarapa from Cape Palliser to Castlepoint and throughout the sand-dune lake system of the Manawatu. McAllum (1965) has related this distribution to that of forest in 1880.

Land clearance, particularly in the South Island, probably did much to increase the numbers. But throughout the period, the population did not continually expand. In two areas in particular, Marlborough and Wellington, there was, toward the end of the century, a very significant reduction in numbers. Buller (1893) wrote, " This fine duck, formerly so plentiful in the Marlborough district, is becoming scarce, large numbers perishing every season through taking the poisoned grain laid for rabbits. A Marlborough resident informs me that years ago he was a constant attendant when the Maoris hunted the " flappers " or moulting birds when incapable of flight, and that he has known upwards of five thousand to be taken in this manner during a single season. They are now counted only by tens and twenties." Handly (1895) considered drainage and agriculture the reasons for the decline. Likewise, Kirk (1895) commented, " About 15 years ago, the Paradise duck was very common on the east coast of the Wellington district between Cape Palliser and Castlepoint, but at the present time, the traveller may ride the entire distance without seeing a specimen. The eggs and young have suffered from the attacks of rats and wild cats, while stoats and weasels are said to have disposed of the adults, and numbers have been shot for mere sport. The same diminution of numbers has been observed in the South Island where it was always more plentiful than in the North."

Our present knowledge on the effects of poison campaigns and the influence of mammalian predators on waterfowl populations does not allow us to give too much credence to the comments of Buller and Kirk. Over-exploitation seems a more likely reason for the decline.

This decline in Marlborough and Wellington is reflected in the game laws of 1899. The " New Zealand Gazette " (23/3/1899) declared Paradise Shelduck prohibited game in the Wellington district and absolutely protected in the Marlborough and Sounds counties. The shooting fraternity, invariably the last to act in the face of declining game populations, declared the species protected in the North Canterbury Acclimatization district in 1904; presumably it had been gradually declining in that district as well.

Apart from Guthrie-Smith's (1895) comment that the species was becoming rarer in the Petane area, I can find no other comment detailing the status of the Shelduck over the rest of New Zealand at the end of the century.

1900 - 1950

Throughout most of this period there was a gradual extension of the species' range and a rebuilding of the population in areas where a decline had started late in the 1890s. An important feature in promoting the recovery and expansion of the Paradise Shelduck was the chequered history of protection afforded it during the first 20 years — up until the Animals Protection and Game Act 1921 - 22. (Williams — in prep.). In addition, the shooting season was, for the period 1923 - 39, limited to one week and to the South Island only, and land clearance was proceeding rapidly in both Islands.

The range of the species (Figure 3) extended north of latitude 39°S where Buller (1888) noted they rarely occurred. This extension of range was due almost entirely to liberations in the centre of the North Island. J. Cullen in 1915 and 1917 liberated 8 birds (probably from Southland) at Mahuia Prison Camp, four miles from National Park. (T. Shout, pers. comm.). Shortly after liberation, they established themselves on Roto Aira to which 15 more birds (from Southland) were added in 1920 - 21. (Auckland Acclimatization Society Annual Report 1920 - 21). By 1922, a number were to be seen around the headwaters of the Wangaehu River, and later in the decade they became common in the Karioi - Tangiwai area. A comment in the 1929 Annual Report of the Waimarino Acclimatization Society reads, " Paradise Ducks are often to be seen about Karioi and are apparently also increasing, as as many as seven have been seen together where four years ago, a pair was an unusual sight." In the early 1930s up to 600 birds were counted moulting on a lake at Karioi (T. Shout, pers. comm.). Numbers increased rapidly and the range extended south through the Rangiwaea - Taihape area and west toward Raetihi and the Wanganui Valley. A considerable influx into Hawke's Bay — particularly in the area bounded by the Tukituki and Tutaekuri rivers was recorded in 1936. The Hawke's Bay Acclimatization Society annual report of that year stated, " ... thousands were seen on the Inner Harbour Lagoon (Petane area) and on Hawke's Bay rivers." It is very likely that these birds had emigrated from the Rangitikei headwaters. This influx into Hawke's Bay was followed in 1943 - 44 by a substantial invasion into the Wairoa - Gisborne district (A. Blackburn, pers. comm.). Twelve were seen on Lake Repongaere in 1943 and 50 more pairs in the upper Hangaroa Valley. A gradual increase in the area from Tolaga Bay in the north to Wairoa in the south followed, despite the species being placed on the game licence in 1948.

Throughout the Manawatu dune lake system, an increase in numbers was noted — perhaps aided by the liberation of twelve Southland birds onto Kapiti Island in 1931 (Wilkinson, 1953). In the Wairarapa, gradual recolonisation occurred — particularly near Lake Wairarapa where, in 1940, up to 300 were seen (O.S.N.Z. Reports & Bulletins 1: 10).

At some time prior to 1936 some Paradise Shelducks were apparently liberated onto Lake Rotomahana and here became locally abundant, although throughout the Rotorua lakes themselves and indeed over most of the Volcanic Plateau north of Taupo, the birds were not common (*Notornis* 3: 44).

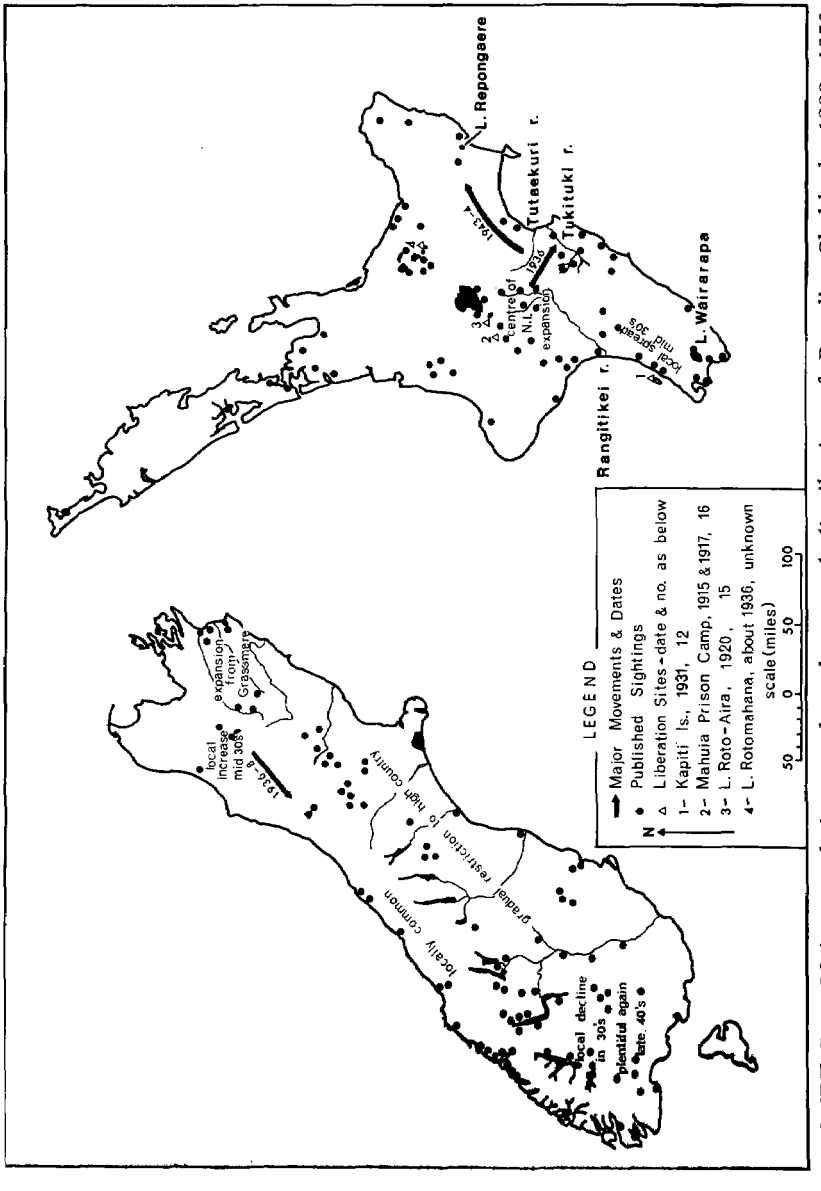


FIGURE 3 — Major population trends and reported distribution of Paradise Shelduck, 1900 - 1950.

Beyond these areas in the North Island only stragglers, pairs or small flocks were recorded e.g. Taranaki, Bay of Plenty, King Country.

In the South Island, despite being returned to the game licence in 1924, local populations, which at the turn of the century were apparently declining, gradually gained numerical strength. The result was that throughout the late 1930s the Shelduck was considerably more numerous over much of South Island than it had been at any stage of its history (including today). But despite the increase, the species' range contracted — disappearing gradually from the lowland areas into the eastern foothills.

In Nelson, little is recorded of the status prior to 1930. But early in this decade, the Nelson Acclimatization Society Reports record a substantial increase in the Murchison area from which birds apparently spread into Buller. Further south along the West Coast there likewise was a gradual increase which, as in other areas, was probably attributable to land clearance. D. Greaney (pers. comm.) noted " in 1940 Paradise ducks were in great numbers in the Haast, Arawhata and other valleys — I had never seen a Paradise duck here before 1914 - 17." But he added that 1940 was their peak year in these areas, and by 1947 only an odd pair was to be seen.

The alarming decline in Marlborough to which Buller (1893) and Handly (1895) had referred was soon halted. From local concentrations at Lake Grassmere and Wairau Lagoon, the species recolonised the Clarence, Awatere and Wairau valleys. Extensive forest and scrub clearance after World War I probably assisted this expansion but the Shelduck's response to protection in some areas in the 1960s suggests protection from the gun may have been a more influential factor in promoting recovery.

The gradual retreat from the lowlands occurred from Kaikoura south to Otago, but along the base of the Alps, numbers were very high by 1940. The area about Lake Sumner became the species' focal point in North Canterbury during its decline at the turn of the century, and it is undoubtedly from here that recolonization of its former range occurred. About Lake Sumner, Shelducks have always been very plentiful. In the hill country drained by the Rakaia River, the local Acclimatization Society recorded poor years over the period 1927 - 34. In the Waitaki Valley, the species remained very common in the foothills but became virtually unknown after 1940 in the lower reaches of the river. The 1940 Annual Report of the Waitaki Acclimatization Society commented, " Paradise duck are not any more plentiful down country but have increased in the Omarama district." Throughout most of Otago the early decline was halted but the resultant increase was concentrated to hilly country above 1000 feet. The pre-1900 range was effectively halved.

The history of population trends in the Southland - Southern Lakes area is confusing. Information suggests that as late as 1930 Shelducks were decreasing in numbers, particularly in the Te Anau district. But recovery must have been dramatic because by the late 1940s, the bird was described as 'plentiful' throughout Southland and Southern Lakes (Southland Acclimatization Society Reports) and R. R. Sutton (pers. comm.) considered that this was the time when they reached their peak numbers.

Thus the period 1900 - 1950 was one during which the species extended its range very considerably in the North Island — the result of land clearance and liberations; in the South Island, local populations depleted at the turn of the century steadily strengthened to peak levels in the late 1930s although the range tended to be restricted to the more elevated country.

1950 TO THE PRESENT DAY

These twenty years have seen dramatic reductions in populations throughout the South Island and some parts of the North Island. At the same time, liberations in Northland and gradual spread into Waikato and South Auckland have resulted in the species ranging over the entire country. The decline began in the South Island in late 1940s and was apparently caused by increased shooting pressure — a lengthening of the shooting season to four weeks, high bag limits over most of the South Island and a rapid and continuous increase in the number of shooters.

The first region of the South Island to experience the decline was the Canterbury foothills. A survey conducted by the Wildlife Service in 1961 revealed that numbers were very low in the Rakaia and Rangitata catchments about 1955 - 57 — the decline being first observed shortly after World War II. The South Canterbury Acclimatization Society commented in 1956 on the considerable decline in its area (Rangitata) and stated that many of the runholders were of the opinion that protection was necessary. North of the Rakaia to Lake Sumner, the downward trend spread. Today, the numbers in the Upper Hurunui river - Lake Sumner area are considerably lower than formerly. D. Maindonald (pers. comm.) referred to a count of moulting birds on Lake Sumner on 28/12/1957 as being between 4000 - 5000. E. Sharpe and M. Crombie (I.A.D. file 46/62/48) reported 3000 birds here on 20/1/1967; but in contrast to 1957, the entire local population appeared to be concentrated on the lake. According to information gathered from runholders by D. Maindonald in 1968, there has been a slight increase since 1957 in the Waimakariri and Rakaia catchments.

In the Waitaki System, M. Keillor (pers. comm.) wrote, " The Hakataramea Valley, about 40 miles long, used to carry a large population — perhaps thousands of birds less than 30 years ago but today (1968) you can travel the valley and see only the odd pair or two . . ." Run-holders in the Upper Waitaki today consider the species ' common ' but " nothing like the numbers of 1930 - 40." Most agree that the decline in this area has been steady and continuous. Throughout Southland, Otago and Southern Lakes, the rapid increase in the late 1940s was apparently followed by an equally rapid decline. By 1962 (R. R. Sutton, pers. comm.) numbers were very low and the species was given protection throughout Southland. Protection from the gun seems to have been enough to reverse the decline. Sutton stated that " the increase was slow at first due to lack of mature breeding stock but has occurred at a much faster rate in the last 2 - 3 years (1967 - 1969). Paradise Ducks are now being recorded in localities where they have not been seen for well in excess of 20 years and the breeding range is also definitely extending." Zander

(1967) considered that the species' range in Southland was generally confined to land between 500 - 1000 ft. particularly in the Te Anau - Lumsden - Garston area.

A steady decline in numbers whilst a game bird, followed by a gradual recovery during years of protection, is also the history of the species in the Nelson district. Until 1958, the annual reports of the Nelson Acclimatization Society recorded ' good ' numbers throughout. But in 1958 they noted fewer than previously. The decline continued until 1966 when the Society decided to protect the species completely throughout Nelson — initially for five years. D. Zumbach (pers. comm.) related details from the Murchison district which are similar to those quoted by Keillor (above) — high numbers in 1957 down to a scattered few in the same locality in 1966 - 67. The decline in Nelson coincides with that in the adjacent West Coast and Marlborough. There was an " alarming decrease in Paradise Ducks " throughout the West Coast (1965 Annual Report West Coast Acclimatization Society); the following year they were protected here also. Zumbach wrote that " since they have been off the (game) licence, there has been a noticeable increase — but they still have a long way to go to even approach the numbers of 10 - 12 years ago." A survey of known moulting sites in Nelson and southern Marlborough on 13/1/1969 revealed a total of about 1100 birds.

Reliable evidence on population trends in the past 20 years over much of Otago and West Coast is not available. Zander (1967) recorded that the range in Otago appears confined to hill country between 1000 - 2000 ft. in the upper Taieri and Ida Valleys, with pockets of concentration near Lake Mahinerangi, Middlemarch and Alexandra - Lauder. Some birds are known to moult on Lake Onslow.

In the North Island, the northward extension of range continued and, aided by liberations in Northland, Paradise Shelduck are now to be encountered throughout.

The Northland liberations (summarised in Figure 4) were mainly of birds trapped in the National Park area (Waimarino Acclimatization Society district) although some were also obtained from Gisborne. Records of these liberations kept by the various Acclimatization Societies involved, are incomplete and many are inconsistent with the number of birds thought to have been supplied.

Within the Whangarei Acclimatization Society's district, an unofficial liberation of 40 - 60 birds was made in 1959 (R. T. Adams, pers. comm.) and in 1961 or 1962, 24 pairs from Gisborne and Waimarino were released. In January, 1963, the Wildlife Service forwarded 42 birds from Lake Repongaere, and 24 more from the Waimarino district the following month. The 1962 - 63 Report of the Whangarei Acclimatization Society however did not record the liberation of these 66 birds but commented, " Thanks are again due to the Waimarino Society for two consignments of Paradise Duck, 182 in all." I can find no further record of liberations into the Whangarei area but R. T. Adams (pers. comm.) informed me that about 100 birds were released there in 1969. The Bay of Islands Acclimatization Society liberated 10 birds onto Lake Owhareiti in January 1964 and although approval was given for one hundred more to be released in this area (I.A.D. file 46/2/27), I can find no record that this

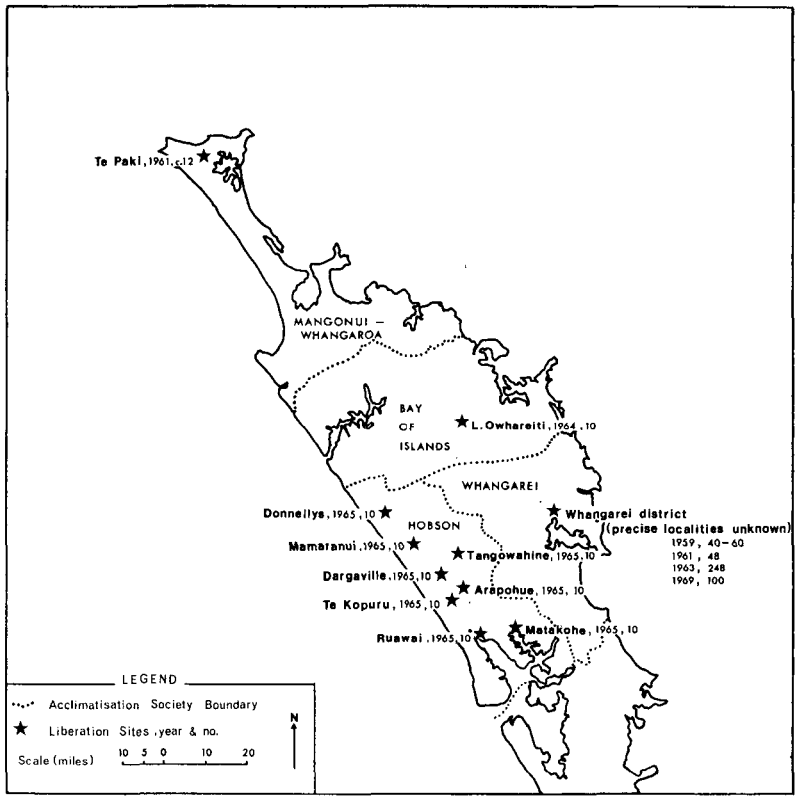


FIGURE 4 — Known liberations of Paradise Shelduck in Northland.

liberation was made. Fifty birds were trapped near Gisborne on 7/1/65 and forwarded to the Hobson Acclimatization Society. The Society reported (22/10/1968, I.A.D. file 46/2/3) that 80 birds were released at eight sites throughout their district in January, 1965, although their 1964 - 65 annual report states that only 48 birds were liberated. The eight liberation sites are recorded in Figure 4. The only other known liberation involved at least 12 birds on Te Paki Station in 1961.

At least 506 birds are known to have been released in Northland, but many liberations have gone unrecorded.

Paradise Shelducks have adapted well to this new area and are becoming increasingly common throughout and there have been numerous observations of small flocks and broods. The greatest concentrations at present appear in the Maungatapere - Kara - Hikurangi swamp area (M. Munro, pers. comm.) and further north from Hokianga to Te Paki (O.S.N.Z. Recording Scheme files). The future of the species in Northland looks bright.

In South Auckland and Waikato recent colonisation has been consolidated. In 1956 the Hamilton sub-society of the Auckland Acclimatization Society reported that Shelducks were frequently to be seen on Lake Karapiro and that they were spreading. McAllum (1965) reported breeding at Lake Wahi and Lake Whangape in 1960 - 61. They are now recorded breeding in the Whangamarino swamp, Patetonga and Piako river (O.S.N.Z. Recording Scheme file). McAllum suggested that sightings north of latitude 37°30'S. were probably of visitors but that breeding could be expected once " a tradition " for the area had been established. This appears to have happened, for although the species is still relatively uncommon, reports of broods are frequent. Throughout southern Waikato, King Country and the Raglan - Kawhia coastal region the species is regarded as common; and the Raglan area was reported to have had greatly increased numbers in 1955 - 56 (Auckland Acclimatization Society 1956 Annual Report).

On the Volcanic Plateau, from Taupo north to Bay of Plenty, the species is resident and breeding but in no great numbers, except for local concentrations about Lake Rotomahana and Lake Rerewhakaaitu. They occur usually on most of the other Rotorua lakes and the population throughout the region is slowly increasing.

Considerable land development is taking place on the Volcanic Plateau and once pasture quality reaches the optimum stage (McAllum, 1965) a steady increase in the area could be expected. In the Tauranga district where the species has not been shot since 1963, numbers are definitely increasing. The increase here is more probably a consolidation of the northerly spread.

In Taranaki, where all grades of pasture occur, Paradise Shelducks are common, with a concentration about Lake Ratapiko. Approximately 250 were recorded here in a post-moulting flock on 26/4/1958 and most of the birds shot in North Taranaki are taken here (B. Quickfall, pers. comm.). Paradise Shelduck in Taranaki, as they probably do in many districts, show a distinct preference for the higher (500 - 1000 ft.) and more dissected inland farmland — being considerably more common in the head waters of the Waitara river and the Whangamomona area than on the open coastal plain. But from Hawera, south, the hill country reaches closer to the coast, and coastal lakes and lagoons not infrequently support flocks of 600 - 700. Moulting probably occurs on some of these coastal waterways. Northern and eastern Wanganui are areas into which the Paradise Shelduck has emigrated from National Park . The increase and spread throughout this region is " gradual and continuous " (Wanganui Acclimatization Society 1960 Annual Report); although the Society's 1956 report suggests there was a considerable influx during 1953 - 56. Southern Wanganui has had a slower build-up and from here along the coast to Cook Strait, the species has at no time been numerous, although it is frequently shot.

During these 20 years, the Tongariro National Park, Hawke's Bay and Gisborne have been the stronghold of the Shelduck in the North Island. In the Waimarino Acclimatization Society district (which includes most of Tongariro National Park), the Society's reports from 1950 to 1960 contain references to the continuing increase

in numbers. But in later years, evidence from banded birds (Williams, in prep.) suggests this expansion has ceased and shooting pressure has reached the maximum which this population can sustain without significantly declining. Nevertheless, the greatest population density in New Zealand is currently to be found in this area.

Within Hawke's Bay there was an apparent recession in the late 1950s. The Hawke's Bay Acclimatization Society recorded numbers in 1956 as " reduced " and in 1959 as " scarce." But the open hill country toward the Ruahine, Wakarara and Kaweka ranges has continued to support numerous Shelducks throughout the 1960s. The species is commonly seen on Ahuriri Lagoon and may moult both here and on Lake Runanga. On the latter numbers of 400 - 500 have been recorded (W. Gunn, pers. comm.).

The gradual colonization of Poverty Bay, following the 1943 - 44 invasion, continued during the 1950s. The considerable population expansion, according to A. Blackburn (pers. comm.) coincided with the widespread aerial topdressing (which increased the clover content of pastures) and with the extensive construction of pot-dams for stock on hill country. Pot-dams are now known to provide ideal rearing habitat for ducklings. Blackburn considers peak numbers about Gisborne to have been in 1956 - 57, and that, until 1962, numbers remained relatively static whilst dispersal northward took place. In March 1962 he observed 200 birds in one flock in the Waikura valley with similar numbers in other northern regions of the East Coast where previously the species was unknown. But since 1962, he considers the Gisborne population to have declined. This belief is substantiated by banding data. Birds in this district are being cropped at a rate which exceeds recruitment. An aerial census of known moulting sites from Whakiki lagoon to Parihaka in January 1969 recorded about 5000 birds. A year later, the count was 3,400.

The remaining area of the North Island to be considered stretches south from Hawke's Bay to Cook Strait and lies east of the Ruahine - Tararua Ranges. The species appears locally abundant at Lake Hatuma but becomes scarcer towards the south, being very rare south of Eketahuna, although small liberations from the Mount Bruce Native Bird Reserve are developing a healthy local population. Scattered individuals and pairs are recorded on ground above 500 ft. along the coast from Castlepoint to Cape Palliser. A variable number (100-150) may be encountered in the vicinity of Lake Wairarapa.

Figure 5 illustrates in general terms only, the status of the species throughout New Zealand at the present time (1969). Population densities are indicated by shading, and terms used to describe density are " abundant," " common " and " rare." The New Zealand zootopographic map has been used as the basis for plotting density distributions. Such a grid method tends to over-simplify but is considered the best method for the data available. Where data for some areas are not available I have used my own judgment in arriving at density values.

Thus, since 1950, Paradise Shelduck numbers in many areas of New Zealand have declined. In some areas, e.g. Southland, West Coast, Waitaki, North Canterbury and Nelson, this decline was

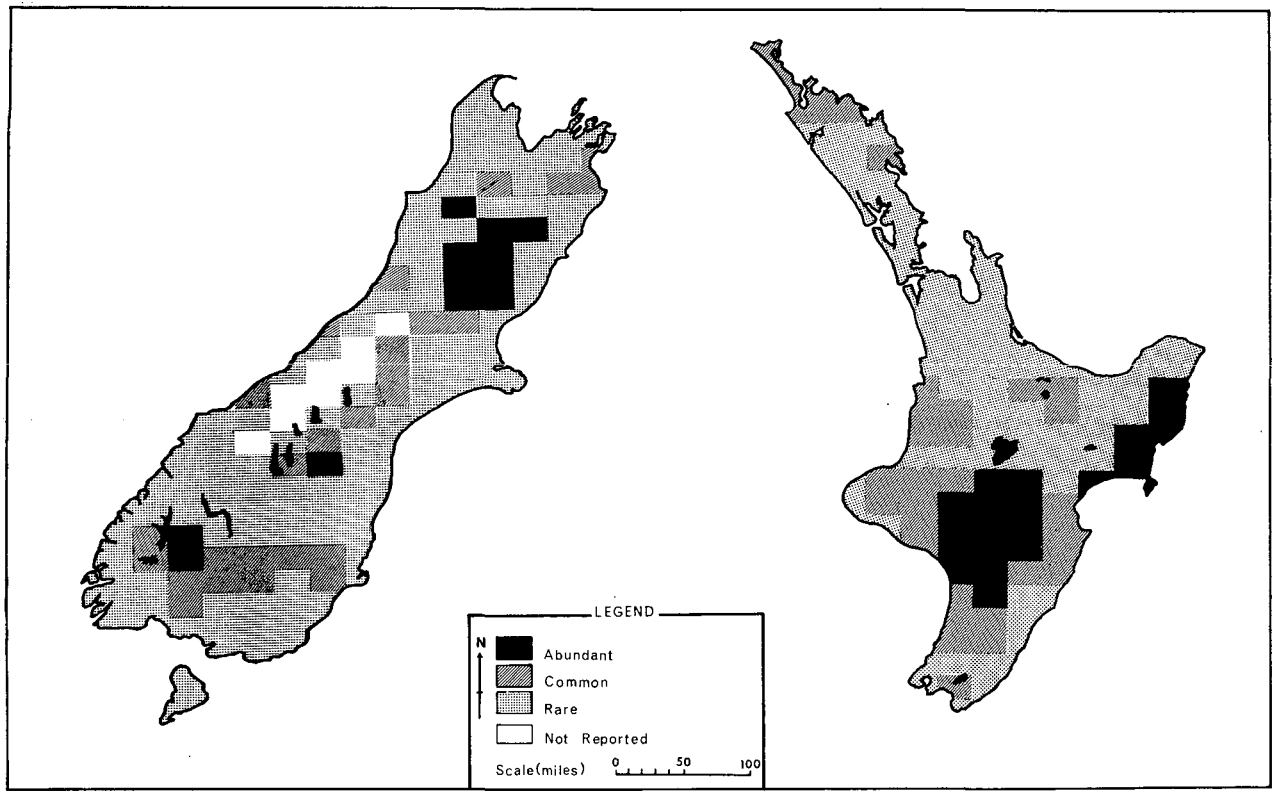


FIGURE 5 — **Comparative** abundance of Paradise Shelduck, based on reports over the period 1965 - 1969.

sufficiently severe to warrant removal from the game licence for varying periods. In at least Nelson and Southland, protection has been sufficient to halt and even reverse this decline. Similar reductions in numbers are becoming apparent in its more populous areas of the North Island. But liberations and natural northward spread have distributed the species throughout the country.

CONCLUSION

This study has revealed that population trends of Paradise Shelduck are strongly related to the pressures of exploitation. Twice since European colonization, the species has suffered substantial declines throughout its range and only a lengthy period during which exploitation was either prohibited or severely limited by law was sufficient to reverse the decline. The present situation is remarkably similar to that which existed at the end of the 19th century, and if the Paradise Shelduck is to continue as an important game-bird, the first step in management is to reduce the current rate of exploitation.

There is no suggestion that the species is in danger of being exploited to extinction throughout its range, although this is possible locally. Banding data (unpublished) show that Paradise Shelducks are, in two areas of the North Island, being shot at a rate equivalent to Mallard *Anas platyrhynchos* and Grey Duck *A. superciliosa,* yet the Shelduck's potential for replacing breeding stock is about one-third that of these Anatids.

The Paradise Shelduck is well adapted to the open farmland of New Zealand. It has the potential to become and remain a common species throughout this habitat. The only barrier to this is over-exploitation.

SUMMARY

The existence of the Paradise Shelduck was first documented by Cook and Forster on Cook's 2nd voyage to New Zealand in 1773. It was however well known to Polynesian man in New Zealand and formed part of his diet. The ancestral shelduck invaded New Zealand no earlier than the early Pleistocene and its existence here was probably assured by the incompletely exploited " goose " niche. Its distribution and abundance in pre-Polynesian times were limited by the scarcity of favourable grassland habitat. Extensive burning by the Maoris increased the available habitat and the numerical strength and range of shelduck presumably increased. The distribution of semi-fossil bones is closely correlated with the distribution of lowland short-tussock grassland and swampland in Maori times. Remains have been recovered from the Chatham Islands where the species does not exist today. In the early years of European colonization, Paradise Shelducks were common throughout the South Island but in the North Island were rarely encountered beyond the eastern portion of Wellington Province south of latitude 39°S. A considerable decline occurred toward the end of the 19th century, and was considered by some authorities to be the direct result of over-exploitation, accidental poisoning and the introduction of predatory ground mammals. A chequered history of protection between 1900 - 1920 and very limited shooting in only the South Island from 1923 - 1939 enabled the species

to reverse this decline and by 1935 to exist throughout most of the South Island in numbers greater than those recorded at any time in its recent history. In the North Island, liberations in the Tongariro National Park district in 1915, 1917 and 1920 provided the nucleus for considerable expansion into Wanganui, Hawke's Bay (in 1936) and Wairoa-Gisborne (in 1943-44). Since 1950, there have been dramatic reductions in Paradise Shelduck populations throughout the South Island and some parts of the North Island. At the same time, liberations in Northland and the gradual northerly spread into Waikato and South Auckland have resulted in the species now ranging over the entire country. The decline is considered the result of increased shooting pressure. In areas where protection from the gun has been afforded, the decline is being reversed.

ACKNOWLEDGMENTS

It is a pleasure to thank Messrs. R. T. Adams, B. D. Bell, A. Blackburn, W. Gunn, M. Keillor, D. Maindonald, D. V. Merton, M. Munro, B. Quickfall, T. Shout, R. R. Sutton and D. Zumbach for the extensive information they have provided for inclusion in this paper. Where these informants are employed by Acclimatization Societies, their views are not necessarily those of their respective Society. I wish also to thank Mr. R. Scarlett, Canterbury Museum, for permission to use his data on bone distribution, Mr. A. T. Edgar for permission to examine the O.S.N.Z. Recording Scheme files, Mr. R. C. Zander for allowing me to consult his unpublished material, and my Wildlife Service colleagues for their assistance in literature-searching and comments on the manuscript.

LITERATURE CITED

BEAGLEHOLE, J. C., 1959: **The journals of Captain James Cook on his voyages of discovery. Vol. 2: The Voyage of the Resolution and Adventure, 1772-1775.** Cambridge University Press.

BULLER, W. L., 1868: On the ornithology of New Zealand. **Trans. N.Z. Inst.** 1: 213-231.
1877: Further notes on the ornithology of New Zealand. **Trans. N.Z. Inst.** 10: 201-209.
1888: **A history of the birds of New Zealand.** 2nd ed. London.
1893: Notes on New Zealand birds. **Trans. N.Z. Inst.** 25: 53-63.

FLEMING, C. A., 1962: History of the New Zealand land bird fauna. **Notornis** 9 (8): 270-274.

FORSTER, J. R., 1843: **Descriptiones animalium quae in Itinere ad Maris Australis terras per annos 1772, 1773 et 1774 suscepto.**

GUTHRIE-SMITH, H., 1895: Bird life on a run. **Trans. N.Z. Inst.** 28: 367-375.

HANDLY, J. W., 1895. Notes on some species of New Zealand birds. **Trans. N.Z. Inst.** 28: 360-367.

HOLLOWAY, J. T., 1959: Pre-European vegetation of New Zealand. In McLintock, A. H, (ed.) **A descriptive atlas of New Zealand,** pp. 23-24. Gov't. Printer, Wellington,

JOHNSGARD, P. A., 1965: **Handbook of waterfowl behaviour.** Cornell Univ. Press.

KIRK, T., 1895: The displacement of species in New Zealand. **Trans. N.Z. Inst.** 28: 1-27.

McALLUM, H. J. F., 1965: The adaptation and increase in the paradise shelduck **(Tadorna variegata)** within a man-modified environment. **Trans. Roy. Soc. N.Z.,** Zool., 6 (12): 115-125

OLIVER, H., 1968: **Annotated Index to some early New Zealand bird literature.** Wildlife Publication No. 106, Department of Internal Affairs, Wellington. 222 pp.

OLIVER, W. R. B., 1955: **New Zealand birds** (2nd Edition). A. H. and A. W. Reed, Wellington.

WILKINSON, A. A. and AMY, 1952: Kapiti Bird Sanctuary. Masterton Printing Company. 190 pp.

ZANDER, R. C. W., 1967: The paradise duck **(Tadorna variegata)** in the Southland and Otago Acclimatisation districts. Unpublished Diploma of Wildlife Management dissertation, Zoology Dept., Otago University.

THREE SONG THRUSHES AT MACQUARIE ISLAND

By W. J. MERILEES

During the morning of 30/8/67, at the Australian National Antarctic Research Expedition Base at Macquarie Island (45° 30′ S., 159° 00′ E.) three Song Thrushes *Turdus philomelos* suddenly appeared. One, a female, which was collected by John Evans (Medical Officer) and the author, is now in the National Museum of Victoria, Melbourne, Australia, number B 9351. This is the first reported occurrence of the Song Thrush at Macquarie Island.

The occurrence of the Song Thrush at Macquarie Island is not surprising in so far as this species has been recorded at all the other outlying Islands of New Zealand with the possible exception of the Antipodes (Williams, 1953: 679). Perhaps of greater interest is the speculation as to where these birds originated and the weather pattern which enabled their arrival.

Macquarie Island and its closest neighbours, the Auckland Islands, 400 miles north east ,and Campbell Island 430 miles east north east, are in the belt of strong prevailing north-westerly winds known as the Roaring Forties (see Fig. 1). At Macquarie Island these winds average nearly 20 knots and for 70% of the time they approach the island from between 255° and 345°. 90% of all weather observations show the sky to be at least 50% overcast (Law and Burstall, 1956: 31-32). At Campbell Island, the only other permanent

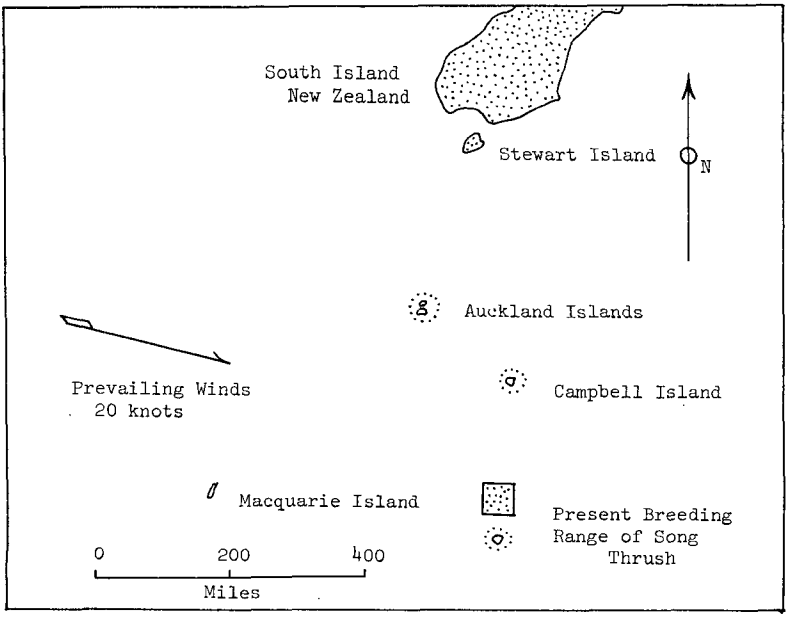


FIGURE 1 — New Zealand and Subantarctic Islands

weather station south of New Zealand proper, the weather conditions are very similar (Bailey and Sorenson, 1962: 40). The strength and direction of these winds make it highly unlikely that passerines from the Auckland Islands, Campbell Island or New Zealand would have favourable wind conditions for a passage to Macquarie Island.

On 29/8/67, a low pressure centre (anticyclone) passed very close to Campbell Island and produced surface winds of 40 knots

Table 1 -- Wind Speed and Direction -- Campbell Island

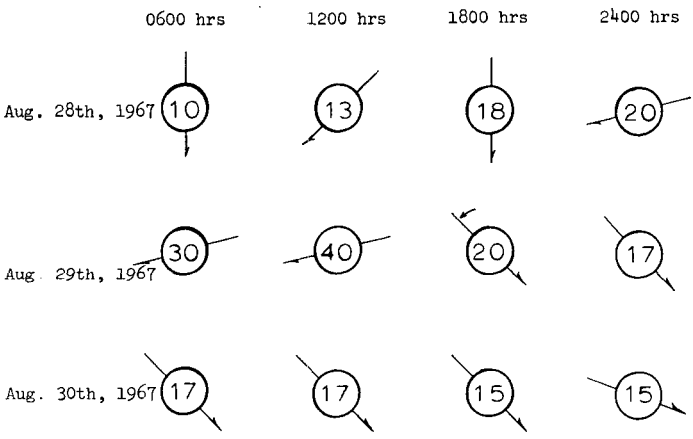


Table 2 -- Wind Speed and Direction -- Bluff, New Zealand

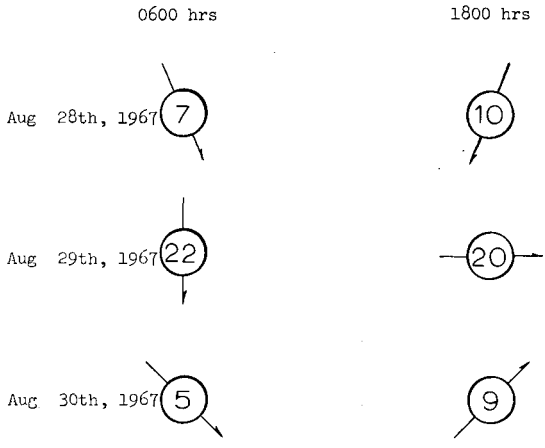
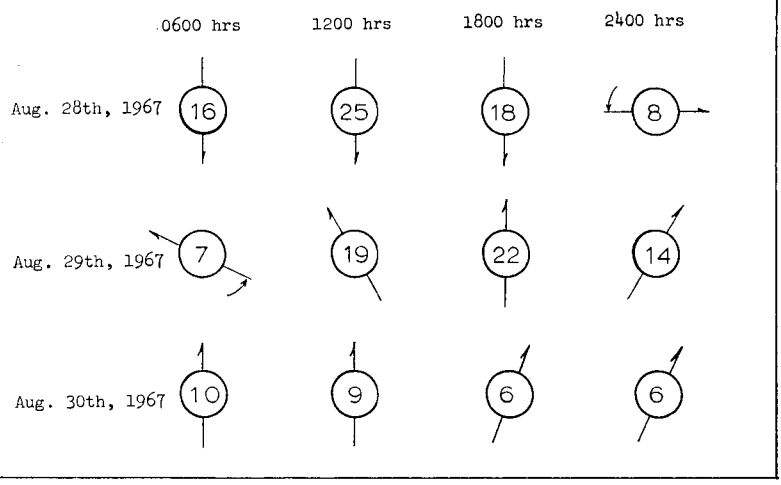


Table 3 -- Wind Speed and Direction -- Macquarie Island



(gusting to 85 knots) from the north east. As the storm passed the winds decreased to 35 knots and swung around through north to the north west (see Table 1). To the north, at Bluff, New Zealand, the winds were from the north averaging 20 knots (see Table 2), and at Macquarie Island they were from the south averaging 15 knots (see Table 3). Owing to an absence of other weather stations in this area this is the only weather data available for this period.

This overall weather pattern as recorded by the weather stations at Bluff, Campbell Island and Macquarie Island is not the normal one, particularly the high north-easterly winds at Campbell Island. Such conditions are present only three or four times per year.

These birds which arrived at Macquarie Island must have originated in one of three areas: either Australia 1200 miles to the north-west, New Zealand 600 miles to the north or one of the sub-antarctic islands mentioned earlier. In Australia the Song Thrush is moderately common only in parts of Victoria (Wheeler, 1967: 56) but the species has not yet become established in Tasmania (Sharland, 1958). Therefore Australia seems an unlikely point of origin. In New Zealand the Song Thrush is also common (Falla et al, 1965: 214) and the distance to Macquarie Island is not excessive. The winds on the 29th seem favourable for such a passage to occur. The same may be said for Campbell Island and probably the Auckland Islands as well.

Eastwood, 1967, gives the flight speed of thrushes in Europe, from radar studies, at between 22 and 35 knots. Birds leaving New Zealand would therefore have a ground speed of approximately 50 knots and birds leaving the subantarctic islands a ground speed of approximately 55 knots. The minimal approximate flight times required to cover these distances would be 12 hours and 7 to 8 hours respectively.

However, the southerly winds recorded at Macquarie Island suggest the birds may have been carried past the island and then doubled back before they reached the island on the morning of the 30th.

Williams, 1953, in discussing the role winds have played in the dispersal of birds explains that many features of bird distribution cannot be accounted for by the " prevailing wind theory " and that these can best be accounted for by occasional winds blowing from other quarters. This explanation seems most applicable to the arrival of the Song Thrush at Macquarie Island.

Williams also suggests " that powerful wind storms have first carried the birds out of sight of land." If this is true for the present observation then this suggests either Campbell Island or the Auckland Islands as the more likely source of the Song Thrush which arrived at Macquarie Island. Only at these two locations does it appear that the wind speed was greatly in excess of the Song Thrush's normal flight speed.

The colonisation of Southern Greenland by the Fieldfare *Turdus pilaris* (Salomonsen, 1951) is a classic example involving non-prevailing wind transport. This particular wind-induced movement in 1937 enabled the Fieldfare to establish a breeding population in Southern Greenland which was maintained until recently. Salomonsen estimated the flight time to be between 15 and 20 hours at a ground speed of approximately 100 kilometers per hour (53.6 knots).

It is also of interest to note that the incidence of vagrants in the genus *Turdus* is very high probably due to their susceptibility to weather-induced movements. Of the 16 species of passerines listed by van Koersveld (1954) as vagrant for the Netherlands, four are species in this genus. Whether the Song Thrush in New Zealand is subject to similar movements does not appear to be documented.

At Macquarie Island the Song Thrush were only seen on the 30th. Should they have left the island after this time and not have fallen prey to the wild cats which frequent the areas where they were observed, they would have had quite favourable conditions for departure.

ACKNOWLEDGEMENTS

The author wishes to thank the Directors of the New Zealand Meteorological Service and the Commonwealth Bureau of Meteorology (Australia) for their very helpful assistance in providing the weather data presented in this paper and to Dr. Rudi Drent, Dept. of Zoology, University of British Columbia for critically reading this manuscript and suggesting some important changes.

BIBLIOGRAPHY

BAILEY, ALFRED M., and SORENSEN, J. H., 1962: Subantarctic Campbell Island: Proc. No. 10, Denver Museum of Natural History.
EASTWOOD, E., 1967: Radar Ornithology. Methuen, London.
FALLA, R. A., SIBSON, R. B., and TURBOTT, E. G., 1966: A Field Guide to the Birds of New Zealand. Collins, London.
LAW, P. G., and BURSTALL, T., 1956: Macquarie Island. A.N.A.R.E. Interim Reports, 14.
SALOMONSEN, F., 1951: The Immigration and Breeding of the Fieldfare (**Turdus pilaris** L.) in Greenland. Proc. 10th Int. Orn. Congr. Upsala, 1950, 515-526.
SHARLAND, M., 1958: Tasmanian Birds. Angus and Robertson, Sydney.
van KOERSVELD, E., 1954: Rarae Aves. Ardea 42, 281-313
WARHAM, J., 1969: Notes on some Macquarie Island Birds. Notornis XVI: 190-197.
WHEELER, W. R., 1967: A Handlist of the Birds of Victoria. V.O. R.G., Melbourne.
WILLIAMS, G. R., 1953: The Dispersal from New Zealand and Australia of some Introduced European Passerines. Ibis 95: 676-692.

Plate II — Royal Penguins during the guard stage: the heavy-billed male stands by while the female feeds the chick.

ASPECTS OF BREEDING BEHAVIOUR IN THE ROYAL PENGUIN
Eudyptes chrysolophus schlegeli

By JOHN WARHAM
Zoology Department, University of Canterbury

SUMMARY

The breeding cycle begins in late September, when the mature males come ashore after their winter at sea to occupy their nesting sites, and ends in early April, when the breeders return to sea following their annual moult. This cycle of nesting and moult is outlined and the main patterns in a complex sign-language of display and posturing are described.

1. INTRODUCTION

This paper is the second in a series to deal with the behaviour of all the *Eudyptes* penguins on their breeding grounds. That on the Rockhopper Penguin *(E. crestatus = chrysocome)* has already appeared (Warham, 1963). The present observations were made between 19 December 1959 and 12 March 1961 while the writer was biologist with the Australian National Antarctic Research Expedition (A.N.A.R.E.) at Macquarie Island. Other work on the present species done during this period but not reported on here formed part of a long-term A.N.A.R.E. programme to investigate the population ecology of the bird under the direction of Dr. R. Carrick. In 1960 this mainly involved the flipper banding of large numbers of chicks. 6,683 were so marked at four different colonies while in 1961 many hundreds of these and other banded birds were re-sighted at their natal colonies or elsewhere. Information resulting from this large-scale banding is being incorporated in the long-term study (Carrick, in preparation) and some has been recently published (Carrick and Ingham, 1970).

There are few previous accounts of this sub-species, the most valuable being those of Falla (1937) and of Carrick (1964). Useful comparative data on the typical race are to be found in Matthews (1929), in Gwynne (1953) and in Downes, Ealey, Gwynne and Young (1959).

The Royal Penguin breeds only at Macquarie Island. Although birds of this species in adult plumage appear on other sub-Antarctic islands such as Campbell Island in the summer (where partnerships may be established between birds of opposite sex — personal observations), the Macquarie Island population shows a high degree of endemism. Nest sites and mates are retained from year to year and young birds show a marked tendency to return to their natal colonies.

Eudyptes c. schlegeli is a medium-sized penguin standing about 40 cm high. Adults have long, orange-coloured, non-erectile plumes which arise on the centre of the forehead and droop over the back of the head and behind the eyes. Like other Eudyptids, Royals show a marked sexual dimorphism in body and bill size. When feeding chicks and thus unencumbered with extensive fat deposits adult females weigh about 4.0 kg whereas their mates average about 4.5 kg. The bills of 10 adults of both sexes measured by A. Gourin (A.N.A.R.E. records) were 65 - 70 mm long (mean 66.4 mm) in the males and 55 - 64 mm long (mean 57.8 mm) in the females and their bills were

31 - 34 mm deep (mean 32.8 mm) in the males and 28 - 32 mm deep (mean 29.4 mm) in the females. These size differences are usually readily apparent in pairs at their nesting sites — Plate II.

The Macaroni Penguin *(E. c. chrysolophus* differs mainly in having black cheeks and throat, areas that in the Royal Penguin are white or pale grey. Judging from the data given by Downes *et al* (1959) Macaronis may also have slightly smaller bills. A very small proportion of the breeders at Macquarie Island also have black throats and cheeks. Such birds are rare. Their under flipper patterns are similar to those of *schlegeli* and the two types interbreed. Conversely, at Heard Island a few white-faced birds are found among the typically dark faced Macaronis (Downes *et al, loc cit*). Birds showing various intermediate conditions between the white faced and dark faced forms are plentiful at Macquarie.

Royal Penguins are colonial when breeding and they occupy about 46 small (< 1,000 nests), medium-sized (1,000 - 10,000 nests), and large (> 10,000 nests) colonies. Precise delimitation of colony boundaries is difficult as in some areas, e.g., at Upper Nuggets and South West Point, breeding groups are more or less contiguous although the young nevertheless tend to return to their own particular " sub-colony."

These breeding aggregations may be along the shoreline and almost down to high water or inland and up to nearly 500 feet above sea level. They tend to occupy open and fairly flat ground with a sandy substrate or one where the rocks and pebbles are fairly small. Occasionally, as at Aurora Point, nests may be located among coastal talus comprising rocks several metres across. Often there is some admixture with Rockhoppers but the latter tend to lay among the more broken rock debris and between tussocks on the slopes above the talus so that where the two species are adjacent the Royals nest closer to the sea than the Rockhoppers.

The world's largest breeding group of Royal Penguins is at the south eastern end of the island at Hurd Point where the birds are spread out across a triangular area of rather flat sand and small rocks estimated by Ainsworth (in Falla, 1937) to cover about 16 acres. The landing places here lie on two sides of a triangle whose base is the bottom of a steep tussock-clad slope. This colony occupies much the same area as that visible in J. F. Hurley's photograph taken between 1912 and 1914. The main difference is that the western edge of the colony was closer to the sea when the earlier picture was taken compared with the situation today, a difference also evident when another photograph taken by Hurley and reproduced by Mawson (1915, vol. 2, p. 226) is compared with those taken by me in 1960. This difference is probably due to the " erosion " of the bird's nesting and resting area above the beach by Southern Elephant Seals *Mirounga leonina.* Several harems comprising about 150 animals are visible in the 1960 photographs, none at all in the earlier ones. Some of the effects of seals on the penguins are discussed in section 2g below.

The smallest colony noted during my stay was one of about 60 nests. It was situated on the seaward side of the main King Penguin *Aptenodytes patagonicus* colony at Lusitania Bay — Plate III. There were two groups of about 30 nests, each lying one either side of a shallow water course. This colony was evidently an innovation of the 1960/61 season, being absent the previous year.

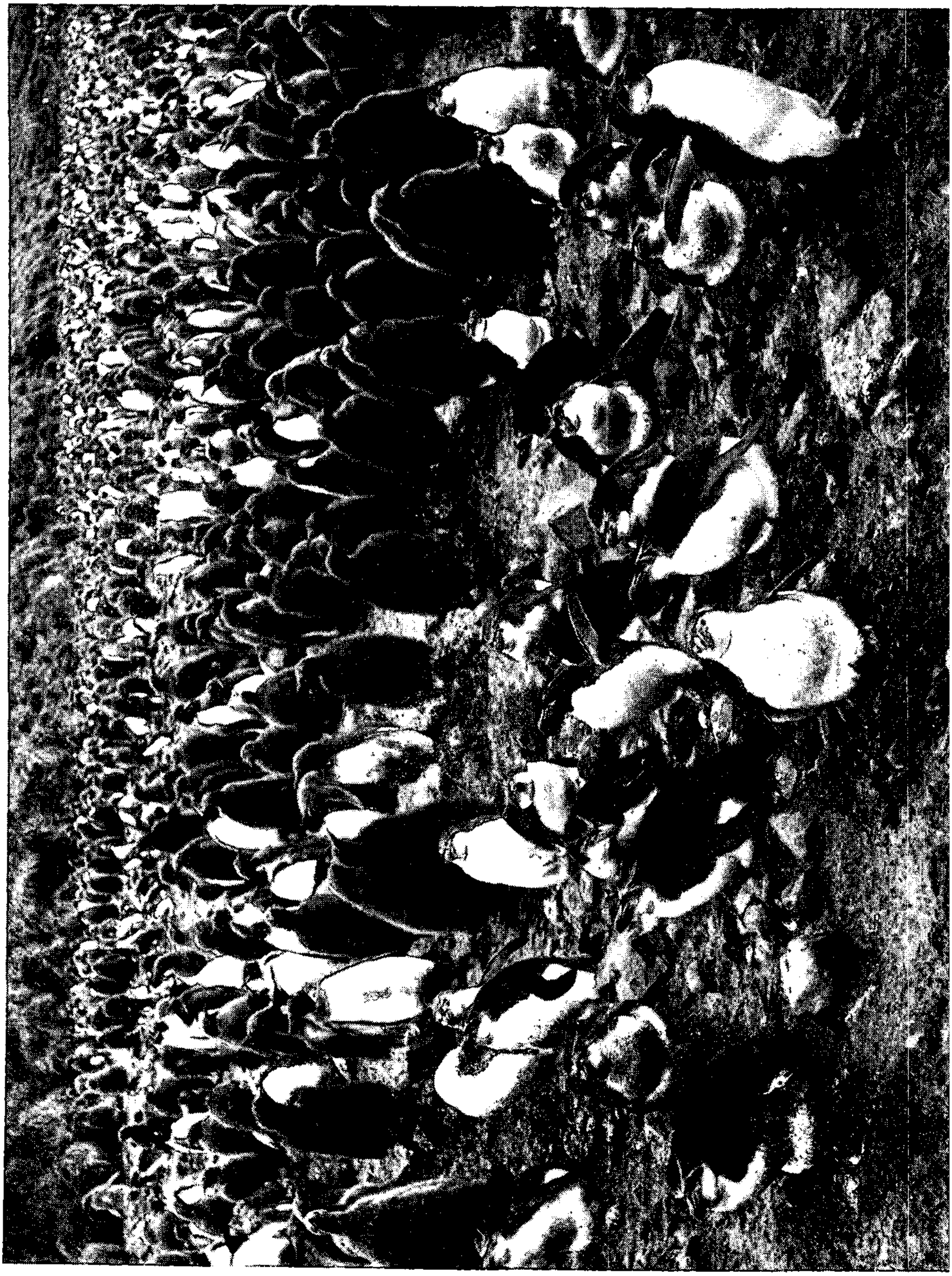


Plate III — Part of a small colony at Lusitania Bay on 31 October 1960. Note the "Macaroni type" bird standing with an egg in the centre of the picture. King Penguins in the background.

Access routes to the inland colonies follow the drainage patterns, the birds making their way to and from their landing places along permanent streams. Where such routes reach the sea and near the main landing areas at coastal colonies, quite large assemblies or "clubs" form. Most of the birds in these appear to be immatures or non-breeders as noted by Falla *(loc. cit)* and these sites are occupied throughout the breeding season, but by a changing clientele. That at Nuggets Beach, where Nuggets Creek reaches the sea has often been figured and sometimes described, in error, as a breeding colony.

2. THE BREEDING CYCLE

a. *General Outline*

Royal Penguins spend the winter at sea, returning to their nesting colonies from mid-September onwards, the males being the first ashore. The breeding cycle is highly synchonised and there seems to be little variation in the dates of the main events at a particular colony from one year to the next. Egg-laying takes place between about 10 and 30 October and after a few days the male departs leaving his mate to undertake the first incubation shift which lasts about 14 days. He then takes over for a similar span while the female feeds at sea. Both are present when hatching occurs between 21 November and 10 December. The chick, sole survivor from a two-egg clutch, is guarded by the male for 10 - 20 days during which time the female brings food for it, while the male fasts. The chick then enters a creche and the male goes to sea. Thereafter both parents feed their chick. Most of these leave for the sea in late January closely followed by the breeding adults who have to fatten up in preparation for their annual moult. They return to their nests after an absence of nearly five weeks and fast for a month while acquiring their new plumage. They leave the island from about the end of March; and after about 15 May no Royal Penguins are to be seen on or from the island until the following spring, as the successful breeders are the last category of the population to moult.

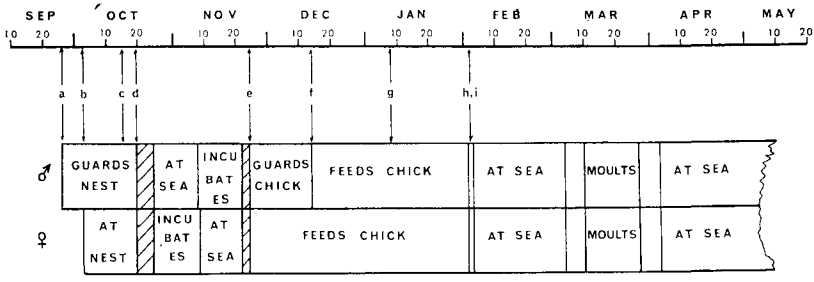


FIGURE 1 — Diagramatic cycle of successful breeders from arrival to departure after moult.

a: Male returns.
b: Female returns.
c: First egg laid.
d. Second egg laid.
e: eggs hatch.
f: chick enters creche.
g: chick starts to feather.
h, i: chick and parents depart.

(Cross hatching indicates periods where adults change duties frequently.)

This annual cycle, as shown by a typical breeding pair, is outlined diagrammatically in Figure 1 which may be compared with similar figures presented by Downes *et al* (1959) for the Macaroni and by Warham (1963) for the Rockhopper.

b. *The Occupation Period*

The majority of the breeding birds return to Macquarie Island during the second half of September. A few arrive earlier and there are A.N.A.R.E. records of birds at Lusitania Bay as early as 3 September and at Hurd Point about 6 September. One would expect to find atypically early arrivals at the biggest colonies as these provide a bigger potential population to draw upon but although the breeding timetables are quite rigid there appear to be some variations in chick development between colonies and these may be reflected in differing mean dates of arrival, but I have no data on that.

Events at the medium-sized Flat Creek colony on the west coast in 1960 illustrate the general pattern of colony growth during this occupation period:—

10 September	No birds present.
14 September	14 birds in two groups near centre of colony.
16 September	38 birds in loose group in centre of colony.
19 September	c. 400 birds scattered over whole area.
22 September	Many single birds, no pairs, colony perhaps ¼ full.
27 September	Colony almost full of single birds.
30 September	Some pairs now present.
2 October	Many pairs now present.
6 October	Colony full of pairs and copulation seen.

The present information on dates of return agrees reasonably well with that given by earlier observers. Thus Ainsworth found (in Falla, 1937) that the first birds at Nuggets in 1912 came ashore on 15 September. The breeding timetable is about a month earlier than that of the typical race in the more severe climate of Heard Island and in Gwynne's table (1953, p. 27) the 8 and 9 November given as laying dates for Macquarie are presumably errors for 8 and 9 October.

The first arrivals are males and although these may group together initially, they soon spread out to stand at their nest sites, collect stones and await their mates. These appear about 8 days later. New arrivals usually land in small parties and just as they do later during their almost daily emergences when feeding chicks, the birds hasten to escape the pluck of the sea and then stand about preening, swishing their tails from side to side, and shaking their feathers free from water before slowly wending their way up to their breeding places.

With the arrival of the female there is much activity, greeting ceremonies are frequent and there is a great deal of nest-making, much fighting and copulation. Both members of a pair appear to remain at or near the nest site until the eggs appear and incubation proper begins.

c. *Egg Laying and Incubation*

The first and smaller of the two eggs comprising the clutch start to be laid about 8 October and the second egg appears from 4 to 6 days later. The mean date for the laying of the eggs is, however, later, being around 16 October for the first egg. This is seldom incubated but one or other of the pair stands over it and they change guard fairly often at this time.

Incubation proper begins with the arrival of the second egg and one or other of the adults adopts a more prone position, tucking the eggs into the highly vascularised brood patch which both sexes possess and which, because of the thickness of the ventral plumage, forms a kind of pouch within which the eggs are held while being partly supported by the sides of the feet. After some days the male leaves for the sea and according to Carrick (1964) some of them may not leave until 10 days after egg laying. By the time that the males do depart they have been ashore without food for about a month.

The colonies are quieter now as the females are less aggressive than their mates and with only one bird to each nest and that one engaged in continuous incubation, there are fewer occasions for bickering.

This genus seems to be unique among birds in laying a small first egg in a two-egg clutch. Gwynne (1953) measured 13 clutches of *c. chrysolophus* at Heard Island and gives a mean size for the first egg of 70.6 x 49.1 mm (range 66.0 - 82.4 x 45.3 - 52.7) and for the second a mean size of 80.9 x 58.7 mm (range 78.1 - 88.0 x 54.8 - 61.7). The mean weights of the eggs were 94.0 g (range 78.9 - 105.4) and 154.5 g (range 128.2 - 171.4).

No eggs were measured by me and the data in the literature for *schlegeli* e.g. those given by Falla *(loc. cit)* and Schonwetter (1966) are unsatisfactory as dimensions for first and second eggs are lumped together. However Soucek (in Gwynne, 1953) gives the mean weights of first and second eggs as 102.8 and 162.2 g respectively and their mean lengths as 68.7 and 80.7 mm.

It will be seen from Figure 1 that in this species, as in other Eudyptids so far studied, it is the female who undertakes the first incubation shift. This occurs despite her having been ashore without food for nearly three weeks and having produced two eggs in that time. Carrick and Ingham (1967) emphasise the importance of adequate fat reserves in the hens if these are to withstand the stresses of egg production and of fasting for nearly 5 weeks from their arrival until their mates take over at the end of a 19-day incubation stint. These workers state that hens lighter than 4.8 kg on arrival rarely lay but that some hens weigh as much as 6.3 kg at this juncture.

With the start of laying, eggs begin to be found outside nests. Such eggs are seldom retrieved but tend to get displaced downhill if not taken by predators. Relaying does not seem to occur and if both eggs are lost, nesting fails for that year. So many eggs are found out of the nests that some observers have concluded that the birds deliberately kick out the first egg. Losses are not however, confined to these eggs; many second eggs are lost too. Naturally the smaller ones predominate if only because they are subject to

risk for 4 to 6 days longer than the large ones and furthermore the risk during these days is greater than it is later as the birds not only fail to sit properly but also change guard frequently. That both eggs may be viable is shown by the fact that two may be hatched in the same nest, although if two young are ever reared, this must be most unusual.

I can find no eye-witness accounts of a Royal Penguin ejecting one of its eggs and Gwynne (1953) who discusses this matter in connection with incubation of Macaroni and Rockhopper eggs, evidently did not see this either, although he clearly believed that it happened. Similar losses are experienced by other members of this genus but more work seems necessary to determine the causes; how much loss is due to the way in which the birds stand over the first egg so that it can be easily dislodged during the disorders so common at this stage of the breeding cycle when there are pairs at every nest and the colonies are crowded; how much is due to deliberate actions of the birds (in the absence of human influences), and how much is due to infertility and to other factors.

With such vast numbers of birds in view, one often comes across anomalous behaviour.. Some penguins may sit on three eggs, the extra ones probably being strays captured from higher nests. Some eggs get coated with mud during rain and then dry out to become cemented to the ground where they resist all the efforts of the sitting birds to turn them with their bills, while sometimes penguins may be found sitting on nests in running water with their eggs warm on top but cold below.

d. *The Chick Stage*

I have no information on which egg hatches first if both survive, but usually both parents are present at the hatch and according to Carrick (1964) the female is present for about a week before this event. Hatching occurs from 33 - 36 days after the laying of the second egg (A.N.A.R.E. data collected by A. Gourin and S. E. Szordas); for 35 days according to Carrick. The latter is the same period as determined by Gwynne (1953) for the typical race.

The male remains at the nest for a further three weeks after the hatch during the so-called " guard stage." Initially he treats the chick rather like an egg, tucking it into his brood pouch. Feeding of the chick at this stage seems to be the sole responsibility of the female but I have few observations on the male's behaviour during the first few days of the chick's life nor were data collected on the frequencies with which meals were provided by the female although these seemed to be of the order of two visits every three days. On each visit a succession of meals is given by regurgitation (Plate II).

Growth is rapid during the guard stage. When alarmed the chick burrows beneath its guardian but soon can only get its fore-parts concealed while its posterior protrudes from beneath the parent's legs. The chick's rear is then well protected by the adult's heavy bill. During the guard stage the main activity between parent and chick apart from brooding is the preening of the latter by the former.

As the chick grows it becomes more mobile and venturesome and the end of the guard stage is marked by the appearance of small groups of three or four chicks away from the nests. These creches begin to form from about 15 December, the date varying somewhat between colonies but the earliest creches are generally seen at the larger colonies. Even on 15 December in 1960 some adults were tending two chicks but as none had been marked it was not certain that they were true siblings or whether a chick from another nest had been accepted by the on-duty male. It is more usual for the males to repel chicks that are not their own. The latter may assist their parents, striking with bill and flippers.

By about 30 December most breeding males are spending their days at sea and both parents now feed the chick. No data were gathered on the frequency of feeds at this time nor on how the parents share these duties but both appeared to forage independently. They brought large quantities of *Euphausia* and some cephalopods. According to Carrick and Ingham (1967) euphausids constitute the main food.

The chicks start to replace their down with feathers in the first half of January and the creches begin to break up as the chicks become stronger. The huddles re-form in the face of any large-scale threat such as the near approach of a man. From about 25 January the creches are no longer seen and the young birds wander quite extensively or may stand on their nests if no big-crested pre-breeders are in occupation. Occasionally the big chicks may pick up stones and add these to the nest and at this time chicks are often seen dancing about on tiptoe while beating their wings violently. During these gyrations they seem unaware of the pecks they receive from bystanders with whom they collide.

By the end of January most chicks have moulted their down and many have fledged. The main body of them has gone by the end of the first week of February. My latest sighting was on 19/2/61, when an adult was feeding a well-feathered chick at Aurora Point.

Although no chicks were marked for this purpose it seemed that in the post-guard stage a chick is fed only by its own parents and then only on the nest. Typically on returning to its nest a breeder displays with forward or perhaps vertical trumpeting after which one or more chicks soon separate from a creche and teeter across to the nest, peeping loudly and waving their flippers. One of these is then fed on the nest site but if a second appears this is pecked vigorously and so repelled. With Rockhopper, Snares *(E. atratus)* and Fiordland Crested Penguins *(E. pachyrhynchus)* parents have only been seen to feed their own chicks on or close to the nest site (Warham, 1963 and unpublished).

Chicks seem to have an excellent sense of position as those displaced during mass banding operations were later being fed at nests many yards from their release points. Their ability to pick out their own from many thousands of similar nests suggests some sort of imprinting by features on the horizon or an ability to pick out the voices of their parents from a considerable distance and amid a great torrent of sound, or both. A similar ability to return to nests after displacement has been recorded of other young sea-birds, e.g. the gannet *Sula serrator* (Warham, 1958).

Plate IV — The guard stage at a typical rocky site. Note the reasonably level ground with Rockhoppers higher up.

Variations in the states of development of chicks between colonies were not investigated quantitatively but some differences were rather obvious. Thus on 16/1/61 the young birds at the medium-sized colony about two miles north of Hurd Point were seen to be markedly more advanced than those at the much larger colony at the Point itself. Many chicks on the smaller colony were almost feathered and their yellow eyestripes were well defined; at the larger many still had quite extensive down on their backs. Rather similar differences had been noted between the chicks at these two colonies the previous season. There also appeared to be differences between the Flat Creek colony and that at Bauer Bay a few miles to the north, the Flat Creek birds being slightly larger at a given date. Finally my notes include several references to the condition of chicks in the Nuggets colonies where those being reared high up and far inland seemed to be less well developed than those at the colony closest to the sea.

Such differences might be due to a number of factors such as differences in the mean ages of the breeding birds at the various colonies as established by Coulson and White (1958) for the Kittiwake *Rissa tridactyla* but it seems more likely that due partly to the tendency of the young to return to their natal colony and of breeders to retain their nest sites and mates from year to year, a degree of genetic isolation develops between colonies that may be reflected in their time tables and perhaps even in their feeding patterns and movements as in the colony-specific dispersal of European Cormorants *Phalacrocorax carbo* studied by Coulson and Brazendale (1968).

e. *Adult Moult*

The departure of the chicks is quickly followed by the return of the adults to sea where they feed up and put on subcutaneous fat in preparation for their annual moult. Birds that have bred successfully start to re-appear ashore during the first week of March. Like other " pre-moult fats " these are noticeably obese and their dorsal feathers soon start to show the dull bronzing that precedes the fall of the old feathers.

Sixteen adults of mixed sexes weighed on average 6.6 kg on arrival as compared with a mean weight of 4.0 kg for five that had moulted. The comparison emphasises the value of sub-dermal fat as an energy reserve during the moult, a time when feeding is impossible.

Breeders return to their nests where they are joined by their mates. Numbers at the medium and large colonies reach a peak around the second week in March, after which there is a steady decline and a mainly one-way traffic of moulted birds down the creeks and beaches to the sea.

Loss of feathers does not begin immediately the birds reach their nests but from 4 to 6 days after that. From 15 to 19 days elapses from the loss of the first to the last feather but when the body feathers have been replaced those of the tail are still very short and further feather growth continues for 5 to 7 days before departure. In their grey-blue and white coats the moulted birds look very dapper and slim, while the rather brownish cast of the colonies as seen from a distance has now been replaced by a bluish

tone. During calms the shed feathers lie thickly on the ground but a wind piles them up into drifts and swirls them into the air like snow scurries. The colonies are fairly noisy during the moulting period, for although the birds are much less active now, many still display and there are some squabbles between neighbours.

The breeders' final disappearance to sea after from 24 to 29 days ashore is preceded by an orgy of bathing either out beyond the breakers as at Nuggets Beach and Bauer Bay or in small rock-walled embayments such as occur at Hurd Point and Flat Creek. Sometimes groups of moulted birds return to the shore and even climb back to the colonies but such visits appear to be only brief and they may arise when moulted birds get caught up with bands of pre-moult fats on their way inland. In those few instances where I was able to watch closely, the birds of a pair completed their moult at different times and neither arrived nor departed together.

By the beginning of April the colonies are thinning out and they are half empty by the middle of that month. Some birds are still ashore in early May and on 11 May 1960 there were still 56 on Nuggets Beach. The last Royal Penguins seen ashore that season were on 13 May and as the first seen ashore the following spring was on 12 September, the species was absent for almost exactly four months.

f. *Immatures*

Adolescence in the Royal Penguin lasts a long time. Carrick and Ingham (1967), from data on 11 successive age classes found that a few five-year-olds lay (though none fledged a chick), that most seven-year-olds come ashore at egg laying but that some are eleven years old before they breed. These workers also established that the birds come ashore progressively earlier and stay longer with increasing age.

Although two-year-olds and some three-year-olds may be recognisable by their smaller sizes and shorter crests, it is the yearling class that is readily identifiable without reliance on marked birds. Yearlings are smaller and slimmer than the adults and have rather small heads and bills. These latter are dull and brownish rather than reddish brown as in the adult but the irides can be almost as bright as the reddish-brown eyes of the adults. Yearlings have very short crests and their cheeks tend to be greyish rather than white. Very occasionally wholly dark cheeked and throated "Macaroni" types are seen.

Yearlings start coming ashore in late November, about a fortnight later than the two-year-olds. Their numbers increase slowly but by about 20 December they are numerous although tending to stand at the edges of the colonies or in the "clubs" above the landing places. They are rather timid and during mass banding operations tend to congregate with the chicks rather than with the adults. According to Carrick and Ingham *(loc. cit.)* individual yearlings do not stay ashore for long at this time of the year. Nevertheless, presumably because their landfalls are not tightly synchronised, in 1960 and 1961, yearlings were seen from about the third week of November until the third week of February. Evidently individual birds come ashore in December and then return to sea to put on

Plate V — During the moult many immatures stand in "clubs" near the breeding colonies. Aggressive encounters such as that seen in the foreground occur whenever these penguins are assembled together.

weight in readiness for their moult and by the last week of January many have started to shed feathers and some have moulted. Three yearlings before the moult averaged 5.0 kg in weight compared with a sample of 8 moulted ones with a mean weight of 3.5 kg.

In the absence of the breeding birds during their fattening up period at sea, yearlings and other immatures penetrate to all parts of the colonies. Thus at Flat Creek on 19/2/60 only the centre of the colony was occupied but the yearlings were outnumbered by rather longer crested birds probably mostly two-year-olds. Most of the yearlings had moulted and left by that date.

Few data on older classes were gathered but big-crested non-breeding birds became noticeable in the post-guard stage. Thus at Hurd Point on 11/1/61 there were many big-crested birds wandering about either singly or in groups and there were far more birds of this type present at that date than yearlings. During this re-occupation period pairs formed and stood around on nests as if owning them, and the males in particular attacked creched chicks. It may be that in this species, as in the Rockhopper, one consequence of the female's taking the first shift on the egg is that the male gets the first spell with the chick and is able to guard it from attack by aggressive but adolescent 'big crests,' the males of which may be powerful enough to interfere with the breeding females when these try to feed their chicks, but which are not powerful enough to interfere with the established males.

It is mostly about this time that groups of penguins in adult plumage are found climbing above the highest colonies and onto the open plateau. Some, like the group of six on 7/1/61 found wandering about several hundred feet above the uppermost of the two colonies above Sandy Bay, almost reach the top of the island.

g. *Some Mortality Factors*

Apart from the prodigality involved in laying two eggs only to raise one chick, there is a very heavy mortality of chicks on the island. Carrick and Ingham state that at their study colony of 2,000 laying pairs only about 750 young are fledged each year.

Many factors are concerned in these losses which start at the egg stage. Not only are eggs lost accidentally but Southern Skuas *Stercorarius skua lonnbergi* and Wekas *Gallirallus australis* may take developing eggs and cause nesting failures. Skuas will pester sitting birds at the fringes of the colonies until they over-reach and allow the egg to be uncovered for long enough to allow the skua to get it. Attempts are made to take small chicks in the same way although I never saw a successful capture. Possibly Southern Giant Petrels *Macronectes giganteus* also get peripheral chicks as they take the larger ones of King Penguins at Lusitania Bay and many fledglings are killed and eaten near the colonies during the young Royals' departures. These birds seem particularly vulnerable during their progress from the inland colonies downstream and giant petrels are often encountered in the stream beds and half hidden by overhanging tussocks feeding on the dead and dying. Others sit offshore in flocks waiting for suitable victims.

Southern Elephant Seals also cause some mortality when they haul out into coastal colonies. Birds with eggs or chicks will not

Plate VI — Elephant Seals cause casualties when they encroach onto breeding sites. This animal caused deaths to both adults and chicks during an intrusion shortly after hatching.

normally shift when confronted by a seal but attack it with their bills. In the result the harassed animal may sweep around in alarm, flattening and killing the birds beneath it (Plate VI).

Elephant Seals may also prevent and hinder the access of breeding penguins to coastal colonies. Thus after a southerly gale on 19-20/10/60 very heavy seas pounded the beach at South East Bay where the seal harems were forced high up the beach and up to the edge of the penguin colony there. Jammed tightly along the shore for several days the seals constituted a severe hazard to the incoming birds. The penguins would cluster on the seaward side of the seal barrier looking for an opening. If one succeeded in getting through, those behind might find their passages more difficult as the first bird through often alerted the seals. Although no penguin was seen to get bitten or squashed a few very near escapes were witnessed and some birds did return to sea; their nest reliefs may well have been delayed or aborted.

New Zealand Fur Seals *Arctocephalus forsteri* also appear to inflict some casualties as birds with breasts pierced apparently by seal canines are occasionally found on the beaches. These seals have increased here as elsewhere in sub-antarctic New Zealand, so that casualties due to them may be expected to increase. Sea lions *Neophoca hookeri* are rare at Macquarie and Leopard Seals *Hydrurga leptonyx* not numerous and losses to seals of all kinds seem unlikely to be very important causes of mortality at the present time.

3. DISPLAY BEHAVIOUR

The displays used by the Royal Penguin are evidently very similar to those of the Macaroni Penguin as described by Matthews (1929) and by Downes *et al* (1959) and the actions of the occasional black-throated birds at Macquarie showed no obvious differences between those of their light-throated neighbours or mates. None of the above authors describe the displays completely and Downes *et al* fail to distinguish between the trumpets used during greeting and recognition at the nest and the actions involved in head swinging, both being referred to as "mutual epigamic display" or "ecstatic display."

There are many variations in the postures and movements described in the following sections, variations due to individual idiosyncrasy and variations due to the intensity of the birds' reactions to the stimuli triggering off the display: many displays are incomplete and are performed in silence. Such individual variations probably provide important clues for individual recognition. It is easy for the human observer to learn to recognise particular birds by peculiarities of voice and posture, so that it would be most surprising if a highly aggressive and mate-specific bird such as this did not utilise these peculiarities in identifying its mate.

a. *Displays of a Sexual Nature*

1. *Mutual Allopreening.*

Mated birds frequently preen each other's heads, necks and napes, turning their heads to one side so that they can reach each other simultaneously. Parents and feathering chicks behave similarly and allopreening is common too between members of temporary partnerships. It then appears to indicate that the female has been

accepted, at least temporarily, by the male and her intrusion within his " individual distance " tolerated. Mutual preening occurs between members of opposite sexes from one year old onwards and also between chicks (sexes unknown) while in the creches. It is seen whenever and wherever numbers of Royal Penguins are ashore.

2. *Nest Forming.*

The bird squats on its belly with its flippers extended and resting on the ground. By pressing backwards with its feet the penguin rotates on its axis and so tends to form a hollow beneath it by the combined actions of belly and feet. This behaviour occurs at both rocky and sandy sites. In the first situation little is usually achieved and the feet may be seen pressing unavailingly against stones or boulders, but at sandy sites appreciable hollows result and the birds may incubate with the sand banked up around them. Nest forming is seen mainly before egg laying, occasionally during the re-occupation period and again, but not very often, during the moult.

3. *Stone Carrying.*

The first males to arrive after the winter at sea soon start to carry stones to their nests and this activity continues in some degree throughout the breeding season and during the moult. Substantial accumulations may result and during the winter these mark the sites of the now abandoned nests. At the Bauer Bay " sandy rookery," where there are no stones, beakfuls of sand are collected and deposited around the rims of the nests. Some birds here and elsewhere also collect tussock grasses and line their nest hollows with these, but for most pairs away from the edges of the colonies, such materials are not available.

The carrying of stones and substitute objects, such as bones, to the nest is a common activity of the male following a changeover at the nest and many males hurry to and fro collecting stones before they finally set off for the sea. Desultory stone carrying is seen on the beaches and in the streams and other approaches to the colonies. It is an activity best developed in the male birds.

4. *Quivering.*

Bending down into the nest, beak towards its feet, chick or egg, the bird shakes its head rapidly through a narrow arc while moving the head and neck from one flank of its body to the other. Chattering cries may accompany these actions. Incubating females commonly quiver when their mates add stones to their nests. Pairs may also display together in this way when standing in nests. Single birds often quiver after returning to eggs or chicks after a change of guard and quivering is often followed by bowing and head-swinging. Quivering was not seen away from the nest.

5. *Bowing.*

This starts with downwards movements of the bill and head into the nest. At the same time a series of deep throbbing cries is uttered, the body shaking with each throb. Bowing often follows quivering and is the usual prelude to head swinging although many bows do not develop further. The flippers are kept to the sides.

Bowing is done by lone birds or by mated pairs: the latter often reach over the rim of the nest with their beaks together, throbbing loudly. Bowing takes place throughout the breeding season and is used by both sexes but seems to be restricted to the nest site.

6. *The Shoulders-hunched Attitude* (Figure 2).

Before a bird of either sex takes over from its mate at the nest it adopts a constrained posture in which the body is erect but the head bowed so that the bill points downward. The shoulders are peculiarly hunched with a kink forming at the back of the neck. The flippers are held stiffly forward, their long axes at about 30° to the vertical and with their inner surfaces more or less parallel to one another.

FIGURE 2 — The shoulders-hunched attitude used at nest relief.

A bird walking onto its nest after a short absence uses this attitude: one that has been to sea usually goes first into a greeting ceremony with its partner but adopts the shoulders-hunched posture before it takes over on the eggs or chick. Both relieved and relieving birds posture, the one on departing and the other as it steps into the vacated position. Often they use a peculiar mincing gait as they change over. Lone birds may use this display when returning to their nest sites, even though these are empty and a similar posture follows coition. Away from the nest the attitude is seen when two adolescents come together at the start of temporary associations. It appears to have submissive as well as sexual elements and has some components in common with the slender walk described below.

7. *Trumpeting* (Figure 3).

A bird of either sex on rejoining its partner at their nest after a substantial absence switches from the slender walk when a few yards away and hurries forward with neck outstretched and flippers still extended and breaks into loud sustained brayings. Its partner responds with similar cries, reaching out from the nest, and neighbouring pairs also copy, stretching out towards the newcomer. As the latter reaches its nest and pushes up to its mate the din

increases as both birds stand upright and throw their heads back so that their bills are vertical and release a great volume of trumpeting sounds, while their flippers move up and down in time with the calls. Their pectoral muscles ripple and swell as the sound pour forth; the calls being given both on expiration and on inspiration. The penguins' heads may move slightly but they are not wobbled or swayed as in the quite distinct head swinging display. If the relieving bird has been away for a long time these ceremonies may be repeated several times before a nest relief occurs and this activity may stimulate vertical trumpeting in neighbours, although the latter usually relax sooner than the re-united partners.

FIGURE 3 — Forward trumpeting: the male (right) greets its mate (left) while a neighbour (centre) joins in.

The noise associated with this display is very considerable and is perhaps most noticeable at night when the general level of sound at the colonies is reduced. Some birds still come ashore after dark and the full ceremonial follows their arrival: sudden bursts of calling in the night indicate that a recent arrival is being saluted by its mate and neighbours.

This display is seen most often during the guard stage of the chicks as the females are coming ashore almost daily then, but it occurs also when the birds are re-united at the moult. It is essentially a mutual display and vertical trumpeting in particular is seldom used by lone birds. Singletons returning to their unoccupied nests generally adopt the shoulders-hunched posture, stand still for a few seconds and then switch to bowing, to forward trumpeting or to head swinging.

Forward trumpeting with beaks and necks outstretched and flippers raised and perhaps moved in time with their calls, accompanies the return of Royal Penguins to their nests after being shifted from them by the passage of a man through the colony: the din that follows mainly arises from the brayings of the birds returning to their nests or moulting sites, to the threatening that occurs as they sort themselves into their correct places, and to the head swinging displays that follow once the nest sites are re-occupied.

Forward followed by vertical trumpeting seems to comprise a greeting and recognition ceremony, the incoming bird being recognised by its partner some yards away from the nest while neighbours too appear to know it.

8. *Head Swinging* (Figure 4).

This is the most frequently performed and most obvious Royal Penguin display. It is used by both sexes and by lone birds or by pairs. The action starts with bowing, then the head is swung back so that the neck is vertical, the flippers are raised and the bill and foreneck are swung from side to side so that the bill almost touches the carpal joint at the end of each stroke. Some birds swing the head so far back that its arc of movement lies behind the upraised flippers. The latter are not waved up and down but move only slightly. Head swinging is accompanied by a series of raucous cries given with the bill open. The sounds are different from those used during trumpeting and have a more pulsing pattern perhaps as a result of the head movements. There is much variation from bird to bird in the sounds used and in the speed and extent of head swinging: some birds swing with a slow deliberate rhythm, others have very jerky actions. Some birds do not raise their flippers or raise only one; and often the performance is given in silence. If one bird is sitting or brooding it may not rise when the other begins displaying but may respond with head swingings while still seated. There is a tendency for the females, even when standing, to call without swinging their heads. In the Rockhopper the display is restricted to male birds (Warham, *loc cit*), and when Royals perform this display it is usually the males that are the initiators.

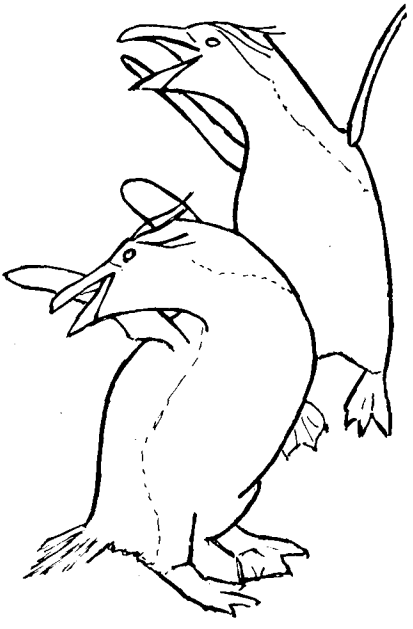


FIGURE 4 — Mutual head-swinging between a mated pair.

Head swinging occurs throughout the breeding season and again during the moult. It is not restricted to the nesting colonies but may be used occasionally whenever the birds are ashore. Immatures and even yearlings may give this display but much less frequently than do fully crested birds.

Head swinging commonly follows any disturbance such as the swoop of a skua low overhead, a bout of threatening between neighbours or even the noise of other birds displaying nearby. The display's main function seems to be that of advertising the bird's ownership of a territory.

9. *Coition.*

Most acts of coition seem to be initiated by the male. He crowds up to one side of his mate reaching towards her nape with his bill and with rapidly flickered flippers beats a tattoo on her back. She may then subside and allow him to mount. He treads up and down, gripping on with his feet and claws and dibbling with his bill round his mate's cheeks and neck while his dangling flippers continue to pat her flanks. His tail is at first swept from side to side as he gradually works backwards but it is eventually depressed to enable the cloacae to make contact. Both remain still for a few seconds during consummation, then the male descends and stands motionless for perhaps half a minute in a statuesque form of the shoulders-hunched posture. The prone female also remains motionless. Mutual preening, head shaking and body stretching may then follow as both relax.

Coition among the breeders ended as the eggs began to be laid but some acts of copulation between birds without eggs or chicks were seen as late as 16 December and on 26/12/60 an unbanded male made the flipper-patting preliminaries to a lone chick almost certainly not its own.

b. *Aggressive Displays*

Most Royal Penguins resist any close approach by penguins other than their mates and by other moving objects, and by means of various intimidatory movements try to keep strangers out of pecking range. The usual response is for the bird to reach forward towards the intruder; and lowering its hyoid and canting its head to one side, it emits a short burst of staccatto cries (Figure 5). It may bob its head up and down a little and hiss explosively and often raises its flippers ready for use. Such threats are usually effective but if the intruder comes close enough to be reached the territory owner strikes out hard with its chisel-tipped bill and flails out with its flippers. The attacked bird then either pulls back or defends itself with similar actions. During disputes between neighbours sitting birds jab at each other with opened beaks (Plate V) and these may get interlocked. In such instances a tug-of-war may develop and both sexes may take a hand in the conflict, the females reaching over their mates to spar with their opponents. In some fights the rights of other neighbours may be infringed upon so that a pair may find itself under attack from several quarters simultaneously. Although actual combat often takes place, particularly at periods when both sexes are ashore, and the pecking seems severe, no instances

in which birds were killed were seen. However, penguins with eyes missing or damaged were occasionally encountered and such injuries may have been the result of fighting.

Other displays mainly of a sexual nature described above often contain elements of threat. Thus a bird may switch abruptly from the " shoulders-hunched posture " to lunge at another bird. Forward trumpeting, too, seems to have threatening aspects and may lead to fighting — c.f. Richdale's note on the " open-yell " as a threat in *Megadyptes antipodes* (Richdale, 1951).

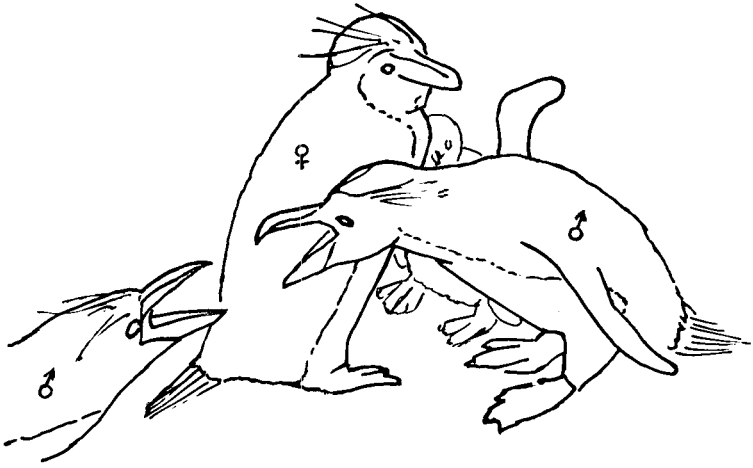


FIGURE 5 — Aggressive threatening between neighbouring males.

Acts of aggression are continually taking place at the breeding colonies and such acts, often apparently unprovoked, may be seen whenever two or more of these birds are joined together, even in the surf of the landing beaches where it seems pointless, if not actually dysgenic. The males are more pugnacious than the females and old established males seem to stand at the top of the peck order with yearlings and lastly chicks at the bottom.

c. *Postures Suggesting Fear*

1. *The Slender Walk*

Birds returning to their nests or moulting places, which they can usually only do by penetrating between other nesting or moulting birds, adopt a special posture. The head and neck are bowed, the body held fairly upright but the feathers are sleeked and the flippers are held stiffly forwards and roughly parallel to one another. The bird appears to be making itself as slim and inconspicuous as possible. It hurries through the throng, seeking the most open leads and dodging pecks without retaliating. When hemmed in it stretches up with its head high as if to keep its eyes beyond the range of the angry birds' beaks but presses on until a clearer space is reached. Here it pauses to perform the " stare around " before hurrying to its nest, mate or moulting place.

2. *The Stare Around.*

This is used during pauses in attempts to pass to and fro among assemblies of penguins. The bird stops suddenly and abandoning its submissive attitude, abruptly swings its head high with the beak somewhat raised to look over its shoulder, holding this posture for a second or so before jerking its head stiffly from side to side, pausing at the completion of each movement. The bird seems to be getting its bearings and it may then revert to the slender walk as it pushes on towards its goal.

3. *The Submissive Attitude.*

Incubating females are occasionally assaulted by other penguins usually of the opposite sex. Females make no attempt to retaliate but crouch down with their bills pressed to the ground even when their attackers peck viciously at their napes and backs. One female turned its beak completely underneath its body, hiding it effectively.

Such incidents were usually the result of disturbance by the observer. For example, a bird squatting in the submissive attitude on 29/10/60 in the hollow between three nests was pecked by the occupants of each. Then the nearest of the sitting birds suddenly got up and moved forward to cover an exposed egg nearer to me whereupon the crouching bird at once took over the vacated egg and settled down. Harmony was then restored. Evidently two incubating birds had shifted from their nests when approached and one of them had then sat down on the other's egg leaving the latter dispossessed. No such incidents were seen after the eggs had hatched, but submissive behaviour seemed to be the rule during incubation when the females were on duty. One result was that the eggs were covered and shielded from damage; whereas, had the penguins responded by threat and attack, the eggs might well have been destroyed in the subsequent fracas. The submissive attitude seems to be analagous to that adopted by the Kittiwake (Cullen, 1957), the Australian Gannet *Sula serrator* described by Warham (1958) and some other sea-birds.

4. *Wing Shivering.*

Many Royal Penguins shiver their wings through very narrow arcs when closely approached by man. Most do not flee but the action seems to be due to nervousness and soon stops once the observer moves away. Whether wing shivering occurs in response to other more natural dangers, such as the approach of a skua, was not determined.

5. *Flipper Flicking.*

Quick flicks of a single flipper are used in circumstances where the bird seems doubtful of the situation in which it finds itself and undecided as to whether it should fight or flee. Non-breeding penguins often use these movements towards neighbours when they stand among established breeders: similarly, penguins away from their nests that are closely approached by man or other intruders may jerk a flipper in their direction even though they are beyond striking distance.

d. *Unclassified Postures*

1. *The Head Shake.*

A Royal Penguin usually concludes a display or definite phase of activity by shaking its head quickly through about 60 degrees so that the plumes become a blur. It does not call but makes swallowing movements immediately afterwards. Head shaking nearly always follows a period of excitement; birds emerging from the sea after a tussle with the breakers shake their heads before they start to preen; one that has just found a quiet spot after being buffeted by higher-status birds shakes its head before relaxing; chicks newly banded shake their heads and stretch themselves before they disperse after release, and so on. The head shake action appears to act as a kind of "signing off" ceremony. At the same time it serves to remove particles from the bill and to spray aqueous droplets, presumably the saline secretions of the nasal glands, to either side.

2. *Comfort Movements.*

Royal Penguins frequently yawn and stretch themselves. They raise their heads, open their bills and draw themselves up to their full height pressing their flippers to their sides, then relax and shake their heads. They scratch the sides of their heads as they balance on one foot and bring the other up over the flipper to scratch with the central claw. Some open their bills, shake their heads and make sneezing sounds.

Preening is important and much time is devoted to the care of the body surface. The feathers are oiled from the preen gland and the back of the head rubbed upon this. Incubating birds and the males during the guard stage of the chicks often rise to stretch themselves and to beat their flippers and during the moult this flickering of flippers often catches the eye as one looks across a colony: it seems to be infectious. Many loose feathers are dislodged in the process. The whole of the body and tail is shaken from time to time with the feathers fluffed. This behaviour is common during rain and snow storms and serves to remove moisture lodged in the feathers.

Mobs of bathing birds are seen off all the large colonies. The penguins float on their sides and, splashing with their flippers, corkscrew around removing the filth accumulated during their spells ashore. Convenient rocks are covered with those that have bathed and need to preen before departing. Temporary partnerships form here and mutual allopreening occurs while some may display with mutual head swinging.

Royal Penguins drink copiously from fresh water when they are ashore. Most of this they get from the streams by which they climb to the inland colonies or which drain past many of the coastal ones but they also drink rainwater lodged in their feathers during showers and sip from the filthy pools that collect between their nests after rain.

In bad weather the birds on the colonies turn their backs to the wind. On the infrequent warm days it is mainly the downy chicks that are seen to pant: they were seen to do this on 26/12/59 when the shade temperature rose to 52°F; the adults mostly seemed unaffected.

4. ACKNOWLEDGEMENTS

I am grateful to fellow members of the 1960/61 ANARE team for help in the field and to Dr. R. Carrick for making my stay at Macquarie Island possible.

5. REFERENCES

CARRICK, R., 1964: Breeding biology of **Eudyptes.** **In** A New Dictionary of Birds. Ed. A. L. Thompson, London.

CARRICK, R., & INGHAM, S. E., 1967: Antarctic sea-birds as subjects for ecological research. Proc. Symposium Pacific-Antarctic Sciences, 11th Pac. Sci. Congress Tokyo, 1966. Jap. Ant. Res. Exped, Sci. Reps. Special Issue No. 1: 151-184.

COULSON, J. C., & WHITE, E., 1958: The effect of age on the breeding biology of the Kittiwake **Rissa tridactyla.** Ibis, 100: 40-51.

COULSON, J. C., & BRAZENDALE, M. G., 1968: Movements of Cormorants ringed in the British Isles and evidence of colony-specific dispersal. Brit. Birds, 61: 1-21.

CULLEN, E., 1957: Adaptations in the Kittiwake to cliff nesting. Ibis, 99: 275-302.

DOWNES, M. C., EALEY, E. H. M., GWYNNE, A. M., and YOUNG, P.S., 1959: The birds of Heard Island. ANARE Sci. Rep. (B), i: 1-135.

FALLA, R. A., 1937: Birds. Rep. B.A.N.Z. Antarctic Res. Exped. 1929-31, (B), 2: 1-288.

GWYNNE, A. M., 1953: Egg-laying and incubation periods of Rockhopper, Macaroni and *Gentoo Penguins.* ANARE *Sci. Rep.*, (B), 1: 1-29.

MATTHEWS, L. H., 1929: Birds of South Georgia. Discovery Repts., 1: 561-592.

MAWSON, D., 1915: The home of the blizzard. London.

RICHDALE, L. E., 1951: Sexual behavior in penguins. Kansas.

SCHONWETTER, M., 1960-66: Handbuch der Oologie. ed. W. Meise. Berlin.

WARHAM, J., 1958: The nesting of the Australian Gannet. Emu, 58: 339-369.

WARHAM, J., 1963: The Rockhopper Penguin **Eudyptes chrysocome** at Macquarie Island. Auk, 80: 229-256.

CARRICK, R., & INGHAM, S. E., 1970: Ecology and Population Dynamics of Antarctic Sea Birds. **In** Antarctic Ecology, 1: 505-525. Ed. M. W. Holdgate. London & New York.

★

SHORT NOTE

AN IMPRESSIVE ASSEMBLAGE OF ALBATROSSES

At 0845 on 28/2/71 M.V. Karepo passed about one and a half miles off a large foreign fishing vessel of the factory type working in the Canterbury Bight. The position at this time was 44.55 South, 172.00 East, with wind NE 15 knots; fine clear weather; air temperature 14.5 C and sea temperature 15.5 C. About four miles from the fishing vessel the numbers of albatross about the ship increased rapidly. The increase continued until we were at our closest point of approach when we estimated that there were at the very least five thousand albatross in the area; possibly more, as many groups of birds could be seen at extreme range.

Birds close enough to be identified included adult and immature Black-browed Mollymawks, Buller's Mollymawks, White-capped Mollymawks and tentatively Salvins Mollymawks and Grey-headed Mollymawks. Royals and Wandering Albatrosses were noticeable only by their small numbers. Four birds that could have been either old Wanderers or Royals were seen. It is doubtful if there were fifty of these larger birds in the area. There were very few other species about, not more than forty Giant Petrels; fewer than ten Cape Pigeons; and possibly fifty other dark petrels, of which those seen clearly were Sooty Shearwaters.

The fishing vessel was engaged in trawling at the time; and whilst the birds were thickest close to her, the rest seemed to be loafing about the area, possibly waiting for the trawl to be lifted. Rafts of up to one hundred mollymawks were not unusual and one raft was estimated to contain one hundred and fifty mollymawks and two Wanderers. Whilst these factory ships seen about the New Zealand coast invariably have large followings of mollymawks, this is by far the greatest number I have so far encountered.

— JOHN JENKINS

SIGHTINGS OF RARE WADERS IN THE FAR NORTH

By A. T. EDGAR

Western Sandpiper *Calidris mauri.*

On 3/11/70, Rangiputa Bank (Rangaunu Harbour) carried breeding populations of Red-billed Gulls, Caspian and White-faced Terns; about 40 New Zealand Dotterels and a large assemblage of arctic waders including Godwits, Knots, Turnstones and Whimbrel. At the southern tip of the bank a small party of Godwits flew when approached by Dr. and Mrs. J. H. Seddon and A.T.E., leaving a small solitary wader on the shoreline.

This bird was under observation for about 45 minutes at ranges of 10 - 20 yards. Using x 10 binoculars, we identified it as a Western Sandpiper. During the period of observation it fed along or just in the edge of the falling tide. Short periods of standing still, body more or less horizontal, alternated with short runs and feeding by dabbing in the mud. At one time it paused to preen the feathers of its upper surface. When a dotterel approached it flipped out of the way and then carried on as before. When we stood up it flew, rising about 15 feet before flattening out, and descended at an angle to land near a party of seven dotterel about 40 yards along the beach, where it continued to feed and allowed close approach without apparent alarm.

Size, about that of a Red-necked Stint; upper parts predominantly brownish grey with light edges to the feathers of mantle, scapulars and wing coverts. Fine dark streaking on crown and neck. A dark patch, narrow in front of and broadening behind the eye, contrasted with well marked white superciliary stripes meeting above the bill. When during one of its brief pauses the bird happened to halt facing the observer, with its bill pointed downwards at an angle of about 45 degrees, as if it was peering, the combination of white forehead and superciliaries, grey crown and dark eye patch produced a somewhat slant-eyed quizzical appearance. Underparts white, with a grey wash on the sides of the breast. Wing tips dark, not extending beyond tail. In flight, the rump showed dark centre and white sides; a very narrow wing-bar. Legs, longer than those of a stint, black (J.H.S.) or very dark blackish olive (A.T.E.); hind toe present. Bill black, at least as long as head, rather slender overall but broader at the base and tapering to the tip, which was slightly decurved.

In deciding on the identification we eliminated *C. pusilla* because of bill shape; and *C. bairdi* because of bill shape, length of wing, and absence of buffy colour. The Western Sandpiper has been recorded in New Zealand only once before, namely on Farewell Spit in October 1964 (Notornis 12: 109).

Little Whimbrel *Numenius minutus.*

Paua, 3/3/71. At high tide a large flock of mixed waders was resting on one of the paddocks, including numerous Godwits, Turnstones, Banded Dotterel, some Knots, Stints, a Tattler, a Terek Sandpiper and two flocks of New Zealand Dotterel totalling about 53 individuals. I had seen no Golden Plover, and was glassing the flock in the hope of finding some, when I saw a single bird standing rather erect with head well up, buffy face and variegated upper

surface. At first sight I took it to be *Pluvialis,* but even at long range there appeared to be something not right about this identification. The paddocks and gateways were wet after heavy rains and I could not use my car but had to approach the birds on foot. Fortunately my bird was associating with one of the New Zealand Dotterel flocks, which did not move when the main mob edged away and allowed me to get to quite close range and have a good look at the stranger. It proved to be a Little Whimbrel.

Slim and erect, head and neck finer than a Golden Plover's and neck longer; bill under two inches, arched downwards, brownish, pinkish at the base of the mandible. Crown dark, with a narrow buffy median stripe and buffy white superciliary stripes. Sides of face buffy. Upper parts boldly spangled, dark brown and buff. Chin and throat whitish, breast buffy, belly and underparts paler or whitish. Rump and tail, well seen when the bird flew a short distance, brownish to greyish brown, tail barred darker brown. Legs relatively long, greyish. Compared with an Asiatic or American Whimbrel the bird had a much shorter bill, was altogether more slender and had a different carriage; it was also noticeably smaller.

White-rumped Sandpiper *Calidris fuscicollis.*

Paua, 30/3/71. A large flock of mixed waders was roosting on one of the paddocks. I was able to spend over an hour moving my car along the western edge of the flock, observing at close range individual birds, including four Sharp-tailed Sandpipers which I watched for some time, alongside Turnstones. On moving round to the eastern edge of the flock I found another sandpiper, standing between two Turnstones. It was much the same shape as the Sharp-tailed Sandpipers, but considerably smaller, and had a fine straight bill; brown crown, whitish superciliary, greyish eye stripe; pattern of back and wings like Sharp-tailed Sandpiper's but less " scaly "; upper breast lightly streaked greyish, rest of underparts whitish. No rufous tinge on breast or crown. Legs, as far as could be seen, dark; no yellowish tinge. The birds were quite tame and I had plenty of time for close observation at a range of about 20 yards with x 10 binoculars but was still uncertain about the identification till the flock began to thin out as parties of birds left to feed on the mudflats. Eventually my birds flew, and I had an excellent view of the sandpiper's all-white rump and dark tail.

———★———

SHORT NOTE

COMMUNAL FISHING BY SHAGS

On 2/5/71 a flock of Little Black Shags *Phalacrocorax sulcirostris* was fishing in Orakei Basin. Scattered through the flock were 12 Pied Shags *P. varius,* diving and swimming with the flock, and except for their comparative clumsiness, behaving exactly like the Little Black Shags. I noticed this behaviour again on 7/5/71 with a smaller proportion of Pied Shags. The Pied Shags usually fish individually. Were they copying the Little Black Shags and joining in where the pickings were better ?

The Pied Shag is a permanent resident of Orakei Basin whereas the Little Black Shag comes and goes periodically, being more often seen there in autumn and winter. Orakei Basin is largely impounded, tidal water controlled by flood gates. — SYLVIA M. REED

FIELD STUDY COURSE, FAR NORTH 11 - 18 JANUARY, 1971

By A. T. EDGAR

The object of the Course was to study the bird life of Aupouri and Karikari Peninsulas. Headquarters was at Houhora Hall, property of Mr. Fred Evans, to whom the Society is grateful for permission to camp on his farm, and for all he did to make the hall and surrounds ready for the course. A stove and refrigerator were temporarily installed; tables and benches from Raio Hall were kindly lent by Mr. Bert Wagener. Mr. Ian Foster, Houhora Hotel, was outstandingly and continuously helpful throughout. His local knowledge and advice were invaluable in the preparatory stages; he arranged that we should draw perishable stores from the hotel as required, allowed use of his cool store, telephone, water supply and some utensils. Two local ladies, Mrs. Buckton and Mrs. Wilson, undertook the task of cooking the meat (about 45 lbs. per day) and provided a superb fish dinner on Friday. The Society is indeed grateful to these ladies not only for the work they did on our behalf but also for the excellent fare provided. Mrs. Fooks and Miss Coles kindly came north two days before the course started to help with arrangements, organised the daily roster of kitchen duties and did yeoman work on break-up day. Terence and Dale Calvert came as advance party, put in a lot of useful preliminary work and were a great help during the course because of their local knowledge, acquired on many previous visits to the area in search of swallows, waders and storm-cast specimens. Richard Veitch (Wildlife) provided some tentage and utensils and was an ever-present help in organisation and camp chores.

We are grateful to Mr. Sankey for a memorable launch trip to Rangiputa Bank; to Mr. Clarry Hoggard for the loan of a dinghy at Kaimaumau; to Messrs. Pip Smith and Bill Wegener for boat and barge transport on Houhora harbour; to Mr. Armstrong (Te Kao school) for help in organising a visit to Great Exhibition Bay; to Mr. Dalbeth for permission to use his road to North Cape; to the Managers of Lands and Survey blocks for permission to travel over their land, and to private landowners for their courtesy and co-operation. We are particularly grateful to Te Hapua 42 Committee for their permission to enter the Corporation's land to study plant and bird life, and to Mr. A. H. Watt, a foundation member of O.S.N.Z. and an old resident of Te Kao, for his advice and guidance in the planning stages. Mr. H. Crene, Ranger, Te Paki Station, was most helpful. Mr. Vincent (Northern Age, Kaitaia) provided valuable press coverage and we were glad to welcome him when he visited the camp and met some of the members.

Telegrams of good wishes were received from Maida and Charles Barlow, Invercargill, and from Hetty and Ross McKenzie, Clevedon. The thoughts of all members were with Hetty and Ross as they celebrated their Golden Wedding; we missed them.

A feature of the course was the large proportion of young members who attended. Long summer days and good, if somewhat windy, weather were in our favour, and everyone had plenty of exercise. Evening meal was (theoretically) at 7 p.m.; provision had been made for evening talks and slides; but it soon pecame apparent that by the time dinner was over there was little time or inclination for activities other than discussion of the day's doings or the next day's programme.

Few members had previous knowledge of the Far North, so an attempt was made to create opportunity for everyone to get a good general idea of the area and its points of special interest, while contributing to the main objects of mapping scheme, beach patrol scheme and general study of the bird population. Mr. Ross Michie conducted botanical parties to Kerr Point and other interesting areas.

The following took part in the course:—

Northland — D. Calvert, W. Campbell, A. T. Edgar, Mrs. M. Hows, Miss E. Madgwick, R. H. Michie, A. M. Munro, Mrs. P. G. Smith; by invitation, M. Kennedy, G. B. Rawlings.

Auckland — K. Bond, T. R. Calvert, S. P. Chamberlin, Miss J. Coles, Mrs. G. J. Eller, Mrs. P. Fooks, M. Galbraith, P. M. Gross, Miss E. Hosken, Miss J. Key-Jones, Mrs. W. Mitchell, Miss B. Pike, Mrs. S. M. Reed, G. P. Robinson, C. F. Senior, R. B. Sibson, Mrs. E. Spragg, C. R. Veitch, T. Walker, A. Wilkins.

South Auckland — F. Barwell, Mr., Mrs. and Mason Brown, Miss S. Fogarty, Mr. and Mrs. T. Harty.

Volcanic Plateau — R. S. Cowan, T. Rose.

Wanganui — Mr. and Mrs. D. Crockett, M. F. O'Shea.

Wellington — J. A. Bartle, Dr. Elsie Gibbons, Mr. and Mrs. B. D. Heather and family, Miss A. Hutson, F. C. Kinsky, Miss M. Logan, Mrs. H. Oliver, Mr. and Mrs. R. S. Slack.

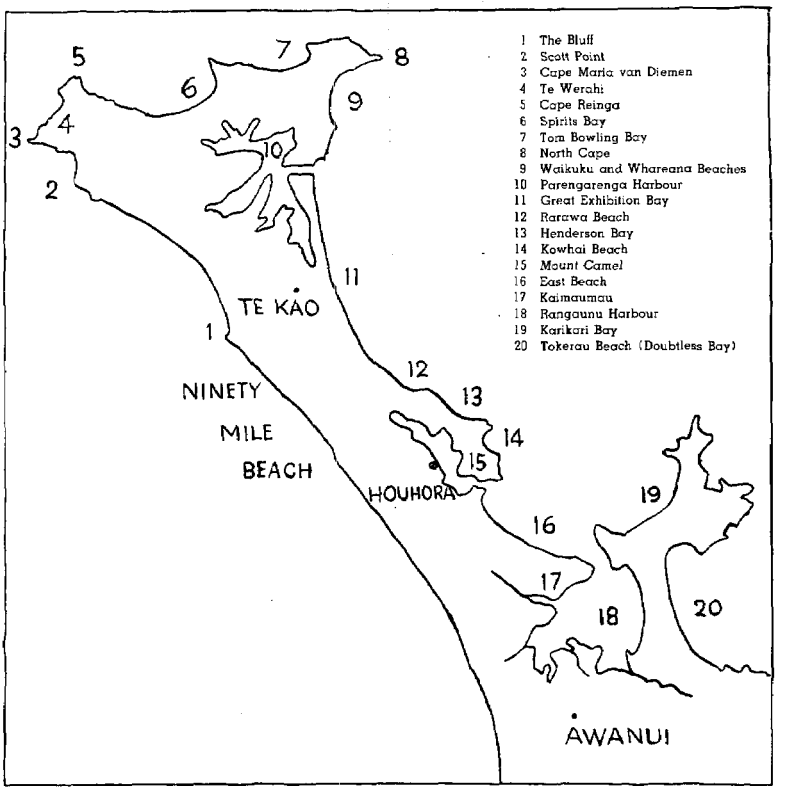
Marlborough — R. Holdaway.

Canterbury — Mr. and Mrs. A. Baker.

TOPOGRAPHY

As the crow flies, the distance from Awanui to Cape Reinga is about 55 miles, from Cape Maria van Diemen to North Cape about 21 miles. Ninety Mile Beach is in fact about 58 miles long, and is backed by sand dunes. East of the dune belt the soil is mainly consolidated sand with peaty gumlands and seasonal swamps. Towards Cape Reinga and North Cape the soil type changes to red brown loams and brown clays, broken country under scrub and some residual bush rising to peaks of over 1000 ft., with stretches of rugged coastline between sandy bays. Opposite Houhora the isolated Mount Camel rises to 774 ft. Of recent years a large part of Aupouri Peninsula has been grassed and carries stock; similar development continues in the area south of Spirits Bay. A programme of afforestation is underway on the dunelands.

The soil of the flat land on Karikari Peninsula is broadly speaking similar to that east of the Aupouri dune belt; formerly under scrub and fern, much of the area is now grassed. The north-eastern tip of the peninsula is broken country rising to over 500 ft., with a rugged coastline.



I am grateful to Mrs. Welch, Kerikeri, for drawing the map.

On Aupouri Peninsula there are numerous small lakes in the dune belt and three larger lakes, Wahakari (west of Te Kao), Waiparera (west of Rangaunu harbour) and Ngatu (west of Awanui). On Karikari Peninsula Lake Ohia (dry in summer) is at the south end and lakes Waiporohita and Rotokawau in the north-west.

MAPPING SCHEME

Time did not permit a detailed search of every 10,000-yard map square in the area, but daily lists were completed for squares visited by each party and some individuals; in this way all 32 map squares were recorded, some of them several times over. From these daily lists record sheets were prepared and sent to Dr. P. C. Bull.

Under List of Species, the number of squares in which certain species were found is given as some indication of relative abundance. In this connection please note that five of the 32 map squares include only a small area of beach or headland, the rest of the square being salt water.

BEACH PATROLS

All beaches were patrolled and beach patrol cards completed for despatch to the organiser by individual members. In the following summary (and in the List of Species) "Northern Block" includes beaches from Scott Point round the north coast to Parengarenga north head, and "East Coast" those from Parengarenga south head to Karikari Bay and Tokerau Beach.

	90 Mile Beach	Northern Block	East Coast	Total
Blue Penguins	55	11	28	94
Albatrosses	18	3	4	25
Petrels	20	10	8	38
Prions	1	9	6	16
Shearwaters	78	53	47	178
Diving Petrels	12	13	37	62
Others	33	22	23	78
Total Birds	217	121	153	491
Miles	58	23	57	138
Birds per mile	3.7	5.3	2.7	3.6

WADERS

For various reasons it was decided not to attempt a simultaneous count on three harbours on a given day, but the figures given in the species list represent the maximum reliable count of each species in each area during the week and provide a fair picture of the local wader population at that time. 11,750 waders were recorded in harbours, on beaches and around lakes; of these 10,030 were arctic waders. In January the late summer build-up of New Zealand breeding waders was under way but still well below maximum. Experience has shown that the arctic wader population of Parengarenga and Rangaunu harbours fluctuates considerably during each season. For example, Whimbrel may be present in fair numbers during the southward migration but few are seen during the summer months; rare stragglers tend to show up at Parengarenga mostly during the period of northward migration.

The traditional roosts at Kaiata and Raumanawa are still used; but of recent years many waders prefer to roost on the flat land near Paua, formerly not suitable for this purpose because it was under low scrub but now transformed into grass paddocks (v. Notornis 10, 92). Waders which feed in Houhora harbour fly over the sandhills to a high tide roost on the east coast at Kowhai Beach. In Rangaunu harbour the main roost is Rangiputa bank, near the heads and offshore from Kaimaumau.

LIST OF SPECIES

In order that this report may be useful for reference by those who attended the course and those who will visit the area in future, the annotated list includes species identified during the course and also other species (marked *) not met with in January 1971, but recorded from the area. References are given where necessary, those

from *Notornis* thus — (4:122). Unpublished records drawn from recording scheme files or private notebooks include the initials of the observer, as follows:—

D.E.C.	D. E. Calvert	H.R.McK.	H. R. McKenzie
T.R.C.	T. R. Calvert	R.H.M.	R. H. Michie
A.T.E.	A. T. Edgar	S.R.	Mrs. S. Reed
G.E.	Mrs. G. Eller	K.R.	Mrs. K. Reynolds
H.A.F.	H. A. Findlay	G.R.	G. Robinson
A.G.	Miss A. Goodwin	M.R.	M. Ross
M.H.	Mrs. M. Hows	J.H.S.	Dr. J. H. Seddon
E.M.	Miss Elizabeth Madgwick	L.W.	Mrs. L. Wagener

Where not otherwise described, localities are identified by letters:—

N = Ninety Mile Beach P = Parengarenga
H = Houhora R = Rangaunu

or by numbers in brackets (1) - (20), corresponding with the numbers on the sketch map.

B.P. = Beach Patrol specimen.

Two papers, Birds of Parengarenga Harbour and Farthest North, A. H. Watt, 1947, *Notornis* 2: 115-120, and Notes on Parengarenga Harbour Waders, E. G. Turbott, 1951, *Notornis* 4: 122-134, are of particular interest. Read in conjunction with this report, they focus attention on some changes which have taken place in the bird population of the Far North during the last twenty years.

Northern Blue Penguin *Eudyptula minor.* Breeds on rocky parts of the northern and eastern coastline and inside Parengarenga harbour opposite the entrance (2:115). Dead birds, see B.P. Summary. An unusually heavy mortality occurred in March 1967, when 163 dead birds were counted on ten miles of beach (16). January 1971, (9) one nest; (20, south end) 5 nests, one adult, two downy chicks.

*New Zealand Dabchick *Podiceps rufopectus.* Formerly occurred sparingly on a number of small lakes (2:115). No recent records, but systematic search of dune lakes may show that the species is still present.

Wandering Albatross *Diomedea exulans.* B.P., N, 10; (11), one; total 11. Fragmentary remains of four large albatrosses (*exulans* or *epomophora*) were found on beaches (9), (12) and (16).

Black-browed Mollymawk *D. melanophris.* B.P. N, one; (9), one; total, two.

Grey-headed Mollymawk *D. chrysostoma,* B.P., N, 3.

*Yellow-nosed Mollymawk *D. chlororhynchus,* observed at sea off North Cape (Oliver, 1955).

Buller's Mollymawk *D. bulleri,* B.P., N, 3.

White-capped Mollymawk *D. cauta cauta,* B.P., N, 2.

*Salvin's Mollymawk *D. cauta salvini,* B.P., N, January 1967, one (A.T.E.).

*Light-mantled Sooty Albatross *Phoebetria palpebrata,* B.P., N, August 1962, two (A.T.E.); (16), September 1970, one (D.E.C.).

Giant Petrel *Macronectes giganteus,* B.P., N, 3; (7), one; (9), one; total 5.

Cape Pigeon *Daption capensis,* B.P., N, 2; (7), one; total 3. A live bird was seen in Parengarenga harbour on 5/7/69 and one at the heads on 6/9/70 (A.T.E.).

[*Snow Petrel *Pagodroma nivea,* N. unconfimed report of a sighting, 29/5/70, by Peter Voisin, H.M.N.Z.S. Lachlan, who has spent three seasons in Antarctica (E.M.).]

Grey-faced Petrel *Pterodroma macroptera,* B.P., N, 6; (6), one; (9), 2; (11), 4; (13), one. Total 14.

White-headed Petrel *P. lessoni,* B.P., N. one; (20), one; total 2.

Mottled Petrel *P. inexpectata,* B.P., N, one.

*Kerguelen Petrel *P. brevirostris,* B.P., (16), 6/9/70, one (D.E.C.).

Pycroft's Petrel *P. pycrofti,* B.P., N, one.

Cook's Petrel *P. cooki,* B.P., N, 2; (9), one; (11), one; total 4.

Lesser Broad-billed Prion *Pachyptila salvini,* B.P., (6), one.

Antarctic Prion *P. desolata,* B.P., (9), two, one of which identified as *banksi.*

*Narrow-billed Prion *P. belcheri,* B.P., N, August 1962, one (A.T.E.).

Fairy Prion *P. turtur,* B.P., N, one; (6), one; (9), 5; (11), 5; (13), one; total 13.

Of recent years few prions other than *turtur* have been found on northern beaches. It may be that the northern limit of the big storm wrecks ends to the south of Reef Point, at the southern end of Ninety Mile Beach.

Grey Petrel *Procellaria cinerea,* B.P., N, one.

White-chinned Petrel *P. aequinoctalis,* B.P., N, 2; (14), one; total 3.

Flesh-footed Shearwater *Puffinus carneipes,* B.P., N, 11; (11), one; (13), one; total 13. Seen offshore, Karikari Peninsula.

Buller's Shearwater *P. bulleri,* B.P., N, 11; (7), one; (9), 8; (11), 6; (13), one; (20), one; total 28.

Numerous at sea off Paxton Point (Great Exhibition Bay) and off the coast of Karikari Peninsula.

Sooty Shearwater *P. griseus,* B.P., N, 32; (6), 3; (7), one; (9), 23; (11), 18; (12), one; (13), one; (20), 3; total, 82.

Short-tailed Shearwater *P. tenuirostris,* B.P., N, one; (6), one; (7), one; (9), 2; total 5.

Fluttering Shearwater *P. gavia,* B.P., N, 23; (6), one; (7), 3; (9), 7; (11), one; (13), 3; (14), 4; (20), 6; total 50. Large numbers seen offshore, Karikari Peninsula and Rangaunu Bay.

*Little Shearwater *P. assimilis,* B.P., (6), 12/11/67, one (A.T.E.).

White-faced Storm Petrel *Pelagodroma marina,* B.P., N, one; (7), one; (9), 2; total 4.

Diving Petrel *Pelecanoides urinatrix,* B.P., N, 12; (6), 2; (9), 11; (11), 14; (12), 3; (13), 2; (14), 3; (16), 3; (18), one; (2), 11; total 62.

*Red-tailed Tropic Bird *Phaethon rubricauda,* once reported regularly cast up on beaches; none recorded of recent years.

Australian Gannet *Sula serrator,* B.P., N, 12; northern block, 10; east coast, 14; total 36. Seen offshore all round both peninsulas, generally in small numbers, but c. 100 in Rangaunu Bay, 11/7/70; three flying young with adults, north end of Tokerau Beach, 15/1/71.

Brown Booby *S. leucogaster,* B.P., (4), one.

*Blue-faced Booby *S. dactylatra,* seen west of North Cape, 1964 (Checklist).

Black Shag *Phalacrocorax carbo.* Sparsely distributed on coasts, harbours and lakes.

Pied Shag *P. varius.* Much commoner than *P. carbo.* Found all round the coastline and occasionally on freshwater lakes. Breeding reported at Whareana (2/116) and at Henderson Bay, 11/11/67 (D.E.C.).

Little Black Shag *P. sulcirostris.* Karikari Peninsula, Lakes Waiporohita (12 birds) and Rotokawau; Lake Waiparera, 29 on 12/1/71. (17), regular, in small numbers, with Little Shags in small mangroves; (H), reported.

Little Shag *P. brevirostris.* (R), common and breeding; (H), (P), present in smaller numbers; on lakes and rivers; occasional on ocean beaches. A gathering of Little Shags at Kaimaumau in November 1967 included 33% white-throated, 20% smudgy, 47% little pied (A.T.E.).

*Spotted Shag *Stictocarbo punctatus.* A bird in partial breeding plumage came ashore at Ahipara (south end of Ninety Mile Beach) on 4/9/69 and died the following day (E.M.). The nearest known breeding colony is at Oaia, about 135 miles to the south.

Lesser Frigate Bird *Fregata ariel.* Hurricane Rosie (3/1/71) brought several frigate birds to New Zealand waters. Houhora Heads, 4/1/71, two (Mr. Wagener), and two south of Reef Point (E.M.). About 5/1/71 three at Pataua, east of Whangarei. 6/1/71, three in Bay of Islands all day, seen flying north over Kerikeri Inlet at 1830 hrs. (K.R.). Mangonui harbour, 8/1/71, one and 9/1/71, two (G.R.). 13/1/71, one seen at Te Werahi. 15/1/71, a dead bird at Scott Point. The dead bird was identified as *F. ariel* and from the description the Mangonui birds were a male and female of this species. They spent much time soaring, were not seen to molest gulls, terns or gannets, but on two occasions flew down to take or investigate something on the water. When harried by Red-billed Gulls the speed of disengagement and upward movement was particularly noted; the tail was used as a rudder in flight. One of the Houhora birds landed on the beach and appeared to eat part of a dead fish. In Bay of Islands the frigate-birds soared over an area of water full of school fish and hunting birds; on several occasions they dived on the fishing birds but were not seen to fish for themselves.

White-faced Heron *Ardea novaehollandiae.* P, a few had settled by 1952 (17:12); now common, 48 in January 1971; 29/3/70, 65 (A.T.E.). R, 35 in January 1971; up to 100 have been counted (M.H.). H, present. Odd birds sighted at N, (4), (6), (8) and (20).

*White Heron *Egretta alba.* Reported from near (5), P and H (10:213); R, regular winter visitor, up to 40 recorded, 15 as late as January (Field Guide); in normal years present in small numbers, usually gone by October.

*Little Egret *Egretta garzetta.* P, (Field Guide); R, August 1954, two (6:91).

Reef Heron *Egretta sacra.* P, a flock of 30 in winter 1946 (2:116) was exceptional, but 11 on 22/1/69; breeding at North Head, 1968. H, breeding 1964 and 1965. R, 11, 1961. Recorded on ocean beaches 1967-71, N, Northern block, (19), (20). (A.T.E.).

*Cattle Egret *Bubulcus ibis.* Just south of our area two spent 1966 winter on a farm three miles from Kaitaia (15:43).

Australian Bittern *Botaurus poiciloptilus.* Generally distributed in swampy areas; recorded in 12 map squares and probably occurs in several additional localities.

*Glossy Ibis *Plegadis falcinellus.* P, 15/12/57 (10:315).

*Royal Spoonbill *Platalea leucorodia.* P, R, 1957-59 (Field Guide).

Black Swan *Cygnus atratus.* Breeds singly and in small groups on lakes throughout the northern peninsula; P, flocks of up to 300 in autumn and winter (2:116). Flocking had not started in January 1971. P, 30/3/71, 300; H, February 1961, 200 (A.T.E.).

*Canada Goose *Branta canadensis.* Ten birds visited Lake Waimimihau, a lagoon at the south end of Ninety Mile Beach, June 1969 (H.A.F.).

Paradise Duck *Tadorna variegata.* Seen near (8), two; (11), two; (12), ten; Lake Waiparera, two. P, breeding reported; winter flock on paddocks, 5/7/69, 18 (A.T.E.). Breeding also reported inland south of Houhora.

Mallard *Anas platyrhynchos.* Not yet common in the Far North; breeding reported on a small lake near Houhora; sightings near North Cape and on Karikari Peninsula.

Grey Duck *Anas superciliosa.* Throughout, in moderate numbers. Sighted in several localities in northern block, around Houhora, 44 on Lake Waiparera and 41 on Lake Rotokawau.

*Grey Teal *Anas gibberifrons.* An unconfirmed report of this species on a lake south of Houhora, August 1970. Grey Teal turn up unexpectedly in other parts of Northland, e.g., Hikurangi (1968); Kerikeri, 29/5/70; Mangonui, 14/5/63, specimen in Auckland Museum (H.R.McK.).

Brown Teal *Anas chlorotis.* One on Lake Waiporohita; the species is holding its own in Bay of Islands and Whangaroa counties, but this may be the first record from Mangonui county.

N.Z. Scaup *Aythya novaeseelandiae.* Not common in 1947 (2:116). Lake Wahakari, 14/4/63, 20 (A.T.E.); 29/10/69, 8 (J.H.S.); January 1971, 3, but others may have been hidden in the lake edge.

Harrier *Circus approximans.* 24 map squares.

*N.Z. Falcon *Falco novaeseelandiae.* Once, Te Kao, about 1928 (2:116).

*Nankeen Kestrel *F. cenchroides.* Cape Reinga, 1969 (16:293).

Brown Quail *Synoicus ypsiliphorus.* 19 map squares.

Californian Quail *Lophortyx californicus.* Karikari Peninsula, common. Aupouri Peninsula, in 1947 only as far north as Te Kao (2:116), but in January 1971 recorded between Te Werahi and Spirits Bay, in several localities; total map squares, 16.

Pheasant *Phasianus colchicus.* Throughout; 21 map squares.

Banded Rail *Rallus philippensis.* Recorded in three localities around Spirits Bay, Parengarenga, Te Kao; calling at Houhora; known to occur at Kaimaumau. Probably more widespread than these few records would indicate.

*Marsh Crake *Porzana pusilla.* Recorded at Lake Tangonge, Kaitaia, May 1948 (3:94); probably occurs on the peninsulas.

*Spotless Crake *P. tabuensis.* Once observed south of Te Kao (2:116). December 1964, a dead bird found on high tide line, Tokerau Beach (M.R.).

Pukeko *Porphyrio melanotus.* Recorded in 10 map squares on Aupouri and 3 on Karikari Peninsula; widespread but in small numbers, ranging as far north as Spirits Bay.

South Island Pied Oystercatcher *Haematopus finschi.* N, 4; P, one; H, 35; R, 29; total 69. Autumn influx had started; but no large numbers of *finschi* reach these northern harbours and most of them have gone by September.

Variable Oystercatcher *Haematopus reischeki.* Distributed all round the beaches on both peninsulas, and in three harbours. Total recorded c. 240, plus some running young; this is probably fewer than the full population; autumn and winter flocks, P, 29/3/70, 155; N, 3/5/70, 170 counted on beach (A.T.E.).

Golden Plover *Pluvialis dominica fulva.* P, c. 100, including one albino; H, 6; R, 4; (20), 2; total c. 112. P, usually arrives in September, may build up to 150 - 200 in January - March, sometimes still present April. 1970 - 71 was a poor season for *dominica* in the Far North (A.T.E.). R, 1/11/69, 70; 3/11/70, none (J.H.S.).

N.Z. Dotterel *Charadrius obscurus.* N, 18; northern block, 64; east coast beaches and harbours, 140; total 222. A low count for N; some birds probably back in the dunes; highest recent count, 3/5/70, 60. P, autumn flocking on paddocks, 24/3/69, 76; 29/3/70, 115 (A.T.E.). R, 16/1/71, 32 plus four chicks on Rangiputa Bank, where c. 40 birds present on 1/11/69 and 3/11/70 (J.H.S., A.T.E.).

Banded Dotterel *Charadrius bicinctus.* N, 12; northern block, 53; P, 450; H, 16; R, 28; east coast beaches, 16; total 575. A small breeding population, with a big autumn and winter influx, especially at P, where at least 1000 were present on 30/1/71; 1970, March c. 1500; August 22nd, under 100; September to December, only odd pairs (A.T.E.).

*Oriental Dotterel *Charadrius veredus.* P, single birds in Feb. 1955 (77:26), March 1968 (15:211), and August 1969 (16:286).

Wrybill *Anarhynchus frontalis.* P, 6; H, 3; R, one; (19), 2; total 12. An autumn and winter visitor, never in large numbers; N, June 1969, 44; P, February 1968, 50; 24 still present as late as 27/9/68. Occasional, Tokerau Beach (A.T.E.). R, 17 on 2/11/69 were unusual (J.H.S.).

Long-billed Curlew *Numenius madagascariensis.* P, 4. 1969/70, July-October, 4-5; January, 9; 25th April, 2. 1970/71, 22/8/70, 3; 20/9/70, 7; October-January, 4; 3/3/71, 2; 30/3/71, none (A.T.E.). R, 2/11/69, one (J.H.S.).

Asiatic Whimbrel *Numenius phaeopus variegatus.* P, 31/8/69, 12; 4/9/69, 14; 27/10/69, 20; rest of season, only one bird seen.

6/10/70, 15; 20/10/70, 22; 18/11/70, 16; January 1971, 8; 30/1/71, one.

R, 1/11/69, 36 (J.H.S.); 22/1/70, 3 (S.R.); 2/11/70, one (J.H.S.).

*American Whimbrel *Numenius phaeopus hudsonicus.* P, two birds on 5/7/69 and 27/10/69 (A.T.E.); R, one on 2/11/70 (J.H.S.).

*Little Whimbrel *Numenius minutus.* P, 3/3/71, one (A.T.E.).

*Asiatic Black-tailed Godwit *Limosa melanuroides.* P, July-October 1969, two; R. 3/11/70, one (A.T.E.).

*American Black-tailed Godwit *Limosa haemastica.* P, 25/3/69, one (A.T.E.).

Bar-tailed Godwit *Limosa lapponica.* P, 1500; H, 1100; R, 3000; N, 20; sundry, 8; total 5628. 1968 March, 3000; July, 800; 1969, March, 2300; July, 500; occasional on beaches; N, 9/2/61, 77; (11), 11/11/67, 600 (A.T.E.).

*Greenshank *Tringa nebularia.* P, 1968/69, 3; 1969/70, one; H, 2/3/69, 3 (A.T.E.).

Siberian Tattler *Tringa brevipes.* P. 1950, 4-6; 1951, 2 (4:130); 1968/69 and 1969/70, 5 (A.T.E.); January 1971, 4.

Terek Sandpiper *Xenus cinereus.* P, one (present November to March, 1970/71); R, 1/11/69, one (J.H.S.).

Turnstone *Arenaria interpres.* P, 800; H, 120; R, 240; N, 75; sundry, 80; total 1315. During the southward migration large numbers may be seen on beaches at R and (16), e.g., 6/11/67, 600; 6/9/70, 600 (A.T.E., D.E.C.). P, 1947, flocks up to 24 (2:116); 1950, 200 (4:133); 1962, 1000 (10:92); 29/3/70, 1100; 30/3/71, 1000+ (A.T.E.).

Knot *Calidris canutus.* P, 100; H, 2750; R, 60; N, 9; total 2919. Population shows much fluctuation; P, October 1969, 2100; January 1970, 850 (A.T.E.); R, 1/11/69, 2000 (J.H.S.); 22/1/70, none (S.R.).

Sharp-tailed Sandpiper *Calidris acuminata.* P, 10. 14 on 31/3/71. R, 1/11/69, one (J.H.S.); (16), 5/11/67, 12 at a stream mouth (T.R.C.).

Curlew Sandpiper *Calidris ferruginea).* P, 7.

*White-rumped Sandpiper *Calidris fuscicollis.* P, 30/3/71, one (A.T.E.).

*Western Sandpiper *Calidris mauri.* R, 3/11/70, one (A.T.E., J.H.S.).

Red-necked Stint *Calidris ruficollis.* P, 24; R, one; total, 25. P, 23/3/69, 54 (A.T.E.). R, 1/11/69, 6 (J.H.S.).

Sanderling *Calidris alba.* R, one. P, 1950 and 1951 (4:127-128).

*Broad-billed Sandpiper *Limicola falcinellus.* P, Feb.-March 1970, one (A.T.E., A.G.).

Pied Stilt *Himantopus himantopus.* P, 146; H, 31 (one near-black); R, 224; N, 8; northern block, 32; east coast, 64; Lake Waiparera, 100; total 605. A late breeding pair at R; P, very few present September - December; autumn and winter numbers build up to 500 - 680 (A.T.E.).

Arctic Skua *Stercorarius parasiticus.* Two sightings in Rangaunu Bay.

Black-backed Gull *Larus dominicanus.* 30 map squares; nowhere in large numbers.

Red-billed Gull *Larus scopulinus.* 32 map squares. Breeds at Rangiputa Bank, c. 20 pairs January 1958 (R.B.S.); c. 100 pairs 1969, c. 200 pairs 1970 (J.H.S.), and a small colony on the sandbank in Parengarenga harbour in 1970 (A.T.E.). Great numbers arrive in Aupouri Peninsula in autumn, from breeding grounds at Three Kings.

Gull-billed Tern *Gelochelidon nilotica.* N, sight record, F. C. Kinsky.

Caspian Tern *Hydroprogne caspia.* Recorded all round the coast. P, breeding reported 1940-41 on white sand south of the heads (2:118), and probably a few still breed there. R, a breeding colony on Rangiputa Bank at least since 1957 (R.B.S.); 58 nests 9/10/69 (R.H.M.). 160 birds in colony 1/11/69, but only about 80 3/11/70, when eggs were being attacked by unemployed Red-billed Gulls (J.H.S.). 16/1/71, c. 250 birds on the bank, two swimming chicks. N, few in summer, but up to 40 in winter (A.T.E.).

*Crested Tern *Sterna bergii.* Spirits Bay, March 1951 (Checklist).

Eastern Little Tern *Sterna albifrons.* R, 12/1/58, one (R.B.S.); 1/11/69, 9 (J.H.S.); 22/1/70, 15 (S.R.); 3/11/70, 19 (J.H.S., A.T.E.); 16/1/71, 41 (record flock for N.Z.).

Some aspects of the behaviour of these Little Terns may be worthy of comment. As the launch approached Rangiputa Bank on 16/1/71, it was overtaken by two compact flocks of c. 9 and 12 Little Terns. They were flying fast and direct and looked like pale waders. Indeed at a distance they were at first mistaken for Turnstones! In the Firth of Thames, where Little Terns are regular summer visitors and have been observed for many years, they have never been seen flying in such tightly-knit flocks or with such purpose. On the island these Little Terns settled with others already there and moved but little while the tide was high, squatting low and becoming quite difficult to see. Then as the tide dropped, the flock broke up and small parties travelled many miles, feeding along the channels and sometimes resting near the water's edge well clear of the mangroves (R.B.S.).

White-fronted Tern *Sterna striata.* Recorded all round the coast. Not known at Parengarenga in 1947 (2:118); but c. 100 pairs bred on Rangiputa Bank 1957-58 (R.B.S.). November 1969 and 1970, a colony of 1500 - 2000 birds nested on Rangiputa Bank (J.H.S.) and a small colony, c. 150 birds, nested in Parengarenga Harbour on a sandbank Nov.-Dec. 1970 (A.T.E.). Ninety Mile Beach, on a 29-mile stretch, 688, February 1961; 625, 13/5/69; 343, 29/6/69; July-August, only 6 - 64 (A.T.E.).

Sooty Tern *S. fuscata.* B.P., N, 2; (7), one; total 3.

*White-capped Noddy *Anous minutus.* Spirits Bay, one with White-fronted Terns, 10/1/65 (12:240).

*Grey Ternlet *Procelsterna cerulea.* Cape Maria van Diemen; off Cape Karikari, January 1951 (Checklist).

N.Z. Pigeon *Hemiphaga novaeseelandiae.* One at Unuwhao (a peak between Spirits and Tom Bowling Bays); two south of Tom Bowling Bay. 1969, one south of the western end of Spirits Bay; a few still present in remaining patches of forest in northern block.

*White Cockatoo *Cacatua galerita.* Between August 1970 and January 1971 three birds reported at several localities between Houhora and Awanui (M.H. et al.).

*Eastern Rosella *Platycercus eximius.* December 1965, Mt. Camel (L.W.); 1965-1970, sparsely distributed as far north as Ngataki (A.T.E.).

*Parakeet sp. *Cyanoramphus* sp. One report of a parakeet on the forested slopes of Unuwhao, in the 1920's (2:118).

*Oriental Cuckoo *Cuculus saturatus.* Te Kao, 18/12/52 (5:196).

Shining Cuckoo *Chalcites lucidus.* Regular in season. Heard January 1971 in four localities, Awanui-Spirits Bay.

Long-tailed Cuckoo *Eudynamis taitensis.* Te Kao, once 12 together, in rough weather (2:118); 25/2/70, dead bird picked up on Parengarenga block (A.T.E.); January 1971, two records, near Houhora.

Morepork *Ninox novaeseelandiae.* Present; silent around Houhora, January 1971.

Spine-tailed Swift *Chaetura caudacuta.* B.P., N, one. Awanui, 1967 (15:35); Ahipara and Awanui, 1969 (R.H.M., H.A.F.).

N.Z. Kingfisher *Halcyon sancta.* 28 map squares.

*Broad-billed Roller *Eurystomus orientalis.* Te Kao, 1923 (2:118).

Skylark *Alauda arvensis.* Common throughout; all map squares; P, nest, 5 eggs; R, abandoned egg on sandbank.

Welcome Swallow *Hirundo neoxena.* 30 map squares.

Pipit *Anthus novaeseelandiae.* 29 map squares. Widely distributed but much less plentiful than Skylark; feeding young, Karikari Peninsula, 15/1/71.

Hedge Sparrow *Prunella modularis.* 20 map squares; not recorded from the western squares which are mainly dunes or open grassland.

Fernbird *Bowdleria punctata.* 15 map squares; found in both peninsulas as far north as Te Werahi and North Cape areas; more than 10 birds seen in a small area, on a farm near Houhora (T.R.C.).

Grey Warbler *Gerygone igata.* 24 map squares.

Fantail *Rhipidura fuliginosa.* 20 map squares.

Song Thrush *Turdus philomelos.* 25 map squares.

Blackbird *T. merula.* 25 map squares.

Silvereye *Zosterops lateralis.* 25 map squares.

Tui *Prosthemadera novaeseelandiae.* A rare bird in the Far North. Mt. Camel, December 1965 (L.W.); Ngataki, north of Houhora, 27/10/69 (A.T.E.); January 1971, sighted south of Spirits Bay (west), south of Tom Bowling Bay, and near Kowhai Beach.

Yellowhammer *Emberiza citrinella.* 23 map squares.

Chaffinch *Fringilla coelebs.* 26 map squares.

Greenfinch *Carduelis chloris.* 6 map squares; three sightings, one of 5 birds, between Parengarenga and the north coast bays; near Houhora; Karikari Bay; Tokerau (south end).

Goldfinch *Carduelis carduelis.* 19 map squares.

Redpoll *Acanthis flammea.* 10 map squares.

House Sparrow *Passer domesticus.* 24 map squares.

Starling *Sturnus vulgaris.* 23 map squares; throughout, in moderate numbers; flock of 200, Karikari peninsula. May suffer competition for nesting sites from Mynas.

Indian Myna *Acridotheres tristis.* 26 map squares. Spread has been rapid. Few on Aupouri Peninsula till 1967, when a flock of birds arrived at Houhora in October, immediately dispersed and began to breed; some as far north as Te Paki and Spirits Bay by November 1967. By late 1968 they were all the way us the peninsula and 60 were counted in the north-eastern tip, around North Cape area. P, 40, July 1969; nesting in holes in sandstone cliffs, 1970 (G. Eller). Kerr Point, January 1971, 47.

CONCLUSION

A list of 137 birds (species and subspecies) from so small a part of New Zealand is remarkable enough; the prospect of adding to this list is exciting, and attainable if enough observers become available. There is no doubt that additional species of waders, rare stragglers and storm-cast specimens will sooner or later be recorded.

★

SHORT NOTES

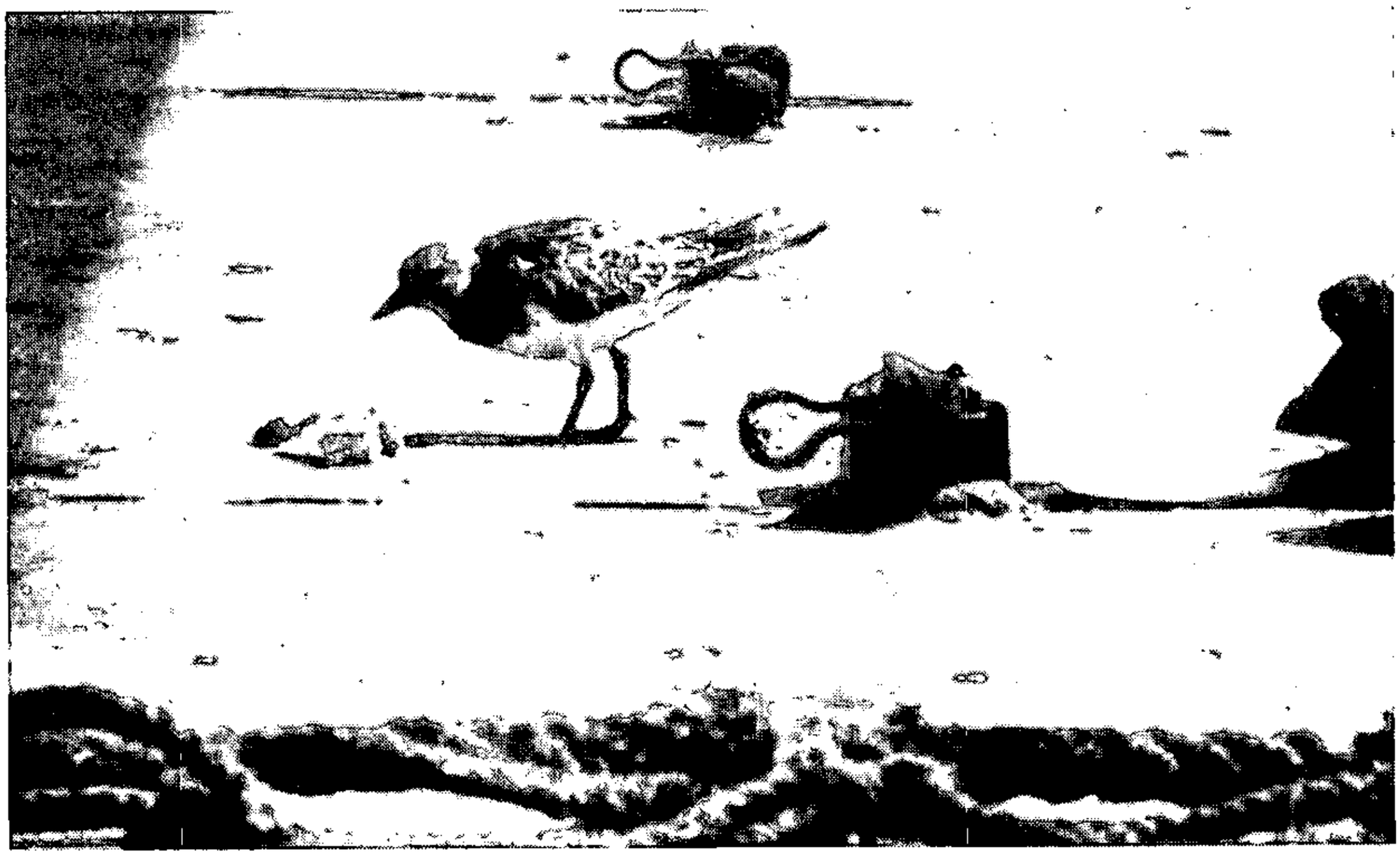
A HITCHHIKING TURNSTONE

At 1300 hrs. on 11/11/70 in position 22° 12'S, 177° 26'E, that is approximately 120 miles south of Kandavu Island, a Turnstone was seen to fly aboard m.v. "Karamu."

The bird was apparently young, having much black about the head, and with legs a dull reddish orange. It was obviously very tired and sheltered from the wind by hiding behind the bolts on top of the after hatch, as though these bolts were stones on a beach. After resting for some hours it took up quarters on a net spread out on the hatch, where, as can be seen from the photograph, it merged completely with the background.

It remained on board, except for short flights around the ship, for the next 3 days 17 hours, during which time it was carried 900 miles to the south. When it finally left, the vessel was just south of Tiri Tiri Island.

Whilst the Turnstone was on board everyone was feeding it and amongst the foods seen to be eaten were raw and cooked meat, pieces of raw fat, raw and fried fish, bread, biscuits, mashed and chipped potatoes, banana, and uncooked rice. On one occassion it was given a fresh flying fish and the bird pecked out both of the eyes and was seen to be pecking continuously inside the gills. A shallow pan of fresh water was put on the hatch and in this the



[John Jenkins

[John Jenkins

bird took many baths and seemed to be drinking very frequently, possibly as a result of its strange diet.

During its stay on board the bird became very tame, running up to anyone who stopped near the hatch and latterly pecking at your fingers if you put your hand near it.

Everyone on the ship was sorry to see the bird leave, and we are now wondering if it will re-join for its northerly migration !

— JOHN JENKINS

MARSH SANDPIPERS IN THE BAY OF PLENTY

The purpose of this note is to record the discovery of four Marsh Sandpipers *Tringa stagnatilis* at Kaituna cut estuary reclamation near Maketu in the Bay of Plenty. The four birds were studied on three occasions, 25/1/70, 2/2/70 and 4/2/70. On the first visit I was accompanied by my wife and on the last by Mr. T. B. S. Taylor. Photographs were taken. On each visit these sandpipers were watched for several hours, usually at a distance of about 40 yards, but sometimes from as close as 25 feet. The weather was generally clear and sunny with a light breeze. Binoculars 7 x 50 and a 30x telescope were used. Previously on 31/8/69 I had had an opportunity to study the single Marsh Sandpiper at Mangere, the sixth to be recorded in New Zealand (Notornis 16, 148 and 286).

These four Marsh Sandpipers associated with Pied Stilts, feeding among them on the swampy mud flats and dozing together a few feet to one side of a resting flock. But if they moved too close the Pied Stilts tended to dash at them. They easily avoided these threatening attacks by hopping or fluttering a few feet out of the way; and quite unconcerned they would resume feeding at once. They fed actively, probing deeply in the soft mud, with distinctive white tails upended. Between probings they strode out quickly and gracefully.

In shape somewhat like small stilts, they had light grey-brown upperparts, long straight sharply-pointed black bills, and long greenish-grey legs. In flight the long legs trailed well beyond the tail. The white forehead and superciliary line contrasted with the black eye and surrounding grey patch which extended back to include the ear coverts. Throat and underparts were very light dusty grey forward, becoming pure white on the belly and under the tail. The upperparts from crown to mantle, scapulars and wings were light brownish-grey. The tail, rump and back appeared white, but a fine transverse barring on the tail feathers was best seen when the tail was spread during preening. In flight the white of the tail and rump extended well up to the mantle as a clear distinctive wedge. Underwing linings and axillaries showed white, shading into speckled grey around the edges. At rest the bend of the wing and the tips of the primaries appeared almost black.

There was a slight variation in plumage of the four birds. While three had uniform smooth brownish grey upperparts, one which may have been immature had a faintly streaked and barred pattern, especially on the mantle, scapulars and overlapping primary feathers.

When flying, they called frequently. The call could best be described as a slowly repeated ' tchew ' ' tchew ' ' tchew.'

Several other species of waders, both endemic and arctic, visited the Kaituna estuary during our visits. After the four Marsh Sandpipers, perhaps the most notable were:— Red-breasted Dotterel (5), Wrybill (7), Pectoral Sandpiper (1), Sharp-tailed Sandpiper (2), Turnstone (13).

— J. H. SEDDON

BLACK-FRONTED DOTTERELS NESTING NEAR TIMARU

On 13 September 1970 I visited the mouth of the Opihi River, about eight miles north of Timaru. Three unusual dotterels were encountered on a small muddy backwash where they were feeding with Banded Dotterels *Charadrius bicinctus*. The former dotterels caught my attention by a contrasting black and white wing-pattern as they flew a few yards. No binoculars were used, but these birds allowed a close approach which enabled me to identify them as Black-fronted Dotterels *Charadrius melanops*.

Three weeks later, on 4/10/70, I returned to the river and found one adult Black-fronted Dotterel sharing the same backwash with a Banded Dotterel and Wrybill *Anarhynchus frontalis*. Nearby a pair of Black-fronted Dotterels (possibly not the same birds as seen on 13/9/70) were present on a large shingle island in the river. After several minutes a nest containing one egg and two newly-hatched chicks was located. The nest was a shallow depression formed of pebbles, small chips of wood and sheep dung. Both adults appeared unperturbed at the presence of scores of fishermen and whitebaiters along the riverside.

No young birds were seen on 26/10/70. On 20/12/70 a total of eight Black-fronted Dotterels, two of these being juveniles — most probably the chicks of 4 October, were observed on the lower four miles of the Opihi River.

On no occasion was this species seen on the tidal mudflats at the mouth of the river, but fed exclusively on the riverbed, especially in muddy pools of which there was no shortage. Should these dotterels remain on the riverbed there would seem to be adequate suitable habitat to accommodate them.

— RAY PIERCE

★

GREY DUCK WITH LARGE BROODS AT SOUTH EAST ISLAND

During a recent trip to the Chatham Islands eight Grey Duck *Anas superciliosa* broods were noted on South East Island (540 acres). Six of these were counted accurately and contained 8, 11, 12, 12, 14 and 17 ducklings less than about one week old when first sighted. The other two broods each contained between 11 - 14 young of about the same age-group as the above. All were seen during the period 6th - 14th November, 1970, during which time the number of ducklings in identifiable broods remained constant. The brood of 17 contained ducklings of a uniform size and was sighted on two occasions — 8th and 10th November.

The broods fed by day and night on wide, rocky, wave-platforms, as freshwater is limited to very small creeks which form brackish puddles on these platforms at low water. Insect life was plentiful in and about these puddles at the time of our visit.

Broods of 14 or more Grey Ducklings are rare on the New Zealand mainland; their more frequent occurrence — and apparently higher survival rate — on South East Island, may be explained by the complete absence of mammalian predators. The only birds of prey present are the Southern Skua *Catharacta lonnbergi* which feeds almost exclusively upon petrels; Black-backed Gull *Larus dominicanus* and 2 - 3 pairs of Harrier *Circus approximans*, none of which was seen to molest the ducklings.

— K. P. HORGAN

1971 ANNUAL MEETING

Christchurch members were hosts to this year's gathering of members on 14th, 15th and 16th May.

The retiring President, Dr. G. R. Williams, welcomed 53 members to the Annual General Meeting and explained that he was now leaving the Council after having served for fifteen years. In this time the Society had grown in numbers, new schemes had been undertaken, the size of "*Notornis*" had increased, and the Checklist and the Field Guide have been published. He recommended members to help with surveys now being undertaken by the Forest Service with a view to conversion of native forests to plantations of exotics, as neither Forest Service nor the Wildlife Branch are able to complete the necessary work on their own. Dr. Williams suggested that the Society might accept responsibility for a national library of sound recordings of bird song, suggested in the past, and now an obvious need. He expressed his thanks to a very loyal and efficient Council which had supported him.

Mr. David Tisdall, of Upper Moutere, Nelson, was announced winner of the year's Junior Member Award. Grants from the Project Assistance Fund have been made to Mrs. J. B. Hamel for work on the excavation of moa remains at Papatowai, and to the preparator of the Dominion Museum for travel within the Fiji Islands.

It was announced that instead of the usual form of study courses, this year's Labour Week-end activities were to be directed to special efforts on the Bird Distribution Mapping Scheme in all regions. Special planning would aim to use people from the larger regions to cover those areas still not surveyed.

Mr. J. P. C. Watt distributed copies of his Treasurer's Report and Balance Sheet and commented on some major points. The meeting voted thanks to Mr. Watt on his retirement as treasurer, and welcomed Mr. H. W. M. Hogg, of Dunedin, to the position. Under the constitution, Mr. Hogg's appointment by Council is for the unexpired portion of the term of the person he replaces, in this case for the year to May 1972, when the position will be open to election.

In the absence of Mr. R. B. Sibson, his report as Editor was read by the Secretary, and received with acclamation. Mr. Sibson tendered his resignation, to take effect from the end of the present volume, as he is retiring and will make an extended overseas trip. The meeting passed a vote of thanks to Mr. Sibson in recognition of his 16 years of distinguished service, with good wishes on his retirement and overseas trip. It was announced that Mr. Elliott Dawson has been appointed editor from the beginning of Volume 19.

Reports from all schemes and sub-committees were read to the meeting, and adopted, to be published in "*Notornis.*"

Mr. F. C. Kinsky was declared elected President of the Society for the next three years, and Mr. B. D. Bell Vice-President. After counting of votes cast in the postal ballot, Mr. D. V. Merton and Mr. A. Blackburn were declared elected to the two places on the Council.

The new constitution was discussed, put to the meeting and carried, voting being 30 for and 16 against. Therefore the draft circulated to all members with the March "*Notornis*" becomes the

Society's constitution on 1st January, 1972, with one amendment made by this meeting: Clause 5 (b) now reads " Student members 20 years of age or under, who elect to receive a 25% rebate from the annual subscription on application to the Treasurer, shall receive all publications and notices, but shall have no right to vote at any general meeting or in any postal ballot." Members are advised to make this amendment to their copies, so that they will then have a complete copy of the new constitution.

Due to a general feeling of uncertainty as to the proposer's exact intention, the motion seeking to amend the constitution by provision for " supporting members " was not voted on, but referred back on the ruling of the chairman, supported by a motion from the meeting.

The annual conference of Regional Representatives was held on Saturday morning and the afternoon was devoted to the presentation of three papers:— Dr. K. Wodzicki, " The Birds of Niue "; Dr. P. C. Bull, " A Report on the Bird Distribution Mapping Scheme "; and Mr. A. Blackburn, " The Birds of Fiji."

Field trips on Sunday completed a very enjoyable and well-organised round of meetings.

— B. A. ELLIS

LIBRARY REPORT
1st January to 31st December ,1970

The past year has been busy and encouraging, with the usual journals and separates coming in. These have been catalogued and there is a steady demand for borrowings. The inter-loan scheme is still popular, and it is interesting to note how frequently these books and journals go to University students all through the country.

A new publication which has been arranged for (on an annual exchange basis) is " California Birds," Journal of California Field Ornithologists. The four issues for 1970 are held and more will come. These are available to members by post.

Our thanks and appreciation must again be expressed to the Director of the Auckland War Memorial Museum and the Council for the accommodation they continue to let us have.

We have said farewell to Miss Evans, but to Mr. Thwaites, the new Librarian, and his staff, we also express many thanks for all they do.

— HETTY McKENZIE, Hon. Librarian

DONATIONS, 1970

The Society gratefully acknowledges the extra monies provided by endowment members, and also the following donations exceeding $1.00 received during the year ended 31/12/70.

C. P. Parsonson $1.00; M. A. Waller $5.00; S. P. Robinson $1.00; J. A. Fagan $1.00; S. R. Emmens $1.00; Dr. D. Dawson $1.00; R. S. Cowan $3.00; G. Wightman $1.00; E. St. Paul $2.00; Anon. $2.00; Miss B. McDougall $13.00; Mrs. G. Dudley $2.00; J. C. Davenport $2.00; M. Keillor $1.00; J. R. M. Chorlton $2.00; Mr. and Mrs. V. H. Barfoot $10.00; R. C. Mueller $3.00; R. N. Holdaway $2.00; J. A. Keast $9.50; Dr. M. Buchler $1.00; R. Houston $1.00; W. Salmons $1.00; K. Kirby $1.00; A. T. Poulton $2.00.

BALANCE SHEET
As at 31st December, 1970

1969 $		$		1970 $
	CURRENT ASSETS:			
3969	Cash at Bank N.Z.	3559		
–	Cash at Bank N.Z. Te Aro	802	**	
20	Sundry Amounts owed to Society	–		
519	Bank of N.Z. Savings Account	1001		
100	Stock of "Notornis"	100		
100	Stocks of "Biology of Birds"	100		
4708	**TOTAL CURRENT ASSETS**			$5562
	INVESTMENTS AT COST:			
5281	Shares in Public Companies	5173	***	
5274	Local Body Stocks	4875		
10555	**TOTAL INVESTMENTS**			$10048
1000	Library at Valuation			1000
16263	**TOTAL ASSETS**			$16610
	LESS LIABILITIES:			
873	Amounts owed by the Society	1085		
–	Amount received for Checklist	802	**	
176	Subscriptions in Advance	187		
	RESERVE FUNDS:			
251	Minor Expeditions	–		
–	Projects Assistance Reserve Fund	300		
1414	Life Subscriptions	1357		
1000	Publications	1000		
3714	**TOTAL LIABILITIES**			$4731
12549	**VALUE OF ACCUMULATED FUNDS AS BELOW**			$11879
	ACCUMULATED FUNDS:			
13965	Balance at 31/12/69			12549
312	Deficiency for year	621		
1104	Transfer to Publications	–		
	Transfer to Projects Assistance Reserve Fund	49		
				670
$12549				$11879

STATEMENT OF ACCOUNTS
For the Year Ended 31st December, 1970

1969 $		$		1970 $
	INCOME WAS EARNED FROM:			
1872	Subscription	1904		
151	Transfer from Life Members	141	*	
16	Donations	71		
106	Profit from Christmas Cards	546		
346	Sale of Back Numbers	420		
19	Surplus Field Study Course	85		
212	Biology of Birds	101		
50	Tent Sales	–		
2772	**TOTAL ORDINARY INCOME**			$3268
	PLUS INVESTMENT INCOME:			
297	Interest	376		
208	Dividends	197		
13	Royalties	316		
518	**TOTAL INVESTMENT INCOME**			889
3290	**TOTAL INCOME**			$4157
	LESS EXPENSES:			
2725	"Notornis" Printing & Distribution	3517		
	Less Subsidy D.S.I.R.	250		
		3267		
14	Annual General Meeting	46		
100	Audit Fee	100		
25	Beach Patrol Scheme	30		
12	Distribution Scheme	25		
75	Donations	60		
96	General Expenses	156		
48	Kermadec Reprints	76		
–	Nett Cost Kermadec Film	212		
76	Library Expenses	50		
56	Nest Record	–		
62	Postages	60		
153	Printing & Stationery	213		
10	Recording Scheme	–		
20	Royal Society Affiliation	20		
130	Travelling Expenses	176		
–	"Notornis" Reprinting	287		
3602	**TOTAL EXPENSES**			$4778
$312	**NETT DEFICIENCY TRANSFERRED TO ACCUMULATED FUND**			$621

SHARES IN PUBLIC COMPANIES
As at 31st December, 1970

Company	Shares Held	Value	Cost of Purchase	Approximate Market Value at 31/12/70
			$	$
Andrews & Beaven Ltd.	578	$1	914.79	750.60
Farmers Trading	500	$1	1018.50	485.00
Forest Products Ltd.	548	$1	1227.45	2029.00
General Foods Ltd. (Convertible Notes)	168		84.00	122.64
Alex Harvey Ltd.	168	$1	486.41	736.96
Winstone Ltd.	500	50c	372.31	580.00
Golden Bay Cement	500	50c	372.31	490.00
J. Wattie Canneries Ltd.	656	50c	697.23	825.31
***	3618		$5173.00	$6019.51

NOTES TO THE ACCOUNTS

Note 1: * Life members transfer 10% of Balance at 31/12/69.

Note 2: ** Cash at Bank of N.Z. Te Aro:—
This represents Receipts on account of Checklist. As the Profit on this Publication has yet to be determined, the whole amount has been shown as owing to the Publishers. The element of profit involved will be credited in next year's Accounts.

Note 3: *** Shares in Public Companies cost $5173 and had an approximate market value of $6019 at 31st December, 1970.

AUDITORS' REPORT TO THE MEMBERS
For the Year Ended 31st December, 1970

We report, that in our opinion, the foregoing accounts of **The Ornithological Society of N.Z. (Inc.)** for the year ended 31st December, 1970, are in agreement with the books and reports of the Society and give a true and fair view of the Society's position at that date and the results of its transactions for the year. The Society has kept proper books and supplied all the information required.

We further report that in our opinion and according to the records and information supplied to us, the Fiji Expedition was self sufficient and that there is no liability to be met by the Ornithological Society of N.Z. (Inc.).

THOMPSON & LANG, Chartered Accountants,
Auditors

Dunedin, 25th March, 1971

INVESTMENTS IN LOCAL BODY STOCKS
As at 31st December, 1970

Auckland Electric Power Board	$600 due	15/2/71
Auckland Electric Power Board	400 due	15/10/75
Southland Hospital Board	991 due	1/11/74
Southland Harbour Board	953 due	30/6/72
Otago Harbour Board	966 due	1/9/71
Auckland Hospital Board	965 due	17/6/73
	$4875	

TREASURER'S REPORT
For the Year Ended 31/12/70

PRESENTED AT THE A.G.M. OF THE
ORNITHOLOGICAL SOCIETY OF N.Z. (INC.)
CHRISTCHURCH — 15th MAY, 1971

During the 1970 financial year inevitable price-rises caught up with the Society and cash transfer for the year resulted in a $621 loss.

Total income for the year was $4157, this being very similar to that of 1968 ($4230). It is pleasing to note the improved profitability of the Christmas Card Scheme after its lull in 1969. Royalties on the 'Field Guide' (which in 1969 had been reversed to cover plate charges) also contributed to the improved total income by $316. Back numbers continue to find a good market, especially to overseas libraries and their sales made a record $420 for the year. The profit made on the Field Study Courses was inadvertent, since these are generally budgeted by the organisers to break even. Sale of the Society's book "Biology of Birds" continued at a reduced rate.

Expenses reached an all-time record in 1970 of $4778. Three non-recurring expenses were incurred: (1) The Kermadec Film was produced, (2) Vols. 2 and 3 of 'Notornis' were reprinted so that complete sets of back numbers can be offered for sale, (3) 200 reprints of all articles relating to the Kermadecs Expedition were purchased for future binding and sale. These non-recurring expenses totalled $575, and are a fair charge against the accumulated fund. The remaining expenditure of $4203 was nearly met by the total income for the year. It is Council's policy to meet the recurring annual expenses by subscription and with regard to this it is pertinent to note that the unit cost of production of 'Notornis' (Vol. 17, 1970) was $2.99 (3517/1175) or $2.78 allowing for the subsidy, while other recurring costs amounted to $0.91 (936/1030) per member. This makes a total cost of $3.90 per member which closely approximates the new subscription rate of $4.00 effective as from 1/1/71. A subsidy of $250 from D.S.I.R. for the publication of Wodzicki and Lairds' paper in Vol. 17, No. 4, is gratefully acknowledged. Actual cost of Notornis for 1970 (Vol. 17) was $3103 for 1175 copies, plus $414 associated expenses of freight, offprints, and distribution*.

* Production costs alone of Vol. 17 averaged $9.34 per page.

Donations from the Society were to the Royal Society Building Fund ($50.00) and $10.00 to the Junior Member Award.

Membership showed a net increase of 26 for the year, bringing total membership to the 1030 mark. 109 new members joined including 14 Junior and 3 Husband/Wife memberships, 40 members resigned, and 46 were written off as being unfinancial.

Investments during the year changed slightly. $400 in the Auckland Electric Power Board matured on 1/4/70 and was transferred to the B.N.Z. Savings Account. Shares in Public Companies changed as follows:

500 $1 shares in Wilsons Portland Cement were replaced by 500 50c each in Golden Bay Cement and Winstone Ltd. A cash settlement of $300 was retained for the purchase of future cash issues in public companies. This change was brought about by Company take-over.

85 $1.00 shares in J. Wattie Canneries were taken up in the 1:8 issue of December 1970.

112 Bonus shares from Andrews and Beavin were received in January 1970 and a further 16 shares were taken up in the cash issue of March 1970.

During the year the Minor Expeditions Fund was replaced by a Project Assistance Reserve Fund of $300, awards from which will be made to defray expenses incurred by members in defined research projects, investigational studies, or expeditions. No applications for award were received during the year.

My thanks again to Dunedin members for their willing help and a special appreciation to Messrs. J. Lang (Auditor) and H. R. Wilson (Broker) for their unfailing goodwill and courtesy in handling the Society's affairs.

— JAMES P. C. WATT,
Hon. Treasurer

CHRISTMAS CARD REPORT

The 1970 Christmas Card depicted the "Laughing Owl" by Joseph Wolf, who was the illustrator for the Zoology of the Voyage of H.M.S. Erebus and Terror, 1844 - 75. This card proved popular and sales recovered to previous levels.

14,500 cards were printed but we only had to pay for 9,500. This was because the printer credited us with 5,000 cards which were poorly printed last year. The actual printing costs also went down this year, which is surprising; but was the result of the printer's installing a new machine which reduced the time involved.

1,220 dozen were sold and this included many previous years' cards. Mixed packs proved very popular. 380 dozen mixed packs, 80 dozen White-fronted Terns and 65 dozen Spotted Shags were sold. These sales reduced the stock of previous years' cards considerably. A net profit of $650 was made compared with $106 last year.

The illustration for this year has not been selected but it is planned to use either a bush bird or a waterfowl. Mixed packs will again be available.

On behalf of the Society I would like to thank the Turnbull Library, the Royal Forest and Bird Protection Society and especially my wife, who has to bear the burden of packaging and despatch of the cards.

— BRIAN D. BELL, Convener

REPORT OF THE NEST RECORD SCHEME
For the Year Ended April 30th, 1971

During the year ending April 30th, 1971, 377 nest record cards have been received from 23 contributors. Observations were made for 54 species. The largest contribution was received from Bob Cowan, with significant contributions also from Junior Members, Hugh Robertson, Stephen Lawrence and Stephen Barr.

Twelve (12) colonial cards covering two species of gulls have been included in this year's report.

The Black-fronted Dotterel is recorded for the first time.

There are now 8292 nest record cards covering 124 species of birds filed in the Nest Record Scheme. Three species, Thrush (1334), Blackbird (1149), and House Sparrow (521) have significant numbers of nests recorded.

Once again several members have made use of the nest record cards for information on breeding behaviour. It would be appreciated 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.

I would like to take this opportunity to suggest to Regional Representatives that they encourage their local O.S.N.Z. members to observe nests and record details during field trips and holiday excursions.

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

— DAVID E. CROCKETT,
Nest Records Convener.

LIST OF CONTRIBUTORS

S. Barr (29), Dr. Marie Buchler with Mrs. Marie Darby and Mr. Darby, D. E. Calvert, T. R. Calvert, J. Cook (15), R. S. Cowan (67), also R. S. Cowan with P. Gross and Miss E. Madgwick (16), J. Cowie (15), J. L. Craig, Mrs. Ruth Crockett, A. T. Edgar (15), D. W. Haddon (40), J. R. Jackson (18), E. B. Jones, S. B. Lawrence (37), M. O'Shea, R. Pierce (27), D. Pitcher, H. Robertson (42), J. Taylor (16), O. C. Torr, also O. C. Torr with G. Welsh (11), Gregory Welsh.

SPECIES LIST OF NEST RECORD CARDS

SPECIES	Previous Total	1970-71	New Total	SPECIES	Previous Total	1970-71	New Total
North Island Kiwi	2	1	3	N.Z. Dotterel	58	1	59
Stewart Island Kiwi	3	–	3	Black-fronted Dotterel	–	1	1
Great Spotted Kiwi	1	–	1	Wrybill Plover	9	–	9
Yellow-eyed Penguin	11	–	11	Pied Stilt	247	20	267
Little Blue Penguin	58	1	59	Black Stilt	6	1	7
White-flippered Penguin	12	–	12	Southern Skua	2	–	2
N.Z. Crested Penguin	2	–	2	Black-backed Gull	423	5	428
Southern Crested Grebe	2	–	2	Red-billed Gull	107	3	110
N.Z. Dabchick	1	–	1	Black-billed Gull	103	13	116
Wandering Albatross	11	–	11	Black-fronted Tern	208	1	209
Light-mantled Sooty Albatross	4	–	4	Caspian Tern	40	2	42
Fairy Prion	16	–	16	Antarctic Tern	3	–	3
Flesh-footed Shearwater	1	–	1	Fairy Tern	9	–	9
Sooty Shearwater	4	–	4	White-fronted Tern	54	–	54
Fluttering Shearwater	7	–	7	White Tern	1	–	1
Allied Shearwater	3	–	3	Grey Ternlet	5	–	5
Black Petrel	1	–	1	N.Z. Pigeon	29	–	29
Grey-faced Petrel	1	–	1	Rock Pigeon	64	–	64
Kermadec Petrel	14	–	14	Kaka	9	1	10
Pycroft's Petrel	5	–	5	Kea	54	4	58
White-faced Storm Petrel	5	–	5	N.Z. Parakeet (Red-crowned)	7	1	8
Diving Petrel	51	–	51	Yellow-crowned Parakeet	4	–	4
Gannet	4	–	4	Shining Cuckoo	4	–	4
Black Shag	64	–	64	Morepork	10	–	10
Pied Shag	21	–	21	Little Owl	14	–	14
Little Black Shag	1	–	1	Kingfisher	65	2	67
White-throated Shag	14	1	15	South Island Rifleman	111	4	115
King Shag	18	–	18	North Island Rifleman	5	–	5
Spotted Shag	5	–	5	Rock Wren	11	–	11
Blue Heron	31	2	33	Skylark	101	12	113
White-faced Heron	14	1	15	Welcome Swallow	176	25	201
Bittern	2	–	2	Fantail	142	3	145
Canada Goose	22	–	22	N.I. Fantail	36	7	43
Domestic Goose (presumed escaped)	2	–	2	N.I. Tomtit	22	1	23
Mute Swan	9	–	9	S.I. Tomtit	23	2	25
Black Swan	49	–	49	N.I. Robin	8	–	8
Paradise Duck	7	–	7	S.I. Robin	15	1	16
Grey Teal	9	–	9	N.I. Fernbird	11	1	12
Brown Teal	2	–	2	S.I. Fernbird	9	2	11
Blue Duck	1	–	1	Brown Creeper	4	–	4
Grey Duck	86	3	89	Whitehead	6	–	6
Grey Duck/Mallard Cross	2	1	3	Yellowhead	13	–	13
Mallard	67	7	74	Grey Warbler	91	8	99
Shoveller	12	–	12	Song Thrush	1254	80	1334
Black Teal	6	–	6	Blackbird	1098	51	1149
Harrier	52	1	53	Hedge Sparrow	147	2	149
N.Z. Falcon	5	–	5	N.Z. Pipit	34	1	35
Pheasant	18	2	20	Bellbird	18	1	19
Brown Quail	4	–	4	Tui	28	–	28
Californian Quail	18	–	18	White-eye	144	10	154
Chukor	1	–	1	Greenfinch	90	4	94
Banded Rail	4	–	4	Goldfinch	353	12	365
Spotless Crake	5	–	5	Lesser Redpoll	62	–	62
North Island Weka	4	–	4	Chaffinch	183	19	202
South Island Weka	8	–	8	Yellowhammer	35	–	35
Pukeko	113	12	125	Cirl Bunting	1	3	4
Australian Coot	11	1	12	House Sparrow	504	17	521
South Island Pied Oystercatcher	107	1	108	Starling	221	10	231
North Island Pied Oystercatcher	30	3	33	Myna	22	–	22
Black Oystercatcher	38	1	39	White-backed Magpie	26	2	28
Spur Winged Plover	32	–	32	Magpie (Species not indicated)	6	1	7
Banded Dotterel	168	4	172	North Island Saddleback	7	–	7
					7915	377	8292

BEACH PATROL SCHEME, 1970

During 1970 there was a good level of activity by patrollers on most coasts. Cards have been received for all zones except Southland and Fiordland. Zones which were particularly well covered were Auckland West by an Auckland group, Taranaki by a New Plymouth group, Wellington West by a Palmerston North group, and Canterbury North and South and Wellington South by individuals. The increased amount of patrolling on South Island beaches is very pleasing.

The following is a tabulation of mileages travelled and birds found on all coasts during the year:—

Coast	*Miles*	*Birds*
Auckland West	845	2284
Taranaki	97	111
Wellington West	263	1030
Westland	16	10
Auckland East	37	92
Bay of Plenty	7	31
East Coast	5	4
Wairarapa	25	12
Canterbury North	27	45
Canterbury South	80	66
Otago	29	28
Wellington South	74	123
North Coast South Island	11	38

Thus 1516 miles yielded 3874 dead seabirds: the mean of 2.6 birds per mile travelled is a relatively high one. The most abundant species was Lesser Broad-billed Prion *Pachyptila salvini* with 1086 specimens. Among several rarer specimens there were 12 Silver-grey Petrels *Fulmarus glacialoides.*

I would like to thank all members who have contributed to this scheme in any way during the year.

— M. J. IMBER, Organiser

BANDING REPORT

The banding reports for the years 1964 - 71 are virtually complete and a summary for these years will soon be ready for publication in " Notornis."

It has been decided, subject to Council approval, that the Banding Officer will supply a three monthly report for " Notornis " of the highlights on banding activities during the previous period, and that in future an annual report on banding activities will be published each year by the Banding Officer.

The conversion of the old type cards to computer type has been completed and 95,000 cards have now been stored on tape.

During the past year a total of 48,299 birds has been banded, an increase of 16,000 over the previous year and approaching the total for the 68 - 69 period.

Your representatives wish to record their thanks to the Banding Officer and his staff for the great amount of work entailed in bringing these records up to date.

— N. B. MACKENZIE
P. WILSON

RECORDING SCHEME
Report for 1970/71

Files or extracts from files for 25 species have been sent out on request during the year. The number of contributors is up on last year, but no records have been received from some regions. The scheme exists to provide a means of collecting and recording unpublished ornithological information not covered by the Beach Patrol, Nest Record and Mapping Schemes. Bird counts from harbours, estuaries and beaches, notes on feeding habits and behaviour, arrivals and departures of migrant birds, occurrence of rare birds and stragglers are all most welcome and when recorded on species files are available for study by members.

The following is a list of contributors:—

Southland — R. R. Sutton.

Otago — J. Aspinall, P. Child, Mrs. Hamel, W. T. Poppelwell, A. Wright.

Canterbury — A. Baker, C. N. Challies, J. R. Jackson, R. J. Pierce.

West Coast — P. Grant.

Marlborough — J. A. Cowie.

Nelson — F. H. Boyce.

Wellington — F. C. Kinsky, D. V. Merton, R. Slack, Wildlife.

Wairarapa —

Manawatu — I. G. Andrew, E. B. Jones, M. G. Macdonald, A. A. Savell.

Wanganui —

Taranaki — D. Medway.

Hawkes Bay —

Gisborne — A. Blackburn.

Volcanic Plateau — C. D. Blomfield, R. S. Cowan, R. W. Jackson.

Bay of Plenty —

Waikato — D. W. Hadden, J. H. Seddon.

South Auckland — J. F. Bell, E. W. Betts, J. Brown, S. Chambers, M. Daniel, M. Douglas, T. Harty, H. R. McKenzie.

Auckland — G. Adams, T. R. Calvert, S. Chamberlain, J. Jenkins, Mrs. Reed, G. Robinson, E. G. Turbott, C. R. Veitch.

Northland — D. E. Calvert, C. D. Clunie, C. W. Devonshire, Miss E. Madgwick, M. Munroe, Mrs. Reyonlds, Miss D. Whyte.

E. & O. E. — A. T. EDGAR, Recorder

REGIONAL REPRESENTATIVES

FAR NORTH & NORTHLAND: A. T. Edgar, Inlet Road, Kerikeri
AUCKLAND: Mrs. S. Reed, 4 Mamaku Street, Auckland 5
SOUTH AUCKLAND: H. R. McKenzie, P.O. Box 45, Clevedon
WAIKATO: D. W. Hadden, Waingaro Schoolhouse, Waingaro, R.D.1 Ngaruawahia
BAY OF PLENTY: R. M. Weston, 250 River Road, Kawerau
VOLCANIC PLATEAU: R. W. Jackson, 9 Kenrick Road, Rotorua
GISBORNE/WAIROA: A. Blackburn, 10 Score Road, Gisborne
TARANAKI: D. G. Medway, P.O. Box 476, New Plymouth
WANGANUI: R. W. Macdonald, 127 Ikitara Rd., Wanganui East
MANAWATU: Dr. I. G. Andrew, 6 Eaton Place, Palmerston North
HAWKES BAY: N. B. Mackenzie, Pakowhai, Napier, R.D. 3
WAIRARAPA: B. W. Boeson, P.O. Box 30, Carterton
WELLINGTON: R. Slack, 31 Wyndham Road, Pinehaven, Upper Hutt
NELSON: F. H. Boyce, 19 Marybank Road, R.D.1, Nelson
MARLBOROUGH: J. A. Cowie, P.O. Box 59, Kaikoura
CANTERBURY: J. R. Jackson, 103 Linwood Avenue, Christchurch
WEST COAST: Vacant
OTAGO: Mrs. J. B. Hamel, 42 Ann Street, Roslyn, Dunedin
SOUTHLAND: R. R. Sutton, P.O., Lorneville, Invercargill

———★———

LITERATURE AVAILABLE

From all bookshops:

A Field Guide to the Birds of New Zealand, by R. A. Falla, R. B. Sibson and E. G. Turbott. 2nd Revised Edition, $5.00.

From B. D. Heather, 10 Jocelyn Crescent, Uinehaven, Silverstream:

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

From B. A. Ellis, 44 Braithwaite Street, Wellington 5:

Field Guide to the Waders, by Condon and McGill. Price 75c.

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

Back Numbers of Notornis at 60c each (Vol. 18 $1.00 each). Large orders for full or part sets at special prices.

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

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

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