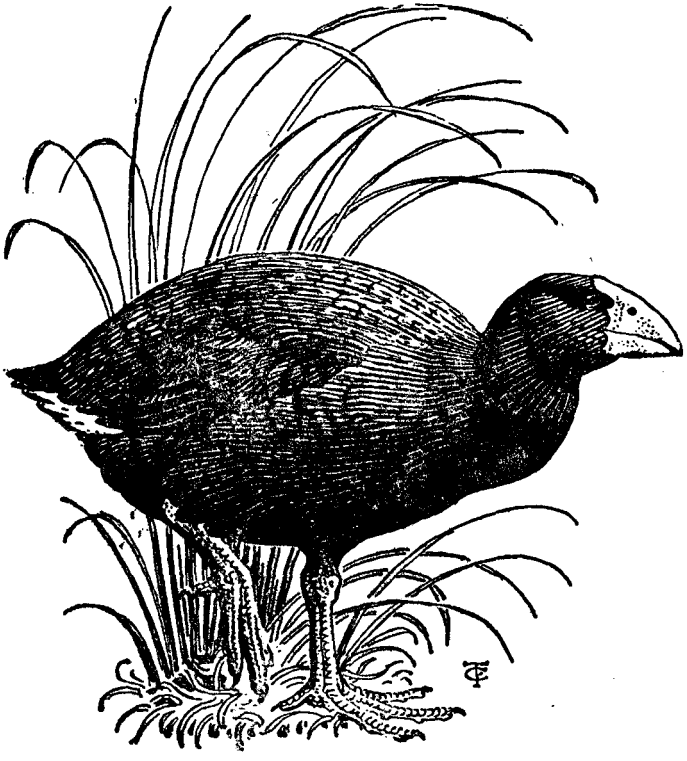
NOTORNIS

Journal of the Ornithological Society of New Zealand



Volume 21 Part 3 September 1974

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VOLUME 21 PART 3 SEPTEMBER, 1974

THE KOKAKO (Callaeas cinerea wilsoni) IN THE HUNUA RANGES

By J. W. St. PAUL and H. R. McKENZIE

ABSTRACT

The history of the Kokako in the Hunua Ranges and contiguous districts is given so far as it is known. No literature prior to 1943 has been found for this area. J. W. St Paul's sixty-five years experience of this bird, and, latterly, his work and that of others have proved that there has been a very serious decline in the population. Although seven nests were found between 1943 and 1953 only one, in 1962, was found in the nineteen years from 1953 to 1972, this in spite of intensive search in the later years. Fears for the future are entertained because exhaustive nest hunting efforts have failed for so long.

Feeding is discussed, also the variation in songs and calls from those of further south. Of predators present *Rattus rattus* and the Myna *(Acridotheres tristis)* are considered to be by far the most destructive agents and could well cause the extinction of the species here and elsewhere.

Even if this bird does die out in the Hunua Ranges all this effort will at least have compiled much information and a certain amount of history.

INTRODUCTION

This account of a local population of Kokako *(Callaeas cinerea wilsoni)* is meant to cover its history, to supplement previous writings, to record recent investigations and to discuss its decline. The Maori

name Kokako is used in preference to the name "Blue-wattled Crow" because the bird has no affinity whatever with the crow (Corvidae), but belongs to the wattle-birds (Callaeidae). Buller (1888: 1, pl. I) gave a comprehensive account of the species (see also Turbott, 1967: 3-6, pl. 1) and M'Lean (1912: 229), graphically described the habits and calls of a local group in the Gisborne district in 1906 and 1907. Sundry further notes published in *Notornis* are mentioned herein (see also J. W. St Paul 1958, 1959; J. W. St Paul & Maning 1960; Macdonald 1966).

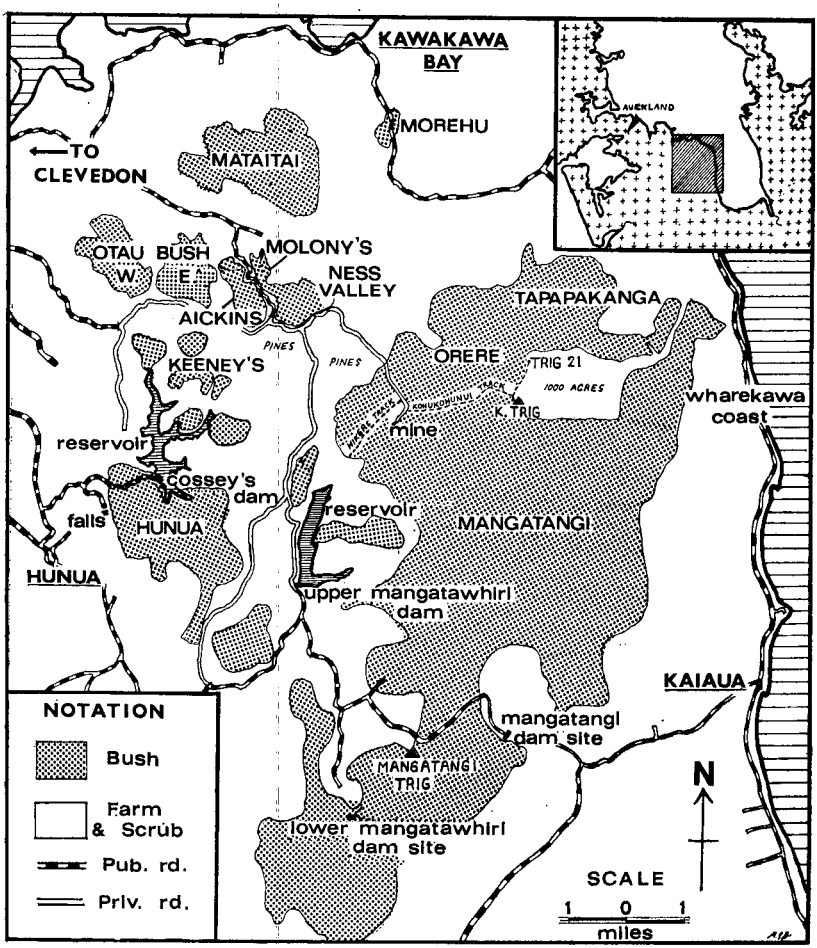

FIGURE 1 — Study area of Kokako in the Hunua Range.
del.: M. E. Douglas

GEOGRAPHICAL

The name " Hunua Ranges " is a term loosely applied to the jumble of minor ranges, with steep ridges, narrow valleys, deep gullies and rough plateaux, widely encircled by Hunua, the ill-defined Otau area east of Clevedon, Ness Valley, Orere, the Wharekawa coast, Kaiaua, Mangatangi, Mangatawhiri and Paparimu towards Hunua. The first map shows the relationships of the areas and places mentioned (Fig. 1).

The naming of these areas within these boundaries is also indefinite. Cossey's Dam (Reservoir) reached via Hunua could be said to be in Hunua or else in Otau. The Upper Mangatawhiri Dam (Reservoir), reached from Hunua, then Paparimu, then by Moumoukai Road, is in the Moumoukai Valley, while the rough high plateau north-west of it is also called Moumoukai. On the west side of the plateau, where Otau impinges on it, farms were bought by the Auckland City Council (later replaced by the Auckland Regional Authority) for the purpose of water catchment, allowed to go back into fern and early bush regeneration, then largely cleared and some hundreds of acres planted in *Pinus radiata.*

The highest feature of the area is Mt Kohukohunui, 2256 feet, best reached from Clevedon via Ness Valley, Moumoukai Hill Road and a private road (Plows' Road), skirting the northern edge of the plateau, then through solid bush on G. M. Maning's manganese mine road to the gate of the mine claim. Here a car is left and a foot track goes east for two and a half miles (4 km) along the top of a high ridge to Mt Kohukohunui and another half mile (800 m) to Trig 21.

On the left of this track is the Orere basin of bush and the reverting " Thousand Acre Clearing " is to the right. Near the summit of Mt Kohukohunui are the sources of the Mangatawhiri River, the Konini Creek and the Mangatangi River, the latter first tending east, then south, partly parallel with the Mangatawhiri. The lower part of the Mangatangi, where a further reservoir will be established, is approached by private road from the Kaiaua-Mangatangi Road. All of this northern, central, eastern and southern area, excepting the Hunua part, is in the main block, with at present two artificial lakes, and is intersected by private roads and a small proportion of cleared land. The pine plantation is on the western side of the bush. Access by these private roads has to be obtained through the Auckland Regional Authority officer in charge.

There are approximately 30,000 acres (12,144 ha) of bush in this main block, most of which is habitable for the Kokako. Some areas of Hard Beech *(Nothofagus truncata)* in the north and east, together with Kauri *(Agathis australis)* and Tanekaha *(Phyllocladus trichomanoides)* which occur more in the east and south, though used, were never so much favoured as the greater area of more mixed bush, with plentiful Tawa *(Beilschmiedia tawa),* all of which held a strong

population in the early days. This choice of habitat still holds good today in regard to the present scanty remnant of the species.

Outside this area are several smaller blocks totalling c6050 acres (2610 ha).

Otau Bush. This, c1050 acres (404.8 ha), in two parts, is on the western slope, some of it sufficiently unspoiled to hold Kokako but most of it heavily browsed and wrecked by timber getting. It lies partly in Otau and partly in Ness Valley and is known to have once held many Kokako. One was seen at the north-western lower corner about 1940 and another at the south-eastern edge on 1 November 1966. This bush has only once lately been checked, but without success, on 12 August 1973 by the King's College Bird Club (KCBC) and it is just possible that it could still hold a very small number of Kokako.

Aickin's Block (really a fraction of the actual survey block), c400 acres (c162 ha) on the south-west side of the Moumoukai Hill Road, is a rough steep narrow valley draining from the Otau Range into Ness Valley. The bush is moderately intact. Mr T. Murray of Clevedon, when a schoolboy, c63 years ago, used to stay and work at times on a back farm at the top edge of this block and he well remembers how in the early mornings the whole valley rang with the song of the Kokako and Tui. Only an occasional Tui is to be heard there now.

Molony's Bush. This 50 acres (20.24 ha) or so is on the north-east side of the Moumoukai Hill Road and is in Ness Valley. In the early sixties it had three Kokako, but lately only one. This one, seen in 1961 by J.W.StP. to have a short tail, was apparently a young one, then with its parents, the latter having since disappeared. One seen there alone on 28 May 1971 is thought likely to have been this bird.

Ness Valley Bush, a headwaters basin, c600 acres (c243 ha), divided only by a fenceline from Molony's, is all of excellent Kokako bush. In 1962 J.W.StP. heard from the ranger's house at the top of the Moumoukai Hill Road six callings at once from this basin and the adjoining Molony's Bush, which could indicate six pairs. None had been heard in the Ness Valley bush block since 24 April 1968 until the KCBC, on a survey, got a call in the north-eastern corner in 11 March 1973. This one however may have been the one from Molony's Bush. A St Paul family survey party had got nothing on 21 February 1971. This sudden drop may be attributable to the felling of an adjoining 150 or so acres of bush on the north side of the 600 acres, including a favoured main ridge. Smoke from the burning of the felled bush may have been a factor as was certainly the case with the birds in the great Raetihi fires of long ago.

Mataitai Block, lying north of Ness Valley, c900 acres (c364 ha) is partly of suitable bush. About twenty years ago two Kokako were shot there but thorough searches by J.W.StP. revealed none in 1970-71. *Cashmore's Hill* or the *Morehu Reserve,* c100 acres (40.48 ha), is

reached shortly after leaving Kawakawa Bay on the way to Orere. Although it has a little good mixed bush it is largely Kauri-Hard Beech association, running into Manuka *(Leptospermum scoparium)* on the ridge tops. Even in the early days it would have held few or no Kokako.

Keeney's Bush, of c400 acres (162 ha), consisting of several patches more or less joined together by secondary growth, is all about the north-eastern area of Cossey's Dam. It held Kokako up to 1957 so still may have some, but none has been seen or heard lately by rangers working there.

Hunua Bush, c2500 acres (1012 ha), extends to the south and east from Cossey's Dam and is known to have once been well populated. The bush is still very suitable for the species. About ten years ago one bird was seen by a casual visitor. A recent search by two competent observers who camped out in the bush and searched 12 or so miles of bush foot tracks and ridge tops was not successful.

HISTORY OF INVESTIGATIONS & NEST HUNTING

J. W. St Paul came to the Moumoukai Valley in 1901 at the age of four years. He remembers throwing clods at Kokako on his way through the bush to school. In those early days he knew this bird to be almost as plentiful as the New Zealand Pigeon *(Hemiphaga novaeseelandiae)*. As the pigeon could then be shot by the sackful this indicates the former abundance of the Kokako and emphasises the fact that we now have only a pitiful remnant. It was not shot as it was not palatable. From 1905 to 1963 J.W.StP. lived and worked in and about the bush, except for his war service in World War 1, taking a lively interest in the birds and the trees. After the war he had a farm which ran back into the bush. Calls and song were readily and frequently heard by him and his wife and family from their house. His wife had lived on a nearby farm and knew the birds well. The Kiripaka Stream runs through this part of the bush. Only one has been heard there lately.

From 1941 a more intensive study of the principal area, as shown on the second map (Fig. 2), was started and H.R.McK. was guided by J.W.StP. to a closely heard Kokako, his first hearing of the bird, on the Mine Road. (The Mine Road is the section from the edge of the bush to the claim gate). On 20 December 1941 R. B. Sibson and H.R.McK. camped on the manganese mine road (the Maning's Road section of it) and very early on the 21st saw their first pair of Kokako in some large Tawa. In the ensuing years many others took part in the study.

The finding of nests is far from being easy. Any success has been achieved by much hard work and sometimes by good luck when parties or persons were just looking for birds, though they were always on the lookout for nests too. The numbers used below as headings for each nest found are shown on the accompanying map.

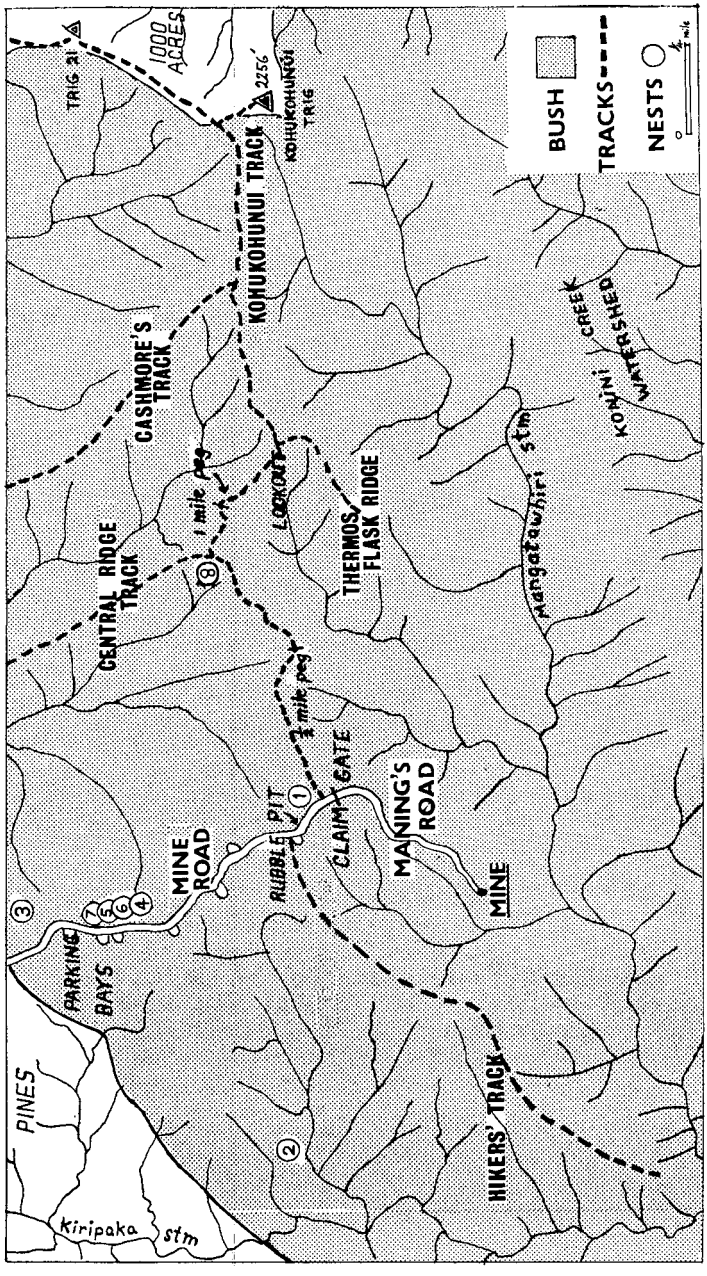

FIGURE 2 — Detail of nest localities of Kokako in Hunua Ranges.
del.: M. E. Douglas

Nest No. 1, (H.R.McK.), 28 November 1943, was 17 feet (5.18 m) up in a Toro *(Myrsine salicina)* in the corner made by the junction of Mine Road and the Kohukohunui Track. It was filled loosely to the brim with dead leaves so evidently was of the previous season. In the bottom of it were fragments of eggshell, which, flattened out were up to 2 cm across. The colour was retained. Predation by a rat seemed most likely, the nest being above a large log where rats would live. The nest had kept its full shape and is now in the Auckland War Memorial Museum (McKenzie 1944).

Nest No. 2, (J.W.StP.), 26 December 1943, was 35 feet (10.6 m) up in an unclimbable Tawa sapling, with parents feeding young. On 5 & 8 January 1944 the parents were about but on the 9th were absent. A bush ladder was made and R. B. Sibson used it to scramble into another tree whence he was able to see that the nest was empty. Below the nest, caught up in twigs, was the dried form of a full sized but not fully fledged young bird. The assumption was that it had been moving about the tree, as they do for several days before leaving completely, that it had died by accident and that the others had left naturally. The dried specimen is in the Auckland War Memorial Museum (McKenzie 1944).

Nest No. 3, (H.R.McK.), 27 November 1949, perhaps 5 of 6 years old, was found on a special nest hunt, c27 feet up in a Toro. It was definitely, by its structure and position, not a pigeon's nest (unpubl.).

Nest No. 4, (R. H. D. Stidolph, J.W.StP. and H.R.McK.), 3 November 1950, was about 40 feet up in a straight Tawa. It was proved to be a "play nest" when on 8 December 1950 D. A. Urquhart made a hazardous and skilful climb and examined it closely. It was only a flat platform and was not concealed (McKenzie 1951: 71).

Nest No. 5, (F. J. Lownsborough, Rev. R. J. Fenton, F. G. Milner, T. F. Murray and H.R.McK.), 2 December 1956, was in a Tawa at 26 feet, in a dense clump of reversionary branches on an old trunk. T.F.M. tied a rope across his ankles, scaled the tree and found three tiny chicks being brooded in a nest. These were watched until they were seen by J.W., R. and R. B. St Paul to finally go away on 27 December 1950. A full account was written (McKenzie 1951: 70-76).

Nest No. 6, (J. D. Mitchell, F.G.M. and H.R.McK.), 6 December 1952, was being built by two birds in a precarious position. One side of the nest rested against, not in or on, a clump of astelia and the other on an unstable reversionary Tawa branch. On 11 December 1952 T.F.M. climbed up and found three eggs. The nest could never have held three large chicks and a parent so a wire was fixed across under it to take the weight. The tree could not be isolated by tinning as had been done with No. 5 so it was decided to leave it alone so that vermin would not be attracted by our visiting it. However the birds must have sensed its instability and deserted. On 26 December 1952 Rev. R.J.F. found the nest empty. The three deep indentations in

the nest lining indicated that the nest had been deserted long before the eggs were taken by some predator (McKenzie 1953: 174).

Nest No. 7, (Rev. R. J. Fenton), 16 November 1953, was in a Toro c60 yards (55 m) west of the nest of 2 December 1950. It was old and unfinished and in a difficult tree so no effort was made to climb to it (unpubl.).

Nest No. 8, (J. W. and R. St Paul), 1 January 1962, was in the early stages of building. The site was about 25 feet up in a mass of rata vine *(Metrosideros fulgens)* on a Raukawa *(Pseudopanax edgerleyi)*. Visited last on 31 January 1962, eggshells on the ground indicated very recent hatching and that the young had been taken on the night of 30 January 1962. Although the tree fell down two years later the nest was still recognisable as such eight years after it was built (R. St Paul 1963: 180).

Nest hunting has been diligently pursued from 1943 to 1973 so the total of eight nests shows the difficulty of finding them. From October 1971 to November 1973 specially planned efforts by many more observers have failed to find any at all. It is really alarming that no nest has been found in the last ten years and only one in the last nineteen years. Strangely enough for a bird of such weak flight ridges are preferred for nesting in the Hunuas. It seems odd to see the birds labouring up through the trees on a very steep slope to the top with a beakful of material and also when bringing food to the young. Bearing this habit in mind main and side ridges were plotted and allotted to teams for special searching. Not even an old nest was found and as already noted they last for several years.

The searchers were briefed in the call of the young, which is made after they have left the nest, an unmusical short "Kwok-kwok," but none was heard. This call, which somewhat resembles the short concluding notes of a frog in song, was described by Mr Robert Quinn to H.R.McK. on 2 January 1944. Mr Quinn had been brought up among Kokako at Patumahoe and knew the species thoroughly. The next day H.R.McK. and others heard the call near the western end of the Kohukohunui Track. The bird followed the party a little way through the high trees but could not be sighted. Fledglings, perhaps a little older, found by J.W.StP., have made calls like some of the shorter ones of the adult. C. R. Veitch, of the Wildlife Service of the Internal Affairs Department, has told H.R.McK. of hearing in the King Country on 17 August 1971 the awkward attempts of a young bird learning to sing.

Young birds have been seen after fledging by J.W.StP. as follows: 24 January 1943, one seen at six feet, fully grown, but not fully feathered, alone (J. W. St Paul 1943: 29).

21 February 1945, two adults feeding two young two-thirds grown and tails only half length, as were those of No. 5 Nest when they left (J. W. St Paul 1946: 136).

1961, the one in Molony's Bush already mentioned, tail three quarters grown. (J.W.StP.)

CALLS

The differences in the calls of the Kokako of the Hunua Ranges from those of further south are quite remarkable. Taped calls of those Kokako near Rotorua and in the King Country illustrate this. However these tapings were made in recent years and songs and calls can well have changed there as they have done here. What we call the " full song " here, two long organ notes, followed by three sharp " pipes," was very common until the last few years, but has, to the best of our knowledge, completely faded out. We have no evidence of this call having been heard further south. The unwary may take it for Tui, but it is never quite the same, though some Tui notes do closely resemble other calls of the Kokako. M'Lean (1912: 229) listed calls in the Gisborne bush in 1906-1907 but the " organ and pipe " was not included. Other calls in the Hunuas are described by Maning (1960: 7-8).

Some years ago there was much argument in the press about the " cowbell " call, common in the King Country, some of the old settlers and bushmen claiming that this made the Kokako the " true bellbird," while the Bellbird of the ornithologists *(Anthornis melanura)* was, according to them, the " mockymock," a corruption of one of the Maori names, Makomako. To our knowledge this " cowbell " call has not been reported lately in the south. It certainly has not been taped. In the Hunuas J.W.StP. knew it from 1905 to 1914, but not since. Neither was it as common here then as it apparently was in the King Country.

Another significant point is that while the Wildlife Service has had considerable success further south in attracting birds by playing taped calls it is seldom that notice is taken here of either the southern taped calls or of their own. M. E. Douglas taped a bird in sight in a tree a few feet above him, then played its calls back to it without its showing any interest at all nor did the playing of the calls attract birds further along the track. They do respond at times but not nearly to the extent that the southern ones do. In the Hunuas no seasonal variation of song has been noticed except in volume. Much remains to be learned of the vocal characteristics of this bird. For instance although a courtship dance has been described (Buller 1888) J.W.StP. has never seen it here, nor has he ever heard a song or call that he could ascribe to courtship.

DECLINE OF KOKAKO POPULATION

The decline of this population, which is now an isolated remnant, is a matter for concern. No-one now alive can remember the forests in the lower country here in their virgin state but enough is known to be sure that they supported a healthy population of the Kokako, New Zealand Pigeon, Kaka *(Nestor meridionalis)* and Red-crowned Parakeet *(Cyanoramphus novaezelandiae)*. This would apply not only

to the rich lower lands of Clevedon but also to Papakura, Pukekohe, Patumahoe, Waiuku and adjacent areas. As late as the early 1940s, R. B. Sibson (pers. comm.) had a reliable report of five Kokako seen at once in a small area of bush at Patumahoe. Mr R. Quinn told H.R.McK. of their abundance there in his young days, when nests were often found, especially in Ramarama *(Lophomyrtus bullata)*, usually with three eggs, one of which would sometimes fail to hatch. The late H. S. Munro, a prominent amateur naturalist of Clevedon, has told H.R.McK. of its being common in what was left of the Clevedon lower bush in his time. He was called to a nest in a tree which grew only a few feet above the high tide mark in a creek. The nest was seen when the tree had been felled. One chick had hatched and he had great difficulty in getting the large chicks out of the other two eggs, one of which, dated 22 November 1887, is in the Auckland War Memorial Museum.

Shortage of food is certainly not a factor in the decline of the Kokako here. The account of J. W. St Paul (1966: 99) shows that the diet is not highly specialised. The bush provides an abundance of the foods listed, enough to support many times the present number of birds, but if this bush were in its virgin state it would support a great many more. I. L. Barton, Forester, Auckland Regional Authority, Hunua, describes the present state of the bush (Barton 1973). He discusses its deterioration during the last hundred years owing to the destruction by browsing, not only to the shrubs of the undergrowth but also to the seedlings and saplings of the larger trees, so that there is now a gap between the old and the young, the mature trees dying out while the young ones, until lately, have been largely prevented from replacing them.

The early settlers wintered cattle in the bush. Some went wild and the last were shot out before 1914. Goats then became a serious menace and, though greatly reduced, are still giving trouble. Pigs and oppossums are hunted assiduously. The young growth is now improving but it will take very much more than a hundred years to fill the gap between the young and the old. The Kokako should certainly survive this period of forest transition, provided it is not annihilated by predators.

The Kokako is now rarely seen on the ground. H.R.McK. has seen it only once when one hopped across a bush road. J.W.StP. used to see it quite often on the ground but not after the advent of the stoat, about 1914. He holds the theory that Kokako which used the ground were wiped out and those more arboreally inclined survived. M'Lean (1912: 229), in the Gisborne bush, found them using the ground frequently, apparently getting fallen berries or insects. He also watched them seeking insects in the bark of trees and in moss. We have never known them to look for insects and odd probings in moss were thought perhaps to be for moisture. Certainly they sought there the tender ends of polypodium rhizome.

It is notable (St Paul 1966: 99) that Tawa is a sign of good habitat, even though it provides only one of the main foods, but any well mixed bush is suitable. The writers have proved that they can recognise good Kokako bush from over a mile away.

The reduction in numbers is firmly believed by the writers to be almost entirely due to predators, the chief being the ship rat *(Rattus rattus)*, sometimes called "roof rat" or "black rat" (the latter here being of the light phase only) and in this bush could well be called the "tree rat." One winter we trapped 24 of these rats in about 2 acres (.88 ha). Another time traps set near a nest caught a stoat, a ship rat and a mouse in only a short time. We have of course only a little definite evidence of rat predation of the Kokako but it is backed up by its known destructiveness to other species in that bush. Another major predator is the Myna *(Acridotheres tristis)* which now penetrates the heavy bush and actually lives in it wherever a road or even a tractor track runs through it. J.W.StP., in the Mataitai Block, found eggs of Pigeon and Tui on such a track where the mynas had taken them to eat their contents. Rats or stoats eat eggs in the nest or take them under cover. This is a serious menace to all of our arboreal native birds. Stoats and cats are present in very small numbers. The gentle Kokako is no match for introduced vermin and we fear that few, if any, are able to breed successfully here.

In 1957 J.W.StP. estimated the population of the main block of 30,000 acres (12144 ha) to be 250 to 300 birds, but c50 in 1967. The more intensive work of 1971-72 by a greatly increased number of searchers revealed a total of perhaps 60 to 70 birds. It would therefore appear that the 1957 and 1967 estimates, not having the advantage of intensive search by so many people, were too low and that the 1957 estimate should perhaps have been 500. In either case however the rate of decrease would be serious. The making of an estimate in this main 30,000 acres is very difficult but a decline is only too obvious. A marked decline has been reported around Rotorua. Other areas further south have not been reported upon until recent years so the former status is not recorded for them.

In February 1971 John A. and Beth Brown of Papakura suggested a sustained effort to study the Kokako of the Hunuas and they led some of the parties which were arranged. Because calls begin at sunrise (seldom at dawn) and usually continue at peak to 9 or 9.30 a.m. it is necessary in summer to camp up near the bush and be on station early. Calls during the day are infrequent and an increase in the evening is too slight to be of use. From February 1971 to August 1973 there have been five campouts of 8 to 11 watchers, one by Miss A. J. Goodwin alone and two by KCBC. J.W.StP. has camped alone eight times for up to three days on Mine Road and once at Kohukohunui Trig. Ten day trips have been organised, six of these by KCBC. One of the camps was at Orere for working the Tapapakanga basin on 4 April 1971. Most one-day trips were made

on the shorter days when the sun rose later, some to Kohukohunui Track, Mine Road, Maning's Road, the Hikers' Track, Ness Valley and Orere basin. For the 24 April 1971 Orere trip Mrs Glenis Martin drove alone from Whenuapai, Simon Chamberlain from Whangaparaoa, Dr Ian Malcolm from Murray's Bay, Murray Douglas from beyond Waiuku and Auckland members arrived at Clevedon at 5 a.m. to go 14 miles from there to the bush. This surely illustrates the calibre of the Kokako seekers, while from February 1972 the boys of the King's College Bird Club, aided by masters supplying transport, have capably joined in the scheme, making many trips. Altogether 61 persons have taken part in these more recent researches, many of them several times.

Many visits are needed to arrive at something like a true count. The behaviour is so unpredictable that no two accounts are likely to be the same. Sometimes no Kokako at all will be seen or heard even in the best areas. This obtained too when the species was far more numerous than it is now. Estimates for the places worked have been arrived at by taking the number of birds heard, doubling it to allow single calls to represent pairs, then deducting one in each six or so to allow for single birds, then adding birds seen. Calls of birds seen are of course not counted. Pairs are much more common than singles. In some cases allowance has to be made for overlap of the areas of two teams getting the same call. On this basis the highest estimate of birds for a trip was 34, on 14 March 1971; 25 on the Kohukohunui Track, 4 on Mine Road, 5 on the Hikers' Track and none on Maning's Road or at the mine.

The Kohukohunui Track area seems to be the most favoured centre at all times of the year, though the birds are spread over several miles. No close flocks, large or small, have been seen. Study over the years 1971 to 1973 has been maintained by camp-outs and one-day trips. Counts for 1971 ranged from 1 to 25, the average for the six trips made being 11.8. For 1972 nine trips gave counts of 2 to 15, the average being 6.7. Nine trips in 1973 gave 4 to 25, averaging 10.6.

J.W.StP. camped at Mt Kohukohunui and from the Trig on 16 November 1973 heard 14 calls from separate places, representing perhaps 25 birds. Two calls were from near Trig 21 and the others in a wide arc to the east, south and south-west for up to one mile. Oddly they started at daylight and ceased at 6 a.m. None was heard on the Kohukohunui Track and Orere basin, neither then nor when he walked along the Track to Mine Road. Was this another loose concentration on the east of the usual area and if so why did it occur away from the usual territory at the time when breeding birds should have been feeding young? We do not consider that these had gathered from the whole block. This can never be checked owing to the impossibility of getting enough watchers to simultaneously cover the remote parts of this large tract of bush before sunrise on the one day.

Mine Road, once populous, is no longer so. J.W.StP., camping often on this road from 1971 to 1973, has found that two pairs at the northern end have gone and that the main nesting area and the bush west of this road now have only odd pairs or single birds occurring at times. Against this decline however is the fact that callings from three of their former positions still come from far down in Cashmore's, east of this road. Records have been 0 to 8, averaging 3.8.

The Hikers' Track has not received much attention, much of the bush being tree fern. Two calls of 1972 and 1973 heard west of the mine could have been from birds of this area, besides the estimate of 5 on 14 March 1971.

Maning's Road and the mine, once particularly populous, was frequently visited but produced nothing for these three years until 4 on 18 January 1973. Here also we have a calling persisting from far to the east of the mine.

The eastern part of the Orere basin (Cashmore's) is included in the Kohukohunui Track records, except that a special survey on 24 April 1971 gave a count of 7.

One camp-out for the Tapapakanga basin yielded 6. Conditions were perfect. One set of callings closely heard and timed by one party was also heard and timed by another party at a distance of a mile and a quarter by map.

Small lots are known on the east side of the upper Mangatawhiri Dam and in the vicinity of the Mangatangi Trig and there are scattered pairs elsewhere. Since the most favoured part of the block held about 34 for 1971 the total for the whole can hardly have been over 60 or 70.

ACKNOWLEDGEMENTS

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PREY-SPECIFIC FEEDING METHODS OF NEW ZEALAND OYSTERCATCHERS

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ABSTRACT

New Zealand oystercatchers use specialised prey-specific methods to feed on common prey found in the marine littoral zone. Methods of locating and dealing with bivalves, limpets, chitons, gastropods, and crabs are herein described. Feeding behaviour may be modified by climatic factors, physical factors of the environment, and competition for food. The mainland species of oystercatchers have similar repertoires of feeding methods, but the South Island Pied Oystercatcher is behaviourally adapted to exploit estuarine bivalves whereas the Variable Oystercatcher is adaptively superior in exploiting limpets and chitons on rocky shores. The Chatham Islands Oysstercatcher seems behaviourally intermediate to its mainland congeners in feeding habits, possibly in response to widely varying feeding habitats in the islands. Differential niche utilization may therefore have been an important factor in the speciation of New Zealand oystercatchers.

INTRODUCTION

Oystercatchers have attracted the attention of both ecologists and ethologists because of their specialised mode of feeding. Many authors have described foods and feeding habits (Dewar 1908, 1910, 1913, 1915, 1922, 1940; Bayne 1941; Webster 1941; Tomkins 1947; Legg 1954; Norton-Griffiths 1967; Heppleston 1971; Dare & Mercer 1973). Despite this wealth of literature, most of which pertains to the European Oystercatcher (*Haematopus ostralegus* L.), very little is known about the feeding habits of the New Zealand species of oystercatchers. The only published account of feeding in these species is that of Oliver (1955) which contains only a brief mention of foods taken by the Variable Oystercatcher *(H. unicolor)*. The present paper reports on some prey-specific feeding methods which were observed during the course of a study of the comparative feeding ecology of the New Zealand species of oystercatchers.

METHODS

Time and location of observations:

Field observations of feeding habits of mainland New Zealand oystercatcahers were made primarily in the winters of 1966 and 1967, and supplementary observations were made in the winters of 1968

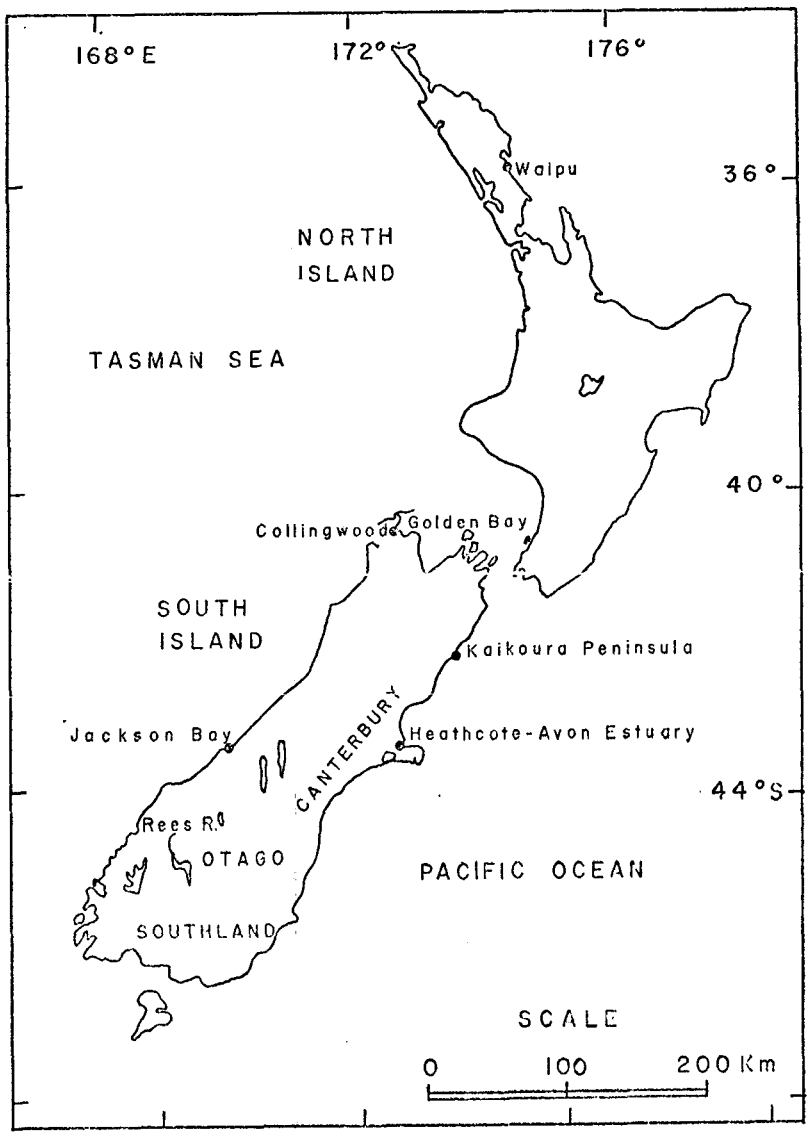

FIGURE 1 — Map of New Zealand showing location of study areas and localities mentioned in the text.

through to 1971. Feeding of the Chatham Islands Oystercatcher was observed only in early November 1970 when the author was fortunate to be a member of the Wildlife Service expedition to the Chatham Islands. The South Island Pied Oystercatcher *(H. ostralegus finschi)* was studied in detail at the Heathcote-Avon estuary in Canterbury, and comparative observations of the Variable Oystercatcher *(H. unicolor)* were made at Golden Bay, Kaikoura Peninsula and Waipu estuary (Fig. 1).

Feeding behaviour:

Individual birds were observed feeding from distances of about 10 to 50 m through 7 x 50 mm fieldglasses. Each bird was followed for 10 min. and the number of probes in search of food were recorded, the number of successes marked, and the food identified where possible. Two experiments were conducted on a dense bed of cockles to test if the observed feeding success of birds was consistent with touch or sight location of the cockles. The success of touch location (random probing) was estimated by walking slowly along probing in the substrate with an oystercatcher bill held in the hand, and counting the number of times a live cockle was located. Similarly, the expected success of visual location was determined by probing at siphons of the cockles which were extended to the surface when shallow water covered the cockle bed. In each test 10 samples of 20 probes were made to allow statistical analysis of data.

Statistical analysis:

Differences between percentages were tested with the angular transformation which yields a test statistic t^s (Sokal & Rohlf 1969). The G-statistic (rather than X^2) was used to test differences in frequencies as it is easier to compute and is more accurate at lower sample sizes (Sokal & Rohlf, 1969). The significance level was set at 0.95, and probability ranges were designated as follows: * = $0.05 > P > 0.01$, ** = $0.01 > P > 0.001$, *** = $P < 0.001$, ns = not significant, $P > 0.05$.

LOCATION OF PREY

Visual location:

The most abundant bivalve mollusc at the Heathcote-Avon estuary is the cockle *(Chione stutchburyi)*, which also forms the major item of the oystercatchers' diet. Cockles (and many other bivalves) usually burrow beneath the surface of the substrate and feed by extending siphons to the surface. The siphons are extended from the gaping shell only when water covers the substrate, and when the tide uncovers the area they are retracted into the closed shell. It is therefore possible to detect feeding cockles by looking for siphons at the surface (see Fig. 2D). Oystercatchers feeding on cockle beds which were covered by shallow water seemed to locate cockles visually. The acute sight of the birds is illustrated by birds striking at a potential food source and then halting the strike at the waterline on seeing that the source was unsuitable. Birds were occasionally seen turning com-

pletely about to investigate something sighted in passing. Further evidence for visual location of prey was obtained by calculating estimates of feeding success, defined as the percentage of probes which were successful in locating prey (see Table 1).

Table 1. Feeding success of South Island Pied Oystercatchers at the Heathcote-Avon estuary.

Date	N	Mean No. of probes per 10 min. ± S.E.	Mean No. of cockles taken per 10 min.± S.E.	Mean % feeding success ± S.E.
12 June 1967	20	15.2 ± 0.81	8.1 ± 0.46	53.2 ± 1.86
30 June 1967	20	10.4 ± 0.96	6.2 ± 0.67	57.3 ± 2.01
25 June 1968	20	17.7 ± 1.10	9.3 ± 0.26	52.6 ± 1.77
21 June 1967	20	19.5 ± 0.37	11.7 ± 0.68	60.2 ± 1.59
3 July 1967	20	22.8 ± 1.34	12.5 ± 0.39	54.7 ± 1.75
27 June 1968	20	16.6 ± 0.72	8.4 ± 0.27	51.6 ± 1.42

The figures for feeding success in the above table are maximal because all observations were taken for birds which were feeding on a dense bed of cockles during the optimum period, i.e. in the period an hour either side of low water (Baker 1969). Under such conditions, South Island Pied Oystercatchers were successful in locating a cockle at approximately every second attempt. This represents a much higher rate of success than would be expected if probing were random and no visual location was involved. The experimental random probing test with an oystercatcher bill gave a mean feeding success of 9.0%, compared with 51.6% for oystercatchers in June 1968. The difference between these two means was statistically significant ($t^s = 3.13^{**}$) and the disparity between these relative success rates becomes even more significant if only the cockles caught gaping are considered. During the observations the birds pierced gaping cockles with their bills in 85.8% of the successful probes, whilst the experimental trials did not locate any gaping cockles at all. The visual location experiment in which the probe with the oystercatcher bill was made at the siphons produced results which were more consistent with feeding success figures of the birds. When conditions were ideal for sighting cockle siphons (bright sunshine, no wind, cockles covered by 1 to 10 cm of water) the mean percentage of successful piercing probes was 46.2%. The difference in the means for the birds and the experimental trial was not significant ($t^s = 0.342$, ns.). The higher recorded success rate of the birds was probably due to their more co-ordinated and better directed piercing probe than that attained manually with the oystercatcher bill.

Both mainland New Zealand species of oystercatcher appear to sight feeding bivalves, judging from the comparative feeding success calculations made at peak feeding periods near low water (see Table 2). The difference between the feeding success means of the two species was not significant (t^s = 0.055, ns.), indicating that they possess similar ability at locating gaping cockles.

Table 2. Comparison of feeding success of mainland New Zealand species of oystercatchers at Golden Bay.

Species	N	Mean No. of probes per 10 min.	Mean No. of cockles taken per 10 min.	Mean % feeding success
South Island Pied Oystercatcher	16	18.4 ± 1.20	8.6 ± 0.59	46.6 ± 2.22
Variable Oystercatcher	22	15.6 ± 0.88	7.2 ± 0.62	45.7 ± 2.45

The location of other bivalves was also probably visual. The pipi *(Paphies australe)*, the tuatua *(Paphies subtriangulatum)*, the large wedge shell *(Macomona liliana)*, the ribbed venus shell *(Protothaca crassicosta)* and the dosinias *(Dosinia anus* and *D. subrosea)* all possess siphons for filter feeding at the substrate/water interface. The large wedge shell frequently occurred at a depth of 3 to 10 cm in the substrate of the Heathcote-Avon estuary, and the only indication of its presence was provided by the siphons at the surface. Oystercatchers which took these bivalves were frequently seen with their bills completely buried in the substrate, indicating they had followed the siphon canals to the buried shell.

The location of mussels attached to hard substrates in shallow water was visual. Only those shells which were gaping were attacked, suggesting that the oystercatchers distinguished suitable mussels by the presence of a gape. Not only were the birds able to see the gape, but their piercing probes were almost always orientated down the longitudinal axis of the gape, as also shown for European *H. ostralegus* (Dewar 1908; Drinnan 1958; Norton-Griffiths 1967). Freshwater mussels *(Hyridella menziesi)* were also attacked while gaping (McKenzie 1963).

The location of amphineuran and gastropod molluscs on hard substrates, and of the mudsnail *(Amphibola crenata)* in estuaries, was visual as these species occurred abundantly at the surface. The main feeding problem facing the oystercatchers on rocky shores is not one of prey location, but rather one of removing prey which are firmly affixed to the rocks.

Touch location:

On uncovered substrates the location of buried bivalves appeared to be tactile. When the feeding grounds were completely exposed, the birds explored any depression in the surface of the substrate. In soft substrates they moved slowly forward making a series of short vertical probes with the bill slightly open and beneath the surface. The regularity of this probing was occasionally interrupted to lift the bill out of the substrate, but the probing was almost immediately repeated in another area. Similar searching probes with the mandibles open have been reported for the European Oystercatcher (Hulscher 1964; Davidson 1967).

When the surface of the substrate is littered with dense concentrations of old opened shells, the location of prey becomes extremely difficult. Although some of the younger birds painstakingly investigated each shell, the majority of birds used a much faster method of differentiating between occupied and empty shells. Two or three short sharp blows were delivered to the shell with the bill held vertically. If the shell is uninhabited the valves flex beneath the applied pressure, but if inhabited the valves are rigid and immovable. A possible explanation for this behaviour is that the birds were able to detect flexibility differences in response to their hammering, and utilised it to locate live prey. Both mainland New Zealand species of oystercatcher used this type of prey location when mollusc beds were exposed by the tide.

METHODS OF TAKING PREY

Estuarine bivalves:

The methods by which New Zealand oystercatchers extract bivalve molluscs from their shells are similar for each bivalve, with small differences associated with the mode of location. Bivalves with a gape between the valves were opened by thrusting the bill into the gape so that the valves were initially parted by the minimum dimension of the bill (bill width) which is often less than 1 mm at the tip. Once the bill was deeply inserted into the shell, opening was completed by immobilising the bivalve by pressure thrusting against the substrate, and then rotating the bill (and body) through 90° so that the 9-12 mm height of the bill forced the valves wider apart and snapped or seriously weakened the adductor muscles which draw the valves together.

Rotation of the body to effect prizing of the valves apart was described for European *H. ostralegus* by Dewar (1908), who found that the rotation was always to the bird's left hand side. This view was supported by Webster (1941) who observed the same behaviour for the North American Black Oystercatcher *(H. bachmani)*. The direction of rotation of New Zealand oystercatchers when prizing bivalves open was also largely to the left, but not invariably so (Table 3). This predominant sinistralism occurred with similar frequency in the three species ($G = 0.532$, ns.).

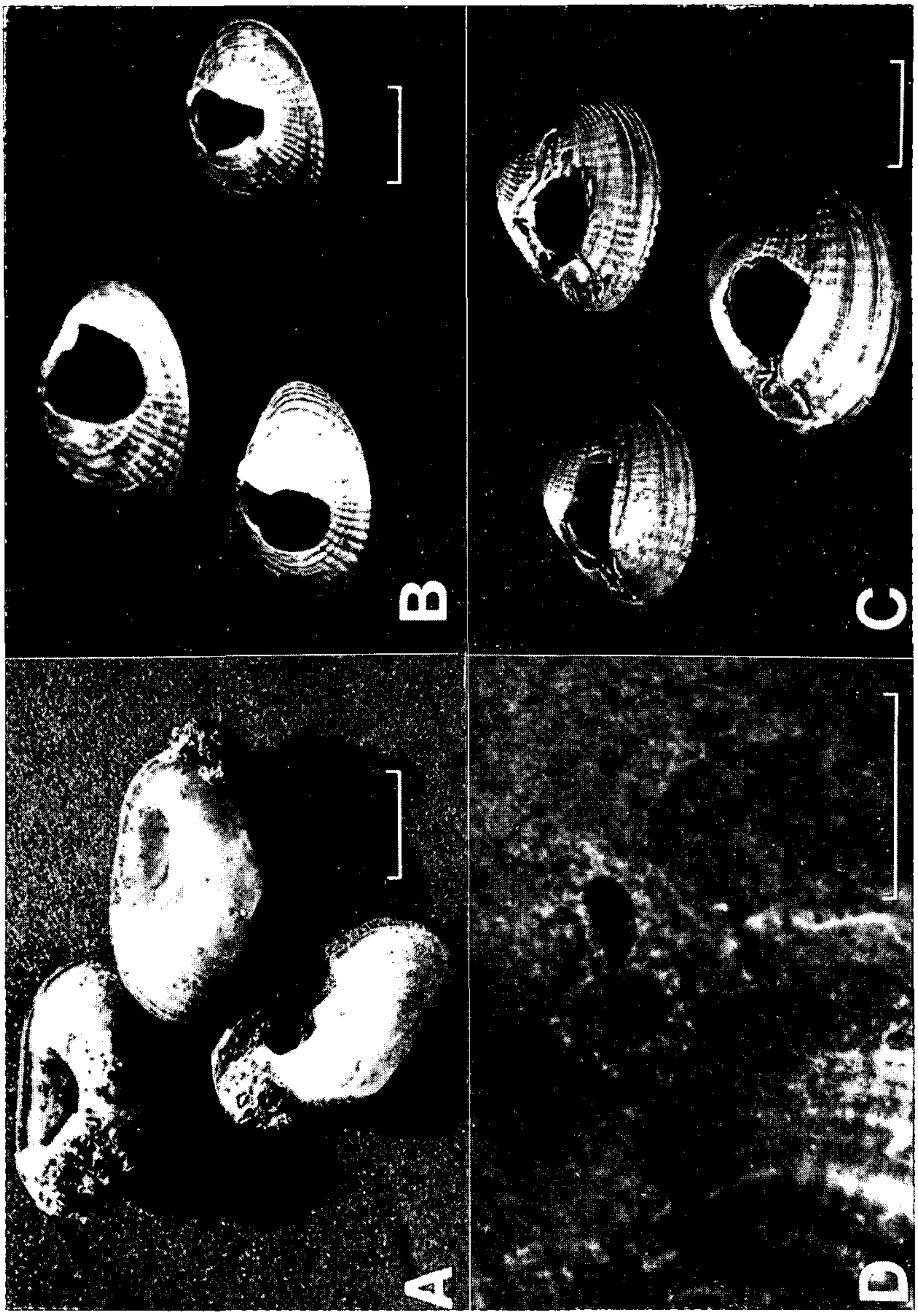

FIGURE 2 — (A) Shells of the pipi *(Paphies australe)* hammered at the ventral aspect.
(B) Shells of the cockle *(Chione stutchburyi)* hammered at the umbo.
(C) Shells of the cockle hammered at the site of borings by *Polydora ciliata.*
(D) A birds-eye view of the extended siphons of an actively feeding cockle, as seen from a height of 20 cm.
In each of the photographs the scale represents 1 cm.

Table 3. Direction of rotation by New Zealand oystercatchers when prizing open bivalves shells.

Species	Number of observations	Direction of rotation	
		to the left	to the right
South Island Pied Oystercatcher	31	28	3
Variable Oystercatcher	36	31	5
Chatham Islands Oystercatcher	24	22	2

According to Stresemann (1929) the constant left hand rotation in the prizing movement results in asymmetry in the maxillary and lacrimal regions of the adult skull. I have been able to examine only seven skulls of New Zealand oystercatchers, none of which appear asymmetrical. Snyder & Snyder (1969) noted that the bill of the Limpkin *(Aramus guarauna)* was always curved to the bird's right, but found that this curvature was in the horny rhamphothecal covering rather than the underlying bones. The rhampathecae of oystercatcher bills may also be curved, but usually such curvature is very slight. In a sample of 100 bills of the South Island Pied Oystercatcher, 24 were curved to the left, 14 to the right and 62 were straight. It is therefore unlikely that sinistral rotation causes curvature of the rhamphothecae in this species. Conversely, sinistralism could not be interpreted as a behavioural adaptation to exploit a morphological peculiarity.

The location of gaping bivalves was not always followed by a successful piercing probe. Bivalves occasionally escaped the piercing probe by drawing their valves firmly together. These closed shells were removed from the substrate by inserting the bill beneath the animal and levering against the substrate, or by seizing the animal between the mandibles and pulling strongly upward.

Firmly closed bivalves which had been dug up were dealt with by two methods: hammering and thrusting. The shell was usually opened by hammering the valves with the point of the bill. Hammering was continued until a hole was made in the shell, and this initial hole was enlarged until the body of the mollusc could be removed through it. At the Heathcote-Avon estuary, shells of both the cockle *(Chione stutchburyi)* and the pipi *(Paphies australe)* were hammered. The position at which the shell was hammered differed for cockles and pipis. The valves of the cockles were hammered in the region of the umbo, which is the thinnest part of the shell, because shell deposition occurs at the margin (see Fig. 2B). Where the valves had been bored by the marine boring worm *(Polydora ciliata)*, South Island Pied

Oystercatchers hammered at this region of weakness in preference to the umbo (see Fig. 2C). Of a sample of 100 opened shells weakened by borers, 92 were hammered at borer sites.

In contrast to cockles, the valves of pipis were hammered near the mantle margin, probably because the shell is extremely thin there, often being drawn out into thin sheets of periostracum at its extremities. Hammering usually resulted in the fracture of a valve at its ventral border (see Fig. 2A). The bird's bill was then inserted through the chipped region of the shell and the body of the pipi extracted.

In sharp contrast to estuarine bivalves, the shells of bivalves on oceanic beaches do not appear to be hammered at all, but instead are opened by thrusting the point of the bill against the persistent gape at the anterio-ventral margin of a tightly closed shell. This change in feeding methods is presumably necessitated by changes in the thickness of shells in estuarine and oceanic environments. Oceanic cockle shells are noticeably thicker than estuarine ones (Baker 1969) and thus are probably too thick to hammer.

Mussels:

Variable Oystercatchers and Chatham Islands Oystercatchers were seen opening the blue mussel *(Mytilus edulis aoteanus)* and the small mussel *(Xenostrobus pulex)* during this study. When covered by shallow water, gaping mussels were pierced between the valves and pried open. Mussels exposed to the air have tightly closed valves, and entrance to the shell can only be attained by hammering a hole through one of the valves. Smaller mussels were removed from the substrate and oriented with their flatter ventral side upwards, but large mussels in excess of about 6 cm were hammered *in situ*, with both the ventral and dorsal borders being hammered depending on which aspect was presented uppermost. Norton-Griffiths (1967) has shown that the taking of closed mussels *(Mytilus edulis)* from hard substrates by European *H. ostralegus* depends upon the birds' strength in overcoming byssal attachment. Unless closed mussels can be removed from the substrate they cannot be opened, as the major point of access to the shell, the byssal cleft, is obscured. As suggested by Heppleston (1971), it seems probable that oystercatchers hammer both borders of larger mussels because they are unable to remove them from the substrate and orientate them. Dense concentrations of small mussels which were less than 2 cm in length were dealt with simply by tearing shells from the substrate and swallowing them whole. Birds feeding in this manner shed faeces which were full of crushed shell fragments. South Island Pied Oystercatchers were never observed feeding on mussels during this study, but Jackson (1964) recorded birds levering them open in Manukau Harbour.

Limpets and chitons:

On rocky shores limpets and chitons form a major portion of the food of New Zealand oystercatchers. Only the Variable Oystercatcher consistently took large limpets such as *Cellana denticulata,*

C. radians, and *C. flava,* probably because this species alone possesses a robust bill and correspondingly massive musclature (Baker 1974). Chatham Islands Oystercatchers were occasionally seen taking limpets from rocky shores on Rangatira Island, but only small shells less than 4 cm in length were attacked.

When limpets are first exposed by the tide, their shells are not drawn tightly down over the foot, and a small gap exists between the substrate and the shell. The birds inspected most limpets and usually only attacked those displaying a gap. When a suitable limpet was located, the bird lowered its head, and delivered a sharp horizontal blow on the side of the shell with the bill. Small limpets were usually knocked over by this blow, but with larger limpets, several blows were required to loosen the grip of the muscular foot. Once the grip was weakened the bird then pushed against it with its bill tip until the shell was dislodged. If pushing was unsuccessful in dislodging the limpet, the bill was forced under the shell and levered against the substrate until the shell toppled over. The contents of the shell were removed by placing the upturned limpet in a suitable crevice, and paring the flesh from the shell with scissor-like movements of the bill.

All New Zealand species of oystercatchers take chitons from rocky shores. To remove chitons from rocks a sharp, angled blow was delivered on the shell plates. If the mollusc was not dislodged by this first attempt, the bird then applied lateral pressure to the margin of the foot until a small area was detached. The bill was then pushed under the chiton, flat side against the rock, and the animal cut from the rock by scissor-like movements of the bill. The flesh was removed in one piece and swallowed whole. Both the snakeskin chiton *(Sypharochiton pelliserpentis)* and the green chiton *(Amaurochiton glaucus)* were dealt with in this way.

Gastropods:

Gastropods such as the mudsnail *(Amphibola crenata)* and the common topshell *(Melagraphia aethiops)* were taken in a similar manner to that described by Dewar (1910) for the purple shell *(Purpura lapillus)*. The bill was inserted into the aperture and pressure applied against the wall of the outside whorl, resulting in a small circular hole being chipped through the shell opposite to the operculum. The shell was then rotated until the chipped hole was presented uppermost. In this position the bill was inserted into the hole and leverage applied towards the apex of the shell uisng the outside whorl as a fulcrum. Under this pressure the dorsal aspect of the shell fractured, and the exposed soft-parts were removed. Of a sample of 150 shells of the mudsnail from the Heathcote-Avon estuary, 128 showed no signs of damage, 14 had holes in the outside whorl, and only 8 were broken open. The effort involved in taking these gastropods apparently made them a relatively unutilised prey. During the course of this study only South Island Pied Oystercatchers were seen to take mudsnails.

Smaller gastropods such as the common mud whelk *(Cominella glandiformis)* and the small horn shell *(Zeacumantus subcarinatus)* were swallowed whole and the shells crushed in the gut. Birds feeding on these small gastropods defecated shell fragments and opercula.

Crabs:

Crabs *(Helice crassa* and *Hemigrapsis edwardsii)* were taken very efficiently by New Zealand oystercatchers. Captured prey were placed on their backs, and stabbed with the bill in the region of the supraoesophageal ganglia until immobilized. The flesh was then rapidly removed from the carapace. Similar prey-specific behaviour was noted for the European Oystercatcher when feeding on the shore crab *(Carcinus maenas)* (Tinbergen & Norton-Griffiths 1964).

FACTORS AFFECTING FEEDING BEHAVIOUR

Climatic factors:

Although a wide range of weather conditions was encountered during the course of this study, oystercatchers were found to feed at all low water periods except during gale-force winds, when they took shelter in less exposed areas. The greatest modifying factor influencing feeding behaviour was wind. On windy days, piercing of bivalves was rarely observed and the prey was located mainly by random probing. The switch from visual to touch location was probably due to the wind producing ripples on the surface of the water, making it impossible for the birds to sight their prey. The same behaviour was noted during periods of heavy rain, presumably for the same reason. South Island Pied Oystercatchers feeding on early morning tides in winter were sometimes prevented from taking prey when the exposed beach was frozen.

Physical factors:

The water content of the substrate probably determined whether bivalves were opened *in situ* or carried ashore for opening on firmer ground. As noted by Drinnan (1957) the water content of the sand, and therefore its resistance to pressure, appears to be important in opening shells. Chapman (1949) has shown experimentally that the resistance of a sandy surface to penetration increases markedly up the shore, mainly due to increased drainage.

The carrying of shells ashore for opening at the Heathcote-Avon estuary was most evident where the substrate was composed largely of sand. Although some pipis were opened at their site of capture, the majority were pierced and carried up onto the beach. The birds used two methods to locate an area of sand sufficiently firm to allow the shells to be opened:

(a) Random wandering, opening being attempted at intervals of a few metres until a suitable area was located.
(b) Flying up to the supralittoral zone of the beach where the sand was firm enough to support opening attempts.

At the Heathcote-Avon estuary cockles were carried ashore less frequently than pipis. On the feeding grounds near the upper end of the estuary, cockles were carried only short distances from the water, probably because the drainage of the mud was so poor that there were no significant differences in water content (and thus surface resistance) over the shore. The three New Zealand species of oystercatchers all carried pierced shells ashore when feeding in sandy habitats.

A specialised type of carrying behaviour was noted for the European Oystercatcher by Davidson (1967), who found that the birds carried cockles to distinct areas of sand to form " feeding piles." Heppleston (1971) also noted the same behaviour when this species was feeding on mussels. Davidson (1967) suggested that the formation of these piles was to provide a firmer surface on which to open shells. Aggregations of predated shells were not seen during this study, indicating that New Zealand oystercatchers do not form feeding piles.

Competition:

Both interspecific and intraspecific competition influence feeding behaviour. The Red-billed Gull *(Larus novaehollandiae scopulinus)*, the Black-backed Gull *(L. dominicanus)* and the Eastern Bar-tailed Godwit *(Limosa lapponica baueri)* all compete with oystercatchers for food. The two species of gulls were " parasitic " on the oystercatchers, stealing food which the latter had located. Oystercatchers feeding in shallow water were commonly followed by both species of gulls, and when a bird located and pierced a bivalve, it was frequently harassed by two or three gulls until the bivalve was dropped or eaten. When the tide first began to expose the feeding grounds, harassment was often acute because feeding flocks were confined to small emergent areas. Oystercatchers feeding on the pipi beds of the Heathcote-Avon estuary near high water were frequently robbed of their prey. However, as the gull population was small (*ca.* 200 birds) in comparison with that of oystercatchers (*ca.* 4000 birds), competition from this source was not serious, especially at low water periods when large feeding grounds were exposed.

When harassment from gulls was temporarily severe, oystercatchers modified their feeding behaviour to reduce competitive interactions. Pierced bivalves which would normally have been carried ashore for opening were opened where they were located. In this manner, the prey could be opened and devoured before gulls were able to effectively harass them. However, localised opening of prey resulted in a higher incidence of failures at shell opening because the substrate was often too soft to support the pressure of the opening attempt.

Competitive interactions were greatest between juvenile Red-billed Gulls and South Island Pied Oystercatchers. Tinbergen & Norton-Griffiths (1964) noted a similar interaction between European Oystercatchers and juvenile Black-headed Gulls *(Larus ridibundus);*

they attributed this behaviour to the fact that the young gulls had not yet learned to fear the oystercatchers' bills. Variable Oystercatchers were rarely menaced by " parasitic " gulls, their larger body size apparently inhibiting attacks.

Godwits provide direct, but non-aggressive competition for oystercatchers as they prey on the same food species. During this study interspecific interactions with godwits were never noted even when they were feeding amongst oystercatcher flocks. At the Heathcote-Avon estuary the effects of competition from godwits were reduced by partial species segregation within the feeding habitat.

Intraspecific fighting was relatively rare, probably because food was abundant at the major wintering haunts. Densities of birds during periods of maximum feeding intensity were as high as one bird per m^2 before competitive interactions became apparent. Interactions almost always took the form of threat postures which frequently culminated in a piping display. Piping displays and fighting were most apparent at the beginning of each new feeding period as the birds were hungriest at this time and were confined to small exposed areas of the feeding grounds.

SPECIES DIFFERENCES IN FEEDING BEHAVIOUR

It is evident from the foregoing that the New Zealand species of oystercatchers differ in their feeding behaviour. Of the two mainland species, the South Island Pied Oystercatcher is behaviourally adapted to exploit estuarine bivalves, whereas the Variable Oystercatcher has strongly developed behaviour patterns for preying on limpets and chitons on rocky shores. Although both species probably possess the same repertoire of prey-specific feeding behaviour, the Variable Oystercatcher is excluded from estuarine habitats in areas of significant species overlap by its small congener (Baker 1969). Conversely, the larger Variable Oystercatcher is adaptively superior on rocky habitats where it alone, by virtue of its larger bill and associated muscles, can efficiently exploit limpets and chitons (Baker 1974). The Chatham Islands Oystercatcher seems behaviourally intermediate to the mainland species in its feeding methods which is consistent with its intermediate morphology. This species feeds in widely varying habitats ranging from sandy and gravelly beaches on Chatham Island to rocky shores on Rangatira and Mangere Island, and thus there would be considerable adaptive advantage in maintaining behavioural flexibility to exploit efficiently a range of habitats. It seems likely that the differential habitat utilization described above has been an important factor in the speciation of New Zealand oystercatchers.

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ALBATROSS DISPLAYS OFF THE SOUTH-WEST COAST OF SOUTH AFRICA

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ABSTRACT

Displays observed at sea for four species of albatross *(Diomedea exulans, D. melanophris, D. cauta* and *D. chlororhynchus)* off the south-west coast of South Africa are described. Incidence of occurrence is related to time of year and to number of birds. Displays were observed mainly in November and December, during the breeding seasons of all four species. It is suggested that displays at sea occur among non-breeding adult and immature birds and are similar to pair-formation displays at the breeding grounds.

INTRODUCTION

Displays at sea have been mentioned or described for the Wandering Albatross *(Diomedea exulans)* (Courtenay-Latimer 1953, Murphy 1914), the Royal Albatross *(D. epomophora)* (Richdale 1950), the Black-browed Mollymawk *(D. melanophris)* (Lowe & Kinnear 1930), the Yellow-nosed Mollymawk *(D. chlororhynchus)* (Courtenay-Latimer 1953), the Black-footed Albatross *(D. nigripes)* (Fisher 1904 *in* Murphy 1936, Yocom 1947) and the Laysan Albatross *(D. immutabilis)* (Palmer 1962). Among the descriptions the following behaviour has been observed: bill-rubbing, wing- and bill-raising, calling and mutual preening. Displays are stated to occur far from breeding sites, sometimes outside the breeding season and between birds of any age-class.

During the period October 1950 to June 1953 sightings of albatrosses were recorded at monthly intervals at routine stations off the south-west coast of South Africa between 32° and 43°S. The observations were made by Second Officer A. Thomas of the R.S. *Africana II,* a Government Division of Sea Fisheries research vessel. The positions of the stations are given by Marchand (1952).

The numbers of albatrosses seen were recorded together with notes on displays. These displays are described and analysed to assess relation to time of year and number of birds for *D. exulans, D. melanophris,* the Shy Mollymawk *(D. cauta)* and *D. chlororhynchus.*

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DESCRIPTION OF DISPLAYS

D. exulans:

Two birds face each other on the water with partially spread wings and point their bills vertically with outstretched necks. A " high pitched whistling noise " is produced at this time. The birds then lower their necks, fold their wings and engage in bill-rubbing, bowing and preening. This display is similar in description to pair-formation displays at the breeding grounds (Jameson 1958, van Zinderen Bakker Jr. 1971).

D. melanophris:

Bill-rubbing between two birds is the only display described. Downes, Ealey, Gwynn & Young (1959) mention bill-rubbing prior to mating for this species.

D. cauta:

Pairs of Shy Mollymawks rubbed bills and made " croaking noises." Murphy (1936) describes bill-rubbing and " cackling " between paired birds at the nest.

Bill-rubbing between *D. melanophris* and *D. cauta* was observed on two occasions; one display is described as " momentary." Display between different albatross species at sea does not appear to have been previously described. On both occasions there was more than one individual of each species present. These two observations have not been included in the analysis.

D. chlororhynchus:

Thomas did not observe display in this species, the least commonly seen. Courtenay-Latimer (1953) describes a display observed in South African waters where mutual preening, bill-rubbing and bowing occurred. Touching bills and bowing is part of pair-formation display in this albatross (Rowan 1951).

TABLE 1

Number of times albatrosses observed displaying in South African waters in relation to species and time of year

Month.	J	F	M	A	M	J	J	A	S	O	N	D	Total
D. exulans		1	1	1	1	2					4	3	13
D. melanophris		1			2						3		6
D. cauta											3	1	4
D. chlororhynchos											1		1
Total	-	2	1	1	3	2	-	-	-	-	11	4	24
No. group sightings*	39	90	88	91	181	136	51	49	38	88	105	82	1 037
% Incidence of occurrence	-	2,2	1,1	1,1	1,7	1,5	-	-	-	-	10,5	4,9	2,3

*more than one bird of each species observed

INCIDENCE OF OCCURRENCE OF DISPLAY

The incidence of occurrence of display is analysed in relation to time of year (Table 1) and to number of birds (Table 2). An observation of displaying *D. exulans* and one of *D. chlororhynchus* in South African waters by Courtenay-Latimer (1953) have been included in the analysis.

Birds were observed displaying on 24 occasions. Sightings of two or more individuals of any species at each station were made on 1,037 occasions. The incidence of occurrence of display for all four albatrosses is 2.3%. Displays were most commonly observed in *D. exulans* (a 4.4% incidence of occurrence) and at a similar level in *D. melanophris* and *D. cauta* (incidences of occurrence of 1.1% and 1.7% respectively). Only one display has been recorded for *D. chlororhynchus*.

Display occurs most commonly in November and December (Table 1). Sixty-two percent of the observations occurred in this period with nearly half occurring in November alone. In November display was observed in over 10% of all sightings of two or more birds. No displays were observed in the period July to October or in January. Displays in *D. exulans* occurred more widely during the year than in other species, but this may be partially due to the larger number of displays observed for this albatross.

TABLE 2

Number of times albatrosses observed displaying in South African waters in relation to species and group size

Group size	1	2-5	6-10	11-15	16-20	21-25	+25	No. group sightings*	No. displays	% Incidence of occurrence
D. exulans	149	206(2)	84(5)	13(3)	6(2)	2(1)	-	311	13	4,2
D. melanophris	192	250	36	19(1)	12(2)	8	23(3)	348	6	1,1
D. cauta	209	267(1)	52	13(1)	6	4	15(2)	357	4	1,7
D. chlororhynchos	51	21(1)	-	-	-	-	-	71	1	4,8
Total	601	744(4)	172(5)	45(5)	24(4)	14(1)	38(5)	1 037	24	2,3
% Incidence of occurrence	-	0,5	2,9		11,1	16,7	7,1	13,2		

*(No. of displays observed is given in parentheses)
more than one bird of each species observed

Displays occurred more commonly when there were large numbers of birds in a group (Table 2). The incidence of occurrence of display for groups of two to five birds is only 0.5% (four displays among 744 observations); for groups of over 25 birds the incidence of occurrence is 13.2% (five displays among 38 observations). Displays occur more commonly among small groups of *D. exulans* than in the other species but large groups of this albatross (over 20 birds present) were rarely seen.

DISCUSSION

Albatross displays at sea appear similar to displays given at the breeding-grounds during pair-formation. Richdale (1950) observed the Ecstatic Ritual of *D. epomophora* at sea; he considers this " ritual " a pair-formation display.

D. exulans arrives at its breeding-grounds on Bird Island, South Georgia and Marion Island in early and late November respectively and pair-formation displays occur in this and the following month (Tickell 1968, van Zinderen Bakker Jr. 1971). *D. melanophris* arrives late in September on Bird Island (Downes *et al.* 1959, Tickell & Pinder 1967). Birds arrive in early October and egg-laying commences the same month in the Falkland Islands (Murphy 1936). *D. cauta* gathers for the breeding season at the Bounty Islands in August and egg-laying occurs at the end of September or early October (Le Souef 1895, Oliver 1930 *in* Murphy 1936). *D. chlororhynchus* was first seen ashore at Tristan da Cunha in early September, egg-laying occurring in this month and in October (Rowan 1951). Pair-formation displays commenced soon after the birds came ashore.

The monthly distribution of displays at sea with a peak in November and December therefore suggests that displaying birds are non-breeders since egg-laying has commenced for the three smaller albatrosses by November and *D. exulans* arrives at its breeding grounds in this month. Richdale (1950) states that the Ecstatic Ritual of *D. epomophora* does not occur once the egg is laid.

The observations are not detailed enough to analyse display in relation to age-class but some displaying *D. exulans* were immature. *D. exulans* does not breed every year but *D. melanophris* does (Tickell & Pinder 1967). There does not appear to be any definite information on the breeding interval of *D. cauta*. *D. chlororhynchus* may not breed every year. During two years of observations on Tristan da Cunha ringed birds were recorded breeding, but different birds were seen in each season (Rowan pers. comm.).

It seems likely that most displaying birds are either adults that are not breeding in the year of observation, having bred in the previous year, or immature birds that have not yet bred for the first time.

Displays were observed more commonly in large groups where birds tended to form a raft at a food source (as during trawling operations). Under these circumstances the birds would be close together allowing display to occur. Richdale (1950) observed parties of up to eight *D. epomophora* displaying at sea. It is likely that the " urge " to display increases with the number of birds present, since birds engaged in Ecstatic Rituals at the breeding grounds attract other birds to join in (Richdale 1950).

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PROBABLE FIRST BREEDING OF THE CATTLE EGRET (Bubulcus ibis) IN NEW ZEALAND

By K. E. WESTERSKOV

ABSTRACT

Cattle Egrets *(Bubulcus ibis)* first arrived in New Zealand in 1963 and have since been seen in increasing numbers, particularly during 1972-73. On 23 November 1972 two adult birds (probably a pair) in full breeding plumage, accompanied by a young bird in the white immature plumage, were seen in a paddock with cattle at Paretai, near the mouth of the Clutha River, south-eastern Otago. The egrets associated with White-faced Herons and twice flew to nearby macrocarpa trees where there were several abandoned heron nests. A week before, the two adult Cattle Egrets had been seen with two young but one had disappeared. From their appearance, behaviour and local circumstances it is suggested that they were a pair with a young and that they had nested nearby together with two or three pairs of White-faced Herons, deriving the stimulus for breeding from this association.

INTRODUCTION

When Peters in 1931 published the first volume of his classic *Check-list of Birds of the World*, the Cattle Egret *(Bubulcus ibis)* was confined to the Old World. Spectacular range expansion and increase in numbers in Africa (the nominate western subspecies *B. i. ibis*) led to colonization of north-eastern South America about 1930 (Haverschmidt 1953) and further spread into North America (Sprunt 1955).

The eastern form *(B. i. coromandus)* similarly expanded its range and reached northern Australia in the early 1920s (Hewitt 1960; Deignan 1964) and has since increased in numbers and spread to many other parts of Australia, including Ulmarra near Grafton, New South Wales, the breeding colony now nearest to New Zealand (Goddard 1955).

ARRIVAL IN NEW ZEALAND IN 1963

The first Cattle Egret was seen in New Zealand in 1963 (Turbott *et al.* 1963); the egret then seen at Belfast, North Canterbury, in September could possibly have been the same as the bird associating with cattle at Waitati, Otago, just before Easter 1963 (Turbott 1964).

NOTORNIS 21: 239-246 (1974)

Since then an increasing number of Cattle Egrets has been seen in many parts of the country; a review of the observations published in *Notornis* 1963-73 shows that over the period 1963-71 there were one to four observations in different localities per year, some years none. In 1972-73 there was a marked increase: in 1972 no less than 11 observations with a total of 23 birds involved (although multiple sightings are possible): in 1973 a total of 14 observations, and 26 birds seen. Up to 5 and 6 Cattle Egrets have been seen together. It is also of interest that in 1973 in 8 out of the 14 observations recorded, possible pairs (2 birds together) were seen. Birds seen in the winter have been in the white non-breeding plumage; review of New Zealand observations shows that Cattle Egrets here assume breeding plumage with the characteristic buff plumes on head, breast and back in September-October, retain this plumage throughout the summer, and change through the post-nuptial moult in February-March into the white winter plumage; birds seen from April to August have been white, adults as well as immatures.

Observations from September-October show moult into breeding plumage in progress, and pure white birds have been seen together with moulting birds or birds already with the buff plumes of the nuptial plumage. This establishes presence in New Zealand of young birds not moulting into the breeding plumage in their first year (?) or moulting late, together with moulting or moulted mature birds. This agrees with the observations of Mackworth-Praed & Grant (1952) that Cattle Egrets do not breed till their second year, and Lowe-McConnell (1967) that in Guyana young Cattle Egrets not in breeding plumage were observed roosting above the nesting birds. Herons and egrets appear to breed from their second year onwards, but Siegfried (1966) in South Africa found a few leg-banded and colour-marked Cattle Egrets breeding within a year. Dr Otto Koenig (1962) in his biological research station Wilhelminenberg, Vienna, kept Cattle Egrets in captivity. They have nested there for a number of years, and he found — as also described by Kolar (1966) from this same station — that they nested when one year old. Koenig expressed the view that the rapid expansion and population increase in the Cattle Egret were undoubtedly associated with their early sexual maturity.

Observations of Cattle Egrets in New Zealand have mainly been over the late summer-autumn-winter-early spring months, February/March to October with only two observations from November-January: single birds in breeding plumage, one November 1963-January 1964 (Turbott 1964), and another in November 1972 (Barlow 1973: 354).

The increasing number of Cattle Egrets, especially from 1972, are indication of more coming across the Tasman, or possibly a result of breeding in New Zealand, or both. So far no record of breeding or possible breeding has been published.

PROBABLE NESTING AT PARETAI, OTAGO, 1972

At noon on 23 November 1972 I received a telephone call from Mr T. A. Walker, Balclutha, Field Officer of the Otago Acclimatisation Society; he told me that he had been informed by Mr D. R. Clark, Port Molineaux, that herons, possibly Cattle Egrets, had been seen at Paretai, near the mouth of the Clutha River. A differently coloured and slightly smaller bird, perhaps a young one, was with them. I immediately drove to Balclutha, having picked up my wife at Brighton on the way, and with Mr Walker we visited the area where the herons/egrets had been seen.

To my pleasure, the birds were still there. In a low-lying wet paddock with much standing water were a few cattle beasts, and scattered over the area several hundred birds, feeding or resting: big numbers of Pied Stilts *(Himantopus h. leucocephalus)*, Black-backed Gulls *(Larus dominicanus)*, and Red-billed Gulls *(Larus novaehollandiae scopolinus)*; 7 Spur-winged Plover *(Lobibyx novaehollandiae)*, 2 South Island Pied Oystercatchers *(Haematopus ostralegus finschi)*, 10 White-faced Herons *(Ardea novaehollandiae)*, and 3 Cattle Egrets.

There was no doubt about the identification of the Cattle Egrets; I was quite familiar with this species which I had seen several times before, including a flock of some 25 following a herd of wild buffalo, 25 February 1971, in the Mt Bundy area, south-east of Darwin, in the company of D. N. Crawford; and a flock of 8 in a field near domesticated water buffaloes at Mai Po near Deep Bay, New Territories, Hong Kong, 5 March 1971; and I had the opportunity to study Cattle Egrets at close quarters — shortly after my encounter with them at Paretai — when visiting the Jurong Bird Park in Singapore, 29 December 1972.

Contrary to what some books state, I did not find these 3 Cattle Egrets particularly approachable (Palmer 1962: 440 calls it the "least shy of our herons"), but maybe my difficulty in approaching them (from behind hedges) was affected by the alert behaviour of some of the other birds associating with them, in particular the White-faced Herons and the Spur-winged Plovers.

Difficulties of approach were increased by the large size of the open area, the egrets being approximately in the centre, patches of open water, some unfriendly-looking steers, and the fairly even distribution of birds over the area. I did not succeed in getting close enough to take satisfactory photos (I had only a 135 mm lens on my Pentax when a longer range telephoto lens was needed), but did take a number of photos; an appreciable enlargement of a section of one of these is shown in Fig. 1. In the original, it is noticeable that the two larger adult birds are bigger, heavier and darker at the head than the smaller, white, young bird in the centre.

The two adult egrets were in full breeding plumage, white with dark orange buff breast and similarly coloured elongated plumes on crown and mantle; the short stocky bill was yellow, the legs

blackish. The young bird was clearly smaller than the two adults, its plumage pure white with no trace of buff, the bill pale yellowish, and the legs dark greenish-grey.

When I was slowly approaching the egrets, other birds in the area flew away, and the egrets grew restless and eventually flew off together with five or six White-faced Herons. They swung over the paddock, gaining height and flew towards a group of tall macrocarpa some 600 metres away; I followed them in my binoculars and saw them landing in the tops of the macrocarpas. When I approached the egrets they remained in the trees till I was about 75 metres away; scattered in other tree tops were six White-faced Herons. I took several photographs of the egrets sitting in the tree tops before they and the herons flew away towards, and landing in, the paddock from where they had recently come.

I wandered back, trying to get close to them, utilising the shelter of gorse bushes and a gorse hedge. But the same performance was repeated, and the wary egrets again flew back to the group of macrocarpas.

Returning to the trees, I examined carefully the ground in the hope of possibly finding egg-shells or feathers of young egret chicks, but in vain. There were several old heron nests high up, but the trees were very dense and long-branched and closer inspection was difficult. From the birds' behaviour (their return to the trees) and later hearing from local people that the white birds had been seen here, my impression was that the egrets probably had nested with a few pairs of White-faced Herons in this group of mature macrocarpa trees. The site was ideally suited, on a small rise, and surrounded by much wet grassland with plenty of cattle and with the large delta of the Clutha River to the north and east.

The three egrets were close together and were feeding when watched at a distance; the young bird was on both occasions, as in the photograph (between flights to trees) between the two adults, most probably its parents. It fed on its own and was not seen being fed by the adult (parent) birds. When feeding or resting in the paddock, the egrets were only seen on the drier parts, not in the flooded areas where the White-faced Herons and Pied Stilts were feeding. I returned to the area on 10 December, equipped with a better telephoto lens, but never saw the egrets again; as they are more dependent upon pasture-land and paddocks with cattle for their dry-feet feeding (mainly on insects) than on streams and swamps as frequented mainly by the White-faced Herons, the surrounding country offered wide scope for dispersal through suitable feeding areas.

On 10 December I contacted a number of people in the area, the local school teacher, school-boys and farmers. From these discussions emanated the following picture: there had at first been four egrets, two larger (adult) and two smaller white (young) birds, and they were first observed by the boys (my two main helpers were

Stephen Gould and Kim Perry) a week before I saw them, dating their first appearance about 16 November. After a couple of days there were only three birds, as I saw them, undoubtedly two parents and a surviving young. That one young bird died is more likely than to accept it left the parents as these egrets are particularly sociable in their behaviour. During the week 16-23 November, the egrets were seen near the Clutha bridge and in the paddocks both north and south of the river (I saw them only in the area south of the river and bridge).

The facts of the observation and associated information are that two adult Cattle Egrets (probably a pair) were associating closely with a definitely young Cattle Egret (probably their young, and earlier two young had been seen with the pair). The egrets fed with a group of White-faced Herons among cattle, and when approached flew off and landed in the tops of nearby macrocarpa trees where several White-faced Herons were sitting and where there were several old heron nests. It is suggested that the social egrets, as has been their habit elsewhere when a pair or two first breed in a new range, nested with the herons, deriving the stimulus for breeding from this association.

Other alternatives are: breeding elsewhere in the general Clutha delta area or the remote possibility that the pair with two young together crossed the Tasman from the nearest colony at Ulmarra in New South Wales. As the young bird observed by me was noticeably smaller than the adults with which it was associating and had already been in the area for a week (and undoubtedly had recently left the nest), it appears very unlikely that the pair with young successfully and together without being split up should have covered the long distance across the Tasman and across the South Island where it is widest.

The most acceptable explanation all considered is that the pair of Cattle Egrets bred in the Paretai area with a small number of White-faced Herons.

THE FUTURE

As to the subsequent fate of these egrets little is known: I did not see them again on 10 December and I left New Zealand on 26 December for a two months' study tour overseas. Mr Walker has advised me that he did not see the Cattle Egrets again in the Paretai area although he passed through a number of times. The following April (1973), however, accompanied by Mr A. J. Russell, Field Officer of the Southland Acclimatization Society, he saw three Cattle Egrets (possibly the same?) at Lake Vincent, between Tokanui and Fortrose. The egrets were in a paddock with sheep. Later that year, October-November 1973, two Cattle Egrets were regularly seen at Haldane Estuary, west of Lake Vincent.

It should be noted that the occurrence of Cattle Egrets and their probable breeding here is extra limital. Distribution maps (Voous 1960; Davis 1960) and many recent faunistic records clearly show that the species is mainly and originally a bird of the tropics and sub-

tropics, overflowing into the temperate zones. Its expansion in the last 50 years, following build-up in numbers, has seen its invasion of less favourable areas of the temperate zones, in particular in eastern North America (Davis 1960) where they have bred as far north as Luther Marsh, west of Orangeville, Ontario (Buerkle & Mansell 1963) at 44°N. In Europe they have only bred in south-western Spain and Portugal but recently Cattle Egrets have spread to and started nesting further north, in the Camargue, France, just under the 44°N latitude (Hafner 1970).

Paretai is situated at 46°S, thus further from the equator than any previous records in both the northern and southern hemispheres. In New Zealand the 44°S parallel bisects the South Island from Ashburton to Jackson's Bay. It would be realistic to expect future breeding (attempts) in the northern part of the South Island or in the North Island. The breeding colonies in Portugal and Spain are in latitudes 36-38°N, corresponding to the stretch Dargaville-Whakatane (36-38°S) in New Zealand. Between the eastern Mediterranean and and the south-western shores of the Caspian Sea, Cattle Egrets breed north to 41°N latitude, corresponding to practically all of the North Island.

As a further help in possible future location and verification of breeding it is of interest, but of little help, to note that Cattle Egrets can be found nesting in reed-beds (as in Africa, Mackworth-Praed & Grant 1957), low, some 2-3 m above the ground in trees (in Florida, Jenni 1969), 3-6 m from the ground in shrubs, trees or bamboos (in Japan, Austin & Kuroda 1953), or from 15-24 m in eucalyptus trees (in South Africa, Skead 1956). Nests can be placed in swamps, over water, but also in trees on dry land and some distance from water.

Cattle Egrets in New Zealand are most likely to nest with a few pairs of White-faced Herons, or maybe with White Herons *(Egretta alba)* and Royal Spoonbill *(Platalea leucorodia)* at Okarito, Westland (?). Initial nesting in colonies or a few pairs of other herons appears an indispensable association to provide sufficient stimulus. Large numbers of Cattle Egrets can nest in separate colonies. The nest is a loosely-built twig platform, the clutch averages 3-4 (1-6) eggs measuring 47-50 x 33-35 mm and are white to light blue, smooth and sometimes with patches of lime (Goddard 1955).

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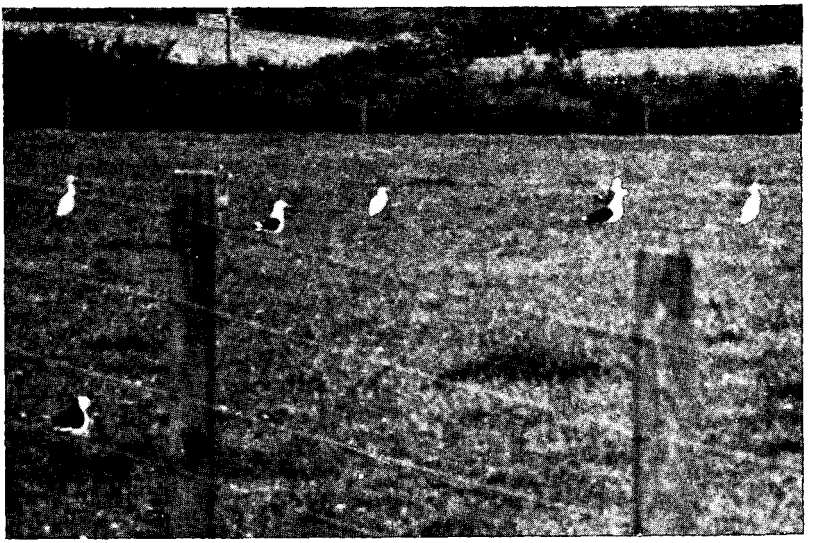

FIGURE 1 — Two adult Cattle Egrets (probably a pair) in breeding plumage and a smaller and pure white young (in centre) associating with White-faced Herons, Black-backed Gulls and Pied Stilts at Paretai, south-east Otago. 23 November 1972.

Photo: K. E. Westerskov

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SHORT NOTE

SPUR-WINGED PLOVER ON N.I. EAST COAST

In May 1973 a duck shooter reported to me the sighting of a strange bird on the Mata River, a tributary of the Waiapu, which flows into the sea 15 km south of East Cape. He saw a similar bird on two successive mornings, some 3 km apart, and from his description it was obviously a Spur-winged Plover, *Lobibyx novaehollandiae.* On 20 November 1973 J. C. Henley recorded one at the Waiapu River estuary; and then on 27 July 1974, I heard a bird call briefly from a coastal valley 8 km north of Gisborne, and moments later another flew overhead, calling vigorously, to join the first bird. From these records it would appear that the Spur-winged Plover is widely prospecting new territory up the East Coast, and perhaps now breeding, if the last two were a pair.

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UNSUCCESSFUL SEARCH FOR THE AUCKLAND ISLANDS MERGANSER (Mergus australis)

By G. R. WILLIAMS and M. W. WELLER

ABSTRACT

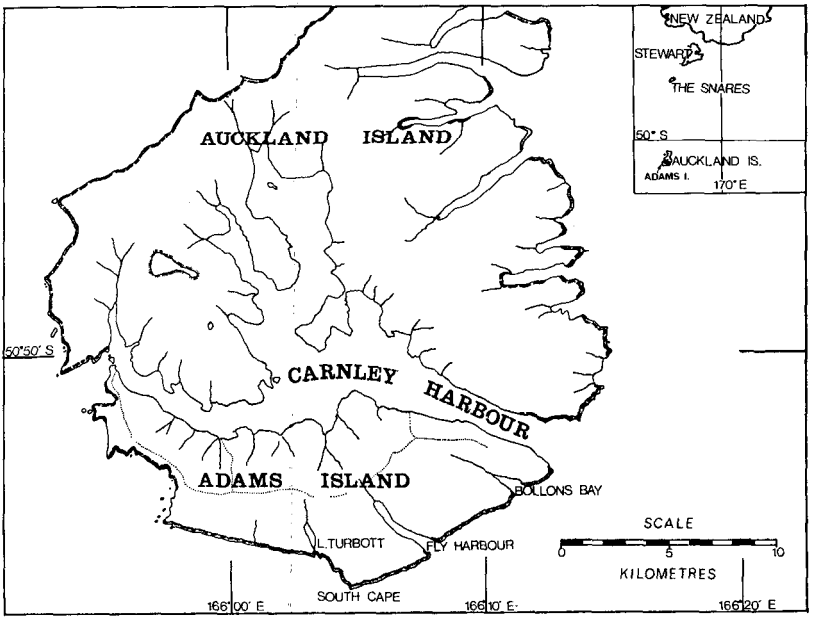
A search was made throughout the Auckland Islands between November 1972 and February 1973 during the joint N.Z. Government/U.S. National Science Foundation Expedition. Although efforts were particularly concentrated on the northern and more sheltered coast of Adams Island where the species was last collected in 1902, the regretful conclusion is that the population has indeed disappeared.

As one of only two species of mergansers known from the southern hemisphere, and the only one occurring below 30°S, the Auckland Islands Merganser is particularly interesting biologically and biogeographically. It was last seen and collected in 1902 by the Earl of Ranfurly on the Auckland Islands about 300 kilometers south of Stewart Island. Kear & Scarlett (1970) have given a comprehensive account of what is known of the species' general habits and range, and the distribution of museum specimens throughout the world. Gressitt & Wise (1971) and Taylor (1971), with only minor omissions, have given well-documented accounts of the flora and fauna of the Auckland Islands as well as a brief outline of their limited and sporadic human occupation.

From November 1972 to February 1973, a joint New Zealand Government and U.S. National Science Foundation expedition visited the archipelago (Fig. 1). During that time all of its islands were landed upon at least once, and perhaps more thoroughly explored by specialists in different biological disciplines than ever before. All those members of the party with at least some ornithological interests were alerted to record any sign that might indicate Mergansers. Because two of us were specifically concerned with birds of wetlands (Flightless Teal, *Anas a. aucklandica* — MWW, and the Snipe, *Coenocorypha a. aucklandica* — GRW), we found it convenient to frequently combine forces in search of the Merganser in every likely water body we encountered. Our main efforts were concentrated on Adams Island (10,120 ha), the only large island free of introduced mammals and virtually unmodified by man. Two much smaller islands, Disappointment (570 ha) and Ewing (80 ha), are also free of introduced mammals but lack suitable streams.

NOTORNIS 21: 247-249 (1974)

Auckland Island itself (460,000 ha) has numerous rivers and fiords as well as two sizeable lakes, but supports large populations of mice, cats, pigs and goats. Enderby Island (690 ha) is the most modified and, although it has a few slow-moving streams and tarns, it harbours mice, rabbits and cattle. Rabbits are the only terrestrial mammals on Rose Island (80 ha). Marine predators such as sealions, *Neophoca hookeri,* may be found almost anywhere in the Group and there are occasional colonies of fur seals, *Arctocephalus forsteri* — usually on Adams, Auckland and Disappointment Islands. Although we saw relatively little of the coast and interior of the main island, various colleagues covered much of its terrain, but reported nothing — which is hardly surprising in the face of its long occupation by cats and pigs.



On Adams Island there are 12 sizeable streams on the northern coast that drain into Carnley Harbour. There are also two inlets and one lake on the southern, precipitous coast. With one exception — that discharging into Bollons Bay, the southern streams are virtually cascades and unlikely, from what little we know of the habits of the Merganser, to be suitable for the species. We did not examine the Bollons Bay stream or Lake Turbott, but other members of the expedition did.

We concentrated our efforts on the northern and more sheltered coast of Adams Island where the species was last collected in 1902

and ascended all the likely streams for a considerable distance. One of us walked in the stream bed, and the other examined the wooded or tussock-covered boggy banks. Other members of the expedition covered a large part of the Island's uplands but reported nothing.

Had any Mergansers been occupying coastal waters of the Group, it seems unlikely that they could have gone undetected over the 3-month period of the expedition, as the various parties travelled extensively by sea and visited all harbours and inlets at least once. The precipitous and acutely-exposed western coast of Auckland Island itself was only cursorily examined, but the abrupt topography provides little suitable habitat for Mergansers or, indeed, other waterfowl.

We are forced to the regretful conclusion shared with others who have searched the Auckland Islands over the last 30 years that the population that occupied this extreme part of the species' range up to the beginning of the 20th century has indeed disappeared.

We should like to thank all those members of the Expedition who helped us in our search (especially B. D. Bell, R. Nilsson and R. Russ of the Wildlife Service) and Captain Alex Black of *Acheron* who took us, in all weathers, to most of the places we wanted to go. We are grateful to Miss Pauline Morse for preparing the map.

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FAREWELL SPIT, MARCH 1974

By A. T. EDGAR

ABSTRACT

The results of a combined Wildlife Service/OSNZ visit to Farewell Spit, the northwestern point of the South Island, from 7 to 14 March 1974 are given. The objects were (a) to make an accurate count of the main waders, (b) to see what rare species were present and in what numbers and (c) to make an accurate count of Black Swan.

A list of 95 species, including past records with their appropriate references, is given. New records are Canada Goose (1), Paradise Duck (15), Large Sand Dotterel (4), Lesser Yellowlegs (1) and Rock Pigeon (1). Counts for waders were: South Island Pied Oystercatcher, 8619 and 7407; Variable Oystercatcher, 74 black; Golden Plover, 16, 15, 14; NZ Dotterel, 8; Banded Dotterel, 1134 and 1624; Mongolian Dotterel, 4; Large Sand Dotterel, 4; Wrybill, 1; Curlew, 22; Asiatic Whimbrel, 23; Little Whimbrel, 1; Bar-tailed Godwit, 13492 and 12215; Lesser Yellowlegs, 1; Greenshank, 2; Turnstone, 1334 and 1879; Knot, 18700 and 16143; Sharp-tailed Sandpiper, 5; Curlew Sandpiper, 3; Red-necked Stint, 28; Sanderling, 2 and Pied Stilt, 20. The count of Black Swan on 12 March 1974 was 13678.

INTRODUCTION

A combined Wildlife Service/OSNZ party visited Farewell Spit 7-14 March 1974. Those taking part in the exercise were B. D. Bell (Leader), J. S. Adams, C. R. Barnicoat, F. H. Boyce, J. A. Brown, A. T. Edgar, B. A. Ellis, T. R. Harty, N. R. Hellyer, R. McLay, M. Smith, T. Hartley-Smith, R. Russ, C. R. Veitch, R. M. Weston, M. Williams; Mesdames M. Adams, B. Brown, H. Harty, S. M. Reed. The party assembled at Nelson noon 7 March, proceeded to Farewell Spit and established camp at Freeman's woolshed that evening, broke camp and returned to Nelson by noon 14 March.

Thanks are due to Brian Bell for organising and running the expedition; to John Adams and Goldie Hartley-Smith for transport on the Spit; to Rod Russ for his efficiency as quartermaster; to the ladies of the party for undertaking a major part of the domestic chores; to Frank and Berna Soper for entertaining us to a barbecue in their delightful garden; to Mr S. W. Freeman and family for practical help and the use of their woolshed.

OSNZ members who over the years since 1961 have enjoyed the facilities and assistance provided on Freeman's farm will learn

with regret that the property has been sold. The Freeman's have been good friends of the Society and all who have experienced their hospitality will wish them good health and good fortune in the future.

Weather was fine and rather warm with light or moderate winds; 4 metre tides between 1000 and 1200 hours on 8-11 March.

The basic plan was —

(a) to make an accurate count of the main waders
(b) to see what rarer species are present and in what numbers
(c) to make an accurate count of Black Swan.

The work programme provided for a day of familiarization on the Spit on 8 March, census of main waders on 9 March and a repeat census on 11 March, check on rarities on 10 and 13 March and a census of Black Swan on 12 March. The daily roster was so arranged that members were able to visit different parts of the Spit on successive days. On wader census days the Spit was worked by six parties covering miles 0-5, 5-7½, 7½-10, 10-12½, 12½-15, 15-tip, with emphasis on the need for accurate counting of large wader mobs congregated at high tide on the outer beach and flats on the Spit. Rarities were noted when seen and checked in detail on alternate days. Several members occupied unorganised time in checking birds on Freeman's farm and pond and at Puponga Inlet.

No special watch was kept for offshore seabirds; storm-cast specimens were listed by CRV and cards were completed for the four map squares which cover the Spit.

In past years the scrub-covered area (miles 0-5) was relatively easy of access by a network of animal tracks. Very few grazing animals remain on the Spit; scrub and rushes are much denser in miles 0-5 and in March 1974 drought conditions had dried up the pools which in normal times hold a few water birds and attract a few sandpipers etc.

SPECIES LIST

Each major expedition to Farewell Spit adds new species to the locality list. March 1974 additions were Canada Goose, Paradise Duck, Large Sand Dotterel, Lesser Yellowlegs and Feral Pigeon. Listed here are 95 species recorded between Freeman's farm and the tip of Farewell Spit.

March 1974 figures are given in some detail and relevant past records are briefly noted, with references in the text when the source of information is other than the list of references given at the end of this paper.

LITTLE BLUE PENGUIN *(Eudyptula minor)*

Regular. March 1974, numerous tracks along the length of the Spit.

WANDERING ALBATROSS *(Diomedea exulans)*

Offshore, January 1961; probable sighting January 1967.

MOLLYMAWK sp. *(Diomedea sp.)*
Offshore, May 1962, January 1967; three in March 1974.

NELLY *(Macronectes giganteus)*
Offshore, May 1962.

BROAD-BILLED PRION *(Pachyptila vittata)*
Storm cast specimen, January 1961. One in October 1971 (BDB).

FAIRY PRION *(P. turtur)*
January 1961, 50 plus offshore; January 1967, two, storm cast.

DARK PETRELS (possibly *Puffinus carneipes*)
Offshore, January 1961, May 1962, January 1967.

BULLER'S SHEARWATER *(P. bulleri)*
Offshore, January 1961.

SOOTY SHEARWATER *(P. griseus)*
Offshore, January 1961, January 1967; March 1974, a number shearing off the outer beach.

FLUTTERING SHEARWATER *(P. gavia)*
Offshore, January 1961, in thousands; May 1962, fairly large flocks; small flocks in January 1967.

DIVING PETREL *(Pelecanoides urinatrix)*
January 1961, storm cast specimen.

GANNET *(Sula bassana)*
January 1961, 12; May 1962, 150; January 1967, 12; March 1974, 30.

BLACK SHAG *(Phalacrocorax carbo)*
January 1961; May 1962, 25-30; September 1962; January 1967, 42; described as the common shag of the Spit, but usually Little Shags are more plentiful. March 1974, highest count on any one day, 22.

PIED SHAG *(P. varius)*
Recorded October 1971 (BDB).

LITTLE SHAG *(P. melanoleucos)*
January 1961, 90; May 1962, 250; April 1965, 400; January 1967, 37. March 1974, 110 counted one evening at the roost near Freeman's pond; inner beach count 12 March 1974, 243.

SPOTTED SHAG *(Stictocarbo punctatus)*
Single birds, storm cast, May 1962 and March 1974.

WHITE-FACED HERON *(Ardea novaehollandiae)*
Regular. Estimated population May 1962, 435. January 1967, only 190 recorded on the Spit, but 290 at Golden Bay and 101 at Westhaven gave a grand total of 581. March 1974, 440 counted along the inner beach during the swan census.

WHITE HERON *(Egretta alba)*
Recorded October 1971 (BDB).

AUSTRALIAN BITTERN *(Botaurus stellaris)*

January 1961, three at permanent pool, mile 3. Not recorded subsequently.

ROYAL SPOONBILL *(Platalea leucorodia)*

March 1958, one (BDB). May 1962, 8. September 1962, 4. April 1965, 2. Not recorded in January 1961 and 1967. December 1973, 5 (R. J. Pierce). March 1974, 4, seen daily either on the zostera flats or on the Spit around mile 6.

BLACK SWAN *(Cygnus atratus)*

Regular. January 1967, estimated 7,000. For the swan census on 12 March 1974 the inner beach was divided into eight sections, each 2-mile section covered by a pair of observers, pairs working toward each other to eliminate overlap. The total recorded was 13,678. On the same day a count was made from a small aircraft flying at 500 feet with two observers and one recorder. The average count of swans from the air was 6,300 and the range 7,100 to 5,600.

CANADA GOOSE *(Branta canadensis)*

A single bird, swimming among the swans on 12 March 1974 and seen on several other days, is a new record for the Spit.

PARADISE DUCK *(Tadorna variegata)*

A new record for the Spit. Birds seen on Freeman's pond on several days by various observers, maximum recorded 15, six males and nine females (SMR). Two males were seen at 3-mile pond (BDB).

MALLARD *(Anas platyrhynchos)*

Recorded in small numbers on all visits. March 1974, two on Freeman's pond (one mutant); party of 10 on Spit.

GREY DUCK *(A. superciliosa)*

Recorded on all visits; May 1962, a mixed flock of 5-600 ducks, some Mallard, mostly Grey or hybrid; January 1967, 91; March 1974, 20 on Freeman's pond, and 153 ducks, mostly Grey, swimming off the inner beach at the time of the swan count.

N.Z. SHOVELER *(A. rhynchotis)*

May 1962, 26; September 1962, 11; January 1967, 10; March 1974, 3.

HARRIER *(Circus approximans)*

Recorded in January 1961. May 1962, 13; September 1962, 4; January 1967, 4-5; March 1974, 10 counted on both census days.

CALIFORNIAN QUAIL *(Lophortyx californica)*

Recorded at the base of the Spit in January 1967. 10 March 1974, a covey of 10 beyond mile 15.

WESTERN WEKA *(Gallirallus australis)*

Regular. Tracks all along the Spit and birds calling at night near the woolshed, March 1974.

PUKEKO *(Porphyrio melanotos)*

January 1961, odd pairs and a family party at mile 3 pool. May 1962, one. January 1967, 2-3 pairs on farm, 2-3 at mile 3, total 10. March 1974, one seen at mile 3, c. 30 on 10 March 1974 beyond mile 15.

SOUTH ISLAND PIED OYSTERCATCHER *(Haematopus ostralegus)*

January 1961, 2,048; May 1962, 4,000; September 1962, 750; January 1967, 4,126 (the total count for Farewell Spit, Golden Bay and Westhaven was 8,214). 1974 census counts, 9 March, 8,619; 11 March, 7,407. On both days over 50% of the birds were in great flocks in mile 7½-10 area.

VARIABLE OYSTERCATCHER *(H. unicolor)*

January 1961, 42, all black except for one intermediate (smudgy) bird. May 1962, 22 blacks, on outer beach and sand flats; September 1962, 16 blacks scattered among 750 SIPO.

January 1967, 37; as on previous occasions a flock was sometimes seen at Fossil Point but birds were at times dispersed along the whole length of the Spit. 9 March 1974, 42 blacks, most of them scattered among the SIPO flocks and easily counted when the flock was put to flight; RMcL studied with binoculars one large flock (mile 7½-10) and reports that it included an indeterminate number of intermediate and pied variable.

GREY PLOVER *(Pluvialis squatarola)*

January 1961, one. September 1962, two single birds at miles 7 and 9 respectively, both in breeding plumage.

Single birds in December 1968, and October 1971 (BDB).

GOLDEN PLOVER *(P. dominica)*

January 1961, 30. April 1965, 3. January 1967, 40. 15 on 28 December 1973 (R. J. Pierce). March 1974, counts on 8th, 9th and 11th were respectively 16, 15 and 14 birds.

NEW ZEALAND DOTTEREL *(Charadrius obscurus)*

January 1961, 5. May 1962, 5. September 1962, one. April 1965, 3. January 1967, 3. Two in October 1971 (BDB). One on 28 December 1973 (R. J. Pierce). March 1974, census counts on 9th and 11th were two at mile 5-7½ and 3 at mile 7½-10, total 5; on 13 March 1974 two parties, one of 5 and one of 3, total 8 birds, seen around mile 8.

BANDED DOTTEREL *(C. bicinctus)*

January 1961, 1,088. May 1962, 1, 255. September 1962, 50. April 1965, 200 plus. January 1967, 930 counted in the week 10th-17th, 1,458 in week 24th-31st. March 1974, 1,134 counted on 9th, 1,624 on 11th.

MONGOLIAN DOTTEREL *(C. mongolus)*

January 1961, one. January 1967, 3. March 1974, 4.

LARGE SAND DOTTEREL *(C. leschenaulti)*

10 March 1974, four at about mile 8 (BDB). A new record for the Spit.

WRYBILL *(Anarhynchus frontalis)*
January 1961, 29. May 1962, 7. September 1962, 2. April 1965, 3. January 1967, 4. Two on 27 December 1973 (R. J. Pierce). March 1974, one.

CURLEW *(Numenius madagascariensis)*
January 1961, 18. May 1962, 7. September 1962, 37. April 1965, 3. January 1967, 35. 9 March 1974, 22. On subsequent days the Curlew flock was variously recorded as 18, 19 and 29 birds, but the maximum figure of 22 is correct; on two occasions it was noticed that when observers approached a large flock of mixed waders, a flock of curlew took off leaving two to four indivduals apparently undisturbed.

ASIATIC WHIMBREL *(Numenius phaeopus variegatus)*
First recorded by BDB in March 1958. January 1961, 21. May 1962, one (sp. unid.). June 1966, 3 (BDB). January 1967, 26. March 1968, 34 and October 1971, 10 (BDB). March 1974, 15 on 9th, 13 on 11th, two parties totalling 23 birds around mile 12 on 12th.

AMERICAN WHIMBREL *(N. p. hudsonicus)*
April 1965, one.

LITTLE WHIMBREL *(N. minutus)*
One in January 1961; one in March 1968 (BDB).

AMERICAN BLACK-TAILED GODWIT *(Limosa haemastica)*
11 March 1974, one at mile 10, closely examined by CRV.

BLACK-TAILED GODWIT (sp. unid.))
One was seen in January 1961.

BAR-TAILED GODWIT *(Limosa lapponica)*
January 1961, 17,720. May 1962, 2,000. September 1962, 8,000. January 1967, 19,000. October 1971, 12,000 (BDB). 9th March 1974, 13,492; 11th March, 12,215; about 80% of the birds were still in winter plumage but movement had probably started as at about 1630 hours a large flock of about 2,000 birds was seen flying high and heading north.

LESSER YELLOWLEGS *(Tringa flavipes)*
A new record for the Spit. When first seen on 9 March 1974 by RMV it was in company with a Greenshank; found again on 10 March 1974 and closely examined by BB, who confirmed the identification.

GREENSHANK *(T. nebularia)*
November 1963, 2. April 1965, 2. January 1967, 1. March 1974, one seen on 9th, two on 11th.

WANDERING TATTLER *(T. incana)*
April 1965, one.

SIBERIAN TATTLER *(T. brevipes)*
1962, one in May, one in September. April 1965, 2. January 1967, 4. March 1968, 4 and October 1971, one (BDB).

TURNSTONE *(Arenaria interpres)*

January 1961, 808. 1962 May, 20; September, 50. April 1965, 400. January 1967, 700. Figures for March 1974 at 1,334 on 9th and 1,879 on 11th were far in excess of any previous record. There were parties and flocks all along the outer beach and on the flats of the Spit. A proportion of the birds may have been on passage. The counts for miles 1-10 were very close on both days at 691 and 688, but for mile 10-tip the count was 643 on 9th March and on 11th March 1,191, of which 635 were found between mile 15 and the tip of the Spit.

KNOT *(Calidris canutus)*

January 1961, 27,370. 1962 May, 730; September, 10,000. January 1967, 26,000. October 1971, 18,000 (BDB). March 1974, 18,700 on 9th and 16,143 on 11th. Of one large mob studied on 12 March 1974 about 90% were already in colour.

SHARP-TAILED SANDPIPER *(C. acuminata)*

January 1961, 2. April 1965, 12. January 1967, 7. March 1974, 5.

CURLEW SANDPIPER *(C. ferruginea)*

January 1961, 2. September 1962, one. October 1964, 3. April 1965, 7. January 1967, 4. March 1968, 4 (BDB). March 1974, 3.

WESTERN SANDPIPER *(C. mauri)*

October 1964, one.

RED-NECKED STINT *(C. ruficollis)*

January 1961, 9. 1962 May, 6; September 4. October 1964, 31. April 1965, 25. January 1967, 38. March 1968, 38 (BDB). 8 March 1974, 28; only 16 and 19 were counted on 9th and 11th March, both counts including a partial albino.

SANDERLING *(C. alba)*

Two in May 1962. Two seen by R. J. Pierce on 28 December 1973 and two on 8-9 March 1974.

PIED STILT *(Himantopus leucocephalus)*

January 1961, 18. 1962 May, 21; September, 10. January 1967, 39, at the pools mile 2-5. March 1974, pools dry; 20 stilts counted near the base of the Spit.

BLACK STILT *(H. novaezeelandiae)*

January 1961, one.

POMARINE SKUA *(Stercorarius pomarinus)*

Single birds recorded in January 1961 and April 1965. March 1974, a dark phase small skua considered to be this species.

ARCTIC SKUA *(S. parasiticus)*

January 1961, 5. May 1962, one. January 1967, 5 or 6 small skuas, usually seen flying over the inner flats. March 1974, three small skuas, seen at intervals over the inner beach and inner flats;

one bird, flying parallel to the outer beach, held a yellowish object in its bill. This object was twice dropped and retrieved in mid air by a rapid swoop, the bird then resuming its horizontal flight.

BLACK-BACKED GULL *(Larus dominicanus)*

January 1961, 200. May 1962, 500. January 1967, 271. March 1974, 353.

RED-BILLED GULL *(L. novaehollandiae)*

January 1961, 199. May 1962, 454. January 1967, 310. March 1974, 380.

BLACK-BILLED GULL *(L. bulleri)*

January 1961, 101. May 1962, 61. January 1967, 160. March 1974, 10 plus.

BLACK-FRONTED TERN *(Chlidonias albostriatus)*

January 1961, 5. May 1962, 23. April 1965, about 200, including a large number of juveniles. January 1967, 10. March 1974, 122, a few with orange bills and feet, the majority with dark bills.

WHITE-WINGED BLACK TERN *(C. leucopterus)*

January 1967, one. 1974, one seen near the tip of the Spit in February by Dr Gerald Robinson, and probably the same bird in March by our party.

CASPIAN TERN *(Hydroprogne caspia)*

January 1961, 86. 1962, 39 in May, 30 plus in September. January 1967, 200. December 1973, colony at Shelly Bank had 46 occupied nests; 125 adults and 30 juveniles at the colony and a number of adults and juveniles which had left the colony were seen along the Spit (R. J. Pierce). March 1974, 109.

CRESTED TERN *(Sterna bergii)*

January 1960, one (Bell 1960: 261).

LITTLE TERN *(S. albifrons)*

January 1967, 3. December 1973, one near tip of Spit (R. J. Pierce). March 1974, 5 (3 at mile 7½-10, 2 beyond mile 15).

WHITE-FRONTED TERN *(S. striata)*

January 1961, 1,085. May 1962, 42. January 1967, 185. March 1974, 693 on 11th, 806 near tip of Spit on 12th.

WHITE-CAPPED NODDY *(Anous minutus)*

January 1961, one.

N.Z. PIGEON *(Hemiphaga novaeseelandiae)*

January 1967, two on Freeman's farm.

ROCK PIGEON *(Columba livia)*

A feral pigeon was seen on 10 March 1974 at mile 7½.

SHINING CUCKOO *(Chalcites lucidus)*

January 1967, one on Freeman's farm; recorded October 1971 (BDB). March 1974, one on Freeman's farm, four on the Spit beyond mile 15.

LONG-TAILED CUCKOO *(Eudynamis taitensis)*
Sightings of single birds on 2 November 1946 (White 1948: 170), 21 January 1961 (McKenzie & McKenzie 1961: 251) and one in the pines near the lighthouse in December 1968 (BDB).

MOREPORK *(Ninox novaeseelandiae)*
March 1974, heard calling; one entered Freeman's woolshed.

N.Z. KINGFISHER *(Halcyon sancta)*
Not recorded in January 1961. May 1962, 28 counted along the length of the inner beach. September 1962, three, and January 1967, one, near base of Spit. March 1974, three near the base of the Spit, two beyond mile 15.

SKYLARK *(Alauda arvensis)*
Regularly recorded in suitable areas on the Spit.

AUSTRALIAN TREE MARTIN *(Hylochelidon nigricans)*
Two in January 1960 (Wright 1960: 261).

WELCOME SWALLOW *(Hirundo tahitica)*
Well established; 11 March 1974, about 50 over paddocks at the base of the Spit and seven birds between mile 12½-15.

N.Z. PIPIT *(Anthus novaezeelandiae)*
Regular; sightings miles 0-10 and near tip of Spit.

HEDGE SPARROW *(Prunella modularis)*
Regular; sightings miles 0-10 and 12½-15.

GREY WARBLER *(Gerygone igata)*
Regular; sightings miles 0-5.

FANTAIL *(Rhipidura fuliginosa)*
Regular; sightings miles 0-5; one black fantail seen on farm.

TOMTIT *(Petroica macrocephala)*
January 1961, seen near homestead.

SONG THRUSH *(Turdus philomelos)*
Regular near base of Spit; March 1974, one recorded mile 12½-15.

BLACKBIRD *(T. merula)*
Regular near base of Spit.

SILVEREYE *(Zosterops lateralis)*
Regular; small flocks recorded at several localities along the Spit.

BELLBIRD *(Anthornis melanura)*
January 1967, present at base of Spit.

YELLOWHAMMER *(Emberiza citrinella)*
Regular; sightings miles 0-10.

CHAFFINCH *(Fringilla coelebs)*
Regular; sightings miles 0-10 and 12½-15.

GREENFINCH *(Carduelis chloris)*
Recorded 1961, 1962 and 1967; not seen in March 1974.

GOLDFINCH *(C. carduelis)*
Regular; March 1974, sightings miles 0-10, 12½-15.
REDPOLL *(Acanthis flammea)*
Regular; March 1974, flocks seen at miles 0-7½ and 12½-15.
HOUSE SPARROW *(Passer domesticus)*
Regular; sightings at base and miles 12½-tip of Spit.
STARLING *(Sturnus vulgaris)*
Regular; March 1974, moderate numbers near base and larger flocks mile 12½-tip of Spit.

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JUST PUBLISHED!

MAURI ORA, Vol. 2, August 1974. The journal of the Biological Society of the University of Canterbury (the first number of which was reviewed in *Notornis* 20 (3): 287-8, September 1973), this useful publication contains the following articles of interest to ornithologists:

Castle, J. F. "Birds recovered from Banks Peninsula beaches, New Zealand, February 1971 to February 1974." Pp. 31-44; Craig, D. A. "Further information on the distribution of the blue duck." Pp. 137-138; Rind, S. "Some helminth parasites of freshwater birds from the South Island, New Zealand, with particular reference to trematodes of ducks." Pp. 139-146.

SHORT NOTES

OBSERVATIONS OF KOKAKO COURTSHIP, HUNUA DECEMBER 1973

Little has been written about the courtship of the North Island Kokako *(Callaeas cinerea wilsoni)* since it was described by Buller (1888: 3). However, on 8 December 1973, we had the good fortune to observe the courtship ceremony of the Kokako in the Moumoukai Bush above Clevedon. The weather was fine and humid, with some patches of cloud, and a very light breeze from the south west. We were engaged in a routine survey of the birds in the Moumoukai Bush, and for the first time were using a small, portable cassette tape-recorder and a pre-recorded tape of the calls of Kokako in the area, made by C. R. Veitch. We set out at 1045 and, about half a mile into the bush, we met with considerable success, attracting a pair of Kokako with the tape. These birds remained in view for about 45 minutes, running about in the trees, searching diligently for the vocal but invisible intruder. As time was running short, we moved up the track another mile where we surprised a second pair which were moving about in the crown of a Toru *(Persoonia toru)* about 20' above the ground.

Initially, the pair took little notice of us but when we started the tape-recorder they became very excited. It was interesting to note that these birds were not as vocal as the " half-mile " pair, which responded to the tape with full song, mews and clucks. Instead, this pair reacted to the tape but did not look for it. The birds circled us a number of times in a clockwise direction, bounding through the trees, demonstrating remarkable agility and hardly deviating from a circular " path " of radius about 20 yards. They paused on the branch of a large Tawa tree, about 40 feet above the ground, clearly visible from our vantage point on the track about 20 yards away. The male mounted the female with a vigorous flapping of wings, uttering a bubbling call (similar to a smooth pebble dropped into a still pool) and clucking ecstatically during copulation. The birds resumed their path around us, returning to the same branch where a courtship display was performed. The pair faced each other on the branch and bowed to each other like a couple of elderly, grey-suited Continentals greeting each other in the street, repeated several times in quick succession. After almost completing another circuit, they paused in a large Tawa adjacent to that in which the courtship had been observed. Here, partially obscured from our view by vegetation, copulation occurred for a second time again with a vigorous flapping of wings (lasting in total about 10-15 seconds). After copulation, they circled us perhaps

twice more before vanishing into the wooded gully below. The Kokako appeared indifferent to human presence, reacting only to the taped calls. The " chase " through the trees appeared to be part of the ritual, and was conducted with what we could best describe as " joie de vivre."

A thorough search of the ridges in the vicinity on three subsequent weekends failed to find any trace of nesting activity.

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A VARIABLE OYSTERCATCHER FAMILY AT WAIKANAE

For several years a pair of *Haematopus unicolor ("reischeki")* has been resident at Waikanae Estuary and has attempted to breed. After the nesting season, the pair is sometimes joined by immigrants (including a banded bird from Wellington Harbour) and occasionally another pair remains in the spring. The " home pair " consists of a completely black male and a smudgy intermediate pied female, the sexes being inferred from positions during attempts at copulation (CAF, 21 July 1972) and consistent behaviour when incubating eggs (MLF, 13 January 1974) or accompanying chicks (CAF, 27 December 1971). We cannot prove that the " home pair " has been unaltered since 1971 but we have no evidence to suggest a change.

The " home pair " had two downy running chicks on 12 December 1971 which both survived to fly and were both pied (27 December 1971); probably they would be " pied intermediate " in Baker's classification (1973). The following season, the home pair, or a pair with the same plumages, produced two pied downy chicks (first seen 18 November, MLF), about 5 inches tall on November 26 (CAF), seen again on December 9 (MLF) but reduced to one survivor on December 16 and 28, when it was fully fledged. These chicks (and especially the survivor) were exceptionally pied individuals, only distinguished from *H. finschi* by their larger size and by the behaviour of the parent pair towards them. In particular they had white shoulder patches and white rumps extending forward between the scapulars as in *H. finschi.* Neither of us has ever seen such extremely pied specimens of *H. unicolor " reischeki."* In 1973-74 the home pair failed to produce young.

We record these broods because Baker (1973) had no record of Pied progeny from Black X Intermediate parentage.

REFERENCE

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INCUBATION OF AN ADELIE PENGUIN EGG BY A SOUTH POLAR SKUA

During the austral summer of 1972-73, I observed and photographed a pair of South Polar Skuas *(Catharacta maccormicki)* incubating the egg of an Adelie Penguin *(Pygoscelis adelie)* at Hallett Station, Antarctica (72°19'S, 170°13'E). Both members of the pair incubated the egg from 6-14 January 1973, and both defended the nest and territory much as has been described for other members of their species (Young 1963). The nest resembled that of other South Polar Skuas (Spellerberg 1969), and was located about 20 m from the nearest penguin colony.

From all outward appearances the egg seemed to be normal, except for a small crack on one side, possibly indicating that at one time it had been frozen. It was of average size (71.7 x 56.5 mm) and only slightly soiled on the surface. The ambient temperature ranged from −8° to 0°C during the incubation period, but the egg was checked several times and was never found to be frozen.

An unincubated penguin egg was in the gravel about 3 m from the skuas' nest and remained there unharmed for the entire 9 days the other egg was being incubated. Several other penguin eggs were scattered about the rookery, but were usually eaten within a day unless frozen or on the interior of a penguin colony. On 15 January both the incubated egg and the egg near the nest were gone, and only one member of the pair was observed defending the territory.

How this incubated egg got in the nest was not determined, but since skuas normally carry penguin eggs between their mandibles, and since no military personnel were allowed on the rookery during 1973, it is assumed that the egg arrived there through normal behaviour and was subsequently incubated by these birds. Eklund (1961) has described examples of South Polar Skuas incubating Adelie Penguin eggs experimentally placed in their nests, but to my knowledge this is the first reported case of skuas voluntarily incubating a penguin egg. One possibility for this unusual behaviour is that these birds might have picked up the egg from the rookery while frozen, and

thus not edible. The stimulus to brood the egg might have then overcome the stimulus to eat it and incubation was then begun. I suspect that these were immature birds as they did not lay eggs of their own during the breeding season. Unfortunately the ages of the birds were not determined.

This observation was made while I was engaged in work supported by the NSF Antarctic Research Program Grant No. GA 23744 to John R. Baker of Iowa State University. I wish to express my gratitude to Dirk V. Derksen and Milton W. Weller of Iowa State University for reviewing the manuscript.

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SUNBATHING SWALLOWS ?

Recently an interesting incident concerning the Welcome Swallow *(Hirundo neoxena)* was related to me by an Eketahuna farmer, Mr R. Waldman. In his district the swallow is a new arrival and it was he who noticed the birds' unusual habit of " sunning."

Six swallows were watched for often an hour at a time on a lawn just in front of the Waldman's house. The swallows would lie on their sides, one wing extended, tail fanned out and head back apparently lapping up the sun. This behaviour has been seen several times by Mr Waldman and might be related to the extreme tameness of the swallows living near the house and outbuildings.

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★

HOUSE SPARROW PLUCKING BARBARY DOVE

Bird watching in the garden has its surprises, however common the species. A few days ago I was puzzled when I saw a House Sparrow *(Passer domesticus)* making darts at a Barbary Dove *(Streptopelia risoria)* perched on a power line outside the house. The dove avoided the sparrow on this occasion by flying a few feet. This morning, 21 January 1974, my wife saw a sparrow pluck several

feathers from a dove on the wire and fly off with them. A few minutes later we both saw the plucking repeated. The sparrow, after alighting on the line a few feet from the dove, made a sudden dart towards the base of the dove's tail and returned with several feathers in its bill and then flew off across the street, evidently to its nest. The same tactics were repeated again shortly afterwards, the sparrow being a male bird.

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CHINSTRAP PENGUIN AT CAPE HALLETT

From 30 December 1972 to 13 January 1973 a Chinstrap Penguin *(Pygoscelis antarctica)* was observed and photographed at Hallett Station, Antarctica (72°19'S, 170°13'E), a penguin rookery of about 100,000 breeding Adelie Penguins *(Pygoscelis adeliae)* and 60-100 South Polar Skuas *(Catharacta maccormicki)*. The Chinstrap would stay near colonies of the Adelies when on land, but would leave every day or two for a few hours, presumably to feed at sea. It appeared to be in good physical condition with no signs of external anomalies. No positive sex determination was made.

The bird was very pugnacious, taking over nest scrapes of Adelies and stealing stones from the surrounding birds with apparent ease. During the early part of the stay fighting frequently broke out between the Chinstrap and Adelies with the Chinstrap usually winning and claiming the defeated birds' territories. It never stayed on one scrape long, however. Altogether it occupied four Adelie colonies and claimed at least nine scrapes during its 15 day visit.

Watson (1971) and Sladen (1964) give no reports of the Chinstrap Penguin ever having been found on Cape Hallett, but Muller-Schwarze (1967) gives account of a Chinstrap at Hallett Station on 10 January 1965, and one was sighted by E. Gless (Montana College of Mineral Science and Technology, Butte, Montana — personal communication) in February 1968. Hence, the present report represents the third sighting of a Chinstrap Penguin at Cape Hallett and the only sighting during the last five years.

This observation was made while I was engaged in work supported by the NSF Antarctic Research Program Grant No. GA 23744 to John R. Baker of Iowa State University.

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FIGURE 1 — Chinstrap Penguin at Hallett Station, Antarctica. Photo: R. D. Crawford

A STRAY PIED TIT

A male Pied Tit *(Petroica macrocephala toitoi)* spent four days in January 1974 at the home of Mr and Mrs W. Morton a mile south of Clevedon on the Clevedon-Papakura Road (ref. NZMS 1, N42/540418). It was noted to be taking caterpillars in the vegetable garden. Mr Morton recognised it and secured photographs of it which proved its identity, this in open rich dairying farmland eight miles by map from the nearest known habitat of the species, the Moumoukai Bush in the Hunua Ranges. The country between consists of three miles of open farmland and then five miles of rough farmland with patches of poor bush and large areas of scrub, from which there have been no reports known to the writer over the last 52 years.

One was heard on 1 November 1950 by Mr R. H. D. Stidolph in Thorp's Bush (ref. NZMS 1, N42/550445) on the northern outskirts of Clevedon Village. This Scenic Reserve is good bush and a narrow strip of bush and scrub runs six miles north to the sea with farmland and a large pine plantation to the west of it and all open farmland on the east. This should be good habitat but one farmer has owned part of this strip for 52 years and another for 39 years and neither has ever found the species there, nor have I. The one of November 1950 must have been the last or one of the last of a small local population or, more likely, a stray like the present one.

H. R. McKENZIE

P.O. Box 45,
Clevedon

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AUSTRALIAN TREE MARTINS NEAR TE ARAROA

On 25 April 1974 my wife and I observed a flock of birds, identified as this species, at the mouth of the Karakatuwhero River, about 7 km east of Hicks Bay (map ref. NZMS 18, sheet 6, N55-7463). With the assistance of binoculars, detailed notes on plumage and activity were made on the spot, and reference to the *Field Guide* indicated that the birds were Australian Tree Martins, *Hylochelidon nigricans.* Later reference to Oliver (1930), Leach (1912) and Buller (1888) confirmed the species. The distinguishing features of greyish-white rump, absence of deeply forked tail, and chestnut-brown forehead, the last more noticeable in some birds than others, were all noted in the field. The birds did not appear to be disturbed by the near presence of observers, and it is also noted that Tree Martins have previously been reported at Hicks Bay.

Under observation for about an hour on a mild sunny afternoon, these birds were actively hawking over a winding, shallow, shingly river with several small rapids, near the sea outlet. The area was largely coastal wasteland, with extensive lupin growth and a scattering of miscellaneous larger trees. Numbers were c. 30-35 but an accurate count was made difficult by the continuous dipping, diving, darting flight. Occasionally the Martins would flock together in groups of

various sizes and rise on a wheeling high-level flight until almost out of sight. This activity would be followed by scattered dispersal again and return in smaller groups for low-level hawking, even to the extent of touching the water surface. No call was heard.

The area was visited again on 13 July 1974 for the purpose of photographing the Martins. In this we were unsuccessful, possibly on account of the dull and rather windy conditions. However, c. 20 were observed in the same general area, but in smaller more widely-scattered groups, and all flying low. These groups of two to six birds ranged more widely than the closer larger association noted on the first observation.

The initial momentary and distant glimpse of these Martins gave an impression of native bats in flight. When seen to be birds, there remained the possibility of the more common Welcome Swallow. However, after several flights within 10 feet of the observers and the perching of 7 birds within 30 feet, detailed records thus made possible are felt to sufficiently match formal records as to warrant a confirmed sighting.

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OLIVER, W. R. B. 1930. New Zealand birds. Pp. viii + 1-541. Wellington: Fine Arts (NZ) Ltd.

J. C. HENLEY

Waitakaro,
Ruatoria.

★

COMMON SANDPIPER IN THE KAIPARA HARBOUR

A Common Sandpiper *(Tringa hypoleucos)* was seen at Port Albert, on the Kaipara Harbour, on 23 February 1974 by J. A. Brown, E. D. Metherell, D. M. Walter, Mrs Pamela Walter and the writer.

The bird was in the air when first seen. It had the prominent white wing-bar and distinctive manner of flight, with alternating periods of rapid wing-beats and short glides on bowed wings, described by Merton *et al.* (1965) and Edgar (1969). It alighted and we were able to watch as it fed actively over an expanse of estuarine mud close to a main channel, or perched on a shelly hummock and a clump of exposed roots, at times hiding on the far side of these and taking brief looks at us over the top.

Upper surfaces were a soft even brown, darker on the head, while the underparts were white. The straight bill was fine, dark and short, with a paler area, possibly pinkish-yellow, at the base of the lower mandible. A brownish wash spread over face, neck and onto

the upper breast, where it formed a " bib " whose lower margin curved high at the shoulder. Here, a white area in front of the angle of the wing was most noticeable, as also were the almost horizontal stance, tail-jerking and bobbing. The stance and shoulder pattern are well illustrated by Watson & Campbell (1964: 72-73). Witherby *et al.* (1940: plate 117) do not show the shoulder marking. Edgar (1969) suggests that this may be a variable field character. The rump and tail were easily seen as the bird flew on more than one occasion showing the brown centre and white edges with some barring on the tail. The legs were greenish yellow. No call was heard. We watched until after a time the bird moved into mangroves and did not re-appear.

Three previous sightings ,each of a single Common Sandpiper, have been recorded in this journal. These were at New Plymouth on 24 October 1964, Kerikeri on 20 March 1969 and Waikanae on 24 November 1972. W. F. Cash (pers. comm.) found one at the mouth of the Waiongona River, Taranaki, on 13 February 1972, where it was seen on four other occasions. The final sighting was on 9 April 1972.

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WITHERBY, H. F. *et al.* 1940. The handbook of British birds, 4. London: H. F. & S. Witherby Ltd.

BETH BROWN

39 Red Hill Road,
Papakura

★

A SIGHTING OF THE PIOPIO OR NATIVE THRUSH

Sometime about March 1970, we were seeking *Pittosporum turneri* in the Hauhungaroa Range when we observed a young Piopio sitting on a branch and chirping. Shortly a parent flew in at seven or eight feet from the ground and fed it. This was repeated several times in the twenty minutes or so that we watched them, eight or ten feet above us. The parent made no sound and moved almost stealthily through the heavy scrub, taking note of us but showing no alarm. She would fly straight in, feed the chick, turn sideways and observe us for a few seconds and then fly off, keeping low. We kept perfectly still and studied every detail of the parent bird, also the chick, which differed little from the parent in general appearance. Another chick was chirping a little further downhill in the cover. They gave a straight plain chirp, not a trilly chirp like the Song Thrush *(Turdus philomelus)*. RB was quite sure of the identity of the bird as he had been shown a newly dead one by an old man at Raurimu in the King Country many years before and remembered very well the details of it.

In size it was a little larger than a Song Thrush. The bill was curved down a little towards the end. It was of an indefinite colour, as also were the legs. The overall upper colour was more like that of a Fernbird *(Bowdleria punctata)* without the dark streaks. The tail was a good length, rounded at the end, with lighter fawn edging. It was turned down, more so at the end, not straight like that of a Song Thrush. The throat was white, the breast fawn with a few irregular darker markings. In correspondence with H. R. McKenzie we related this event and he told us of the *"Field Guide to the Birds of New Zealand,"* by Falla, Sibson & Turbott, in which is an illustration of the two native thrushes. On Plate 16 we noted that the figure marked " b," the North Island Piopio, had the upper surface too dark and that it should have been more like the figure " a," featuring the South Island Piopio. The throat and breast of " b " as pictured is matched by that of our bird. The downward bend of the tail has been missed on the plate.

We commented at the time on the lateness of the season for young birds. Perhaps this pair had lost an earlier clutch or brood and nested again. It was indeed gratifying that there was a very good chance of the young of this rare species being successfully reared.

REFERENCE

FALLA, R. A.; SIBSON, R. B.; TURBOTT, E. G. 1970. A field guide to the birds of New Zealand and outlying islands. 2nd ed. 256 pp. London: Collins.

REG. BELL
LAURIE SINGLETON

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LETTERS

The Editor,
Sir,

BLACK FANTAIL IN THE WAIRARAPA

Following Mr Stidolph's contribution (December 1973) on the occurrence of the Black Fantail *(Rhipidura fuliginosa)* in the Wairarapa, it may be of interest to record a further sighting in the area. On 17 March 1974, I observed a Black Fantail feeding vigorously in the garden of Mr Ralph Garland, Miro Street, Masterton. It was accompanied by a normal pied bird and after being watched for several minutes both fed away to the north. I was told that the Black Fantail had not been noted previously about the home.

REFERENCE

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W. J. WINSTANLEY

89 Thackeray Street,
Upper Hutt
28 March 1974

The Editor,
Sir,

NORTHERN SHOVELER IN NEW ZEALAND

In regard to Northern Shovelers *(Anas clypeata)* obtained recently in New Zealand (Howard 1968; Kinsky & Jones 1972), no reference was made in recording these occurrences to the statement by Buller in his Supplement (1905: 15) of " one of the partial albinos (of N.Z. Shoveler) in my collection is almost exactly like *Spatula clypeata* of Europe in the extent and distribution of the white plumage." He gave a detailed description of the plumage of two of these so-called partial albinos from Lake Ellesmere. Is it possible that *clypeata* occurred in New Zealand in Buller's day ?

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HOWARD, P. J. 1968. A New Zealand record of the Northern Shoveler. Notornis 15 (4): 253.

KINSKY, F. C.; JONES, E. B. 1972. Northern Shovelers *(Anas clypeata)* in New Zealand. Notornis 19 (2): 105-110, 1 fig.

R. H. D. STIDOLPH

120 Cole Street,
Masterton
14 May 1974

★

The Editor,
Sir,

PECCAVI

I am surprised and a little perturbed that no sharp-eyed critic has pounced upon an error which I made some two years ago and ten thousand miles away when I wrote a review (*Notornis* 19: 281-282) on " The Swans." The name of Buller's lake is of course Papaitonga, not Puponga. I cannot even lay the blame on a printer's imp. Distance and happy memories of Puponga at the base of Farewell Spit may have dulled my wits. Mea culpa.

R. B. SIBSON

26 Entrican Avenue,
Auckland 5

OBITUARY

G. M. TURNER

New Zealand owes much to the many Englishmen who brought to the home of their adoption an appreciation of nature and trained habits of observation. Some like T. H. Potts left unpublished records which have increased in value with the years. Others from modesty or other reasons were content to share their enthusiasms and their insights with contemporaries of like-mind, and are not likely to be remembered beyond their own period and generation. It would be a pity if the contribution of George M. Turner was not accorded some record in more detail than was possible in several newspapers at the time of his death in Nelson on 21 October 1973 at the age of 80.

George Middleton Turner was born in Birmingham and as a young man was commissioned in the British Territorial Army of 1914. Severely wounded in France, he underwent extensive surgical treatment for head injuries and a long period of convalescence. Feeling at last able to think of a career, he decided on sheepfarming in New Zealand, and prepared himself by taking a wool-classing course in Bradford. When he came to New Zealand in the early nineteen-twenties he made a leisurely journey to look the country over. What he saw, aided perhaps by a re-appraisal of his own state of health, changed his plans. He fell in love with Stewart Island, bought a comfortable cottage in Half Moon Bay, and settled down to what was to be a residence of about thirty years. Accompanied often by Roy Traill he explored every part of Paterson Inlet and trekked into the regions beyond. Still further afield he accompanied local fishermen and muttonbirders. An outstanding photographic record, both still and 16 mm motion picture, was one result, for George Turner was a skilled photographer, meticulous in the care of his equipment, as he was with his launch *Pearl* and his island home "Raroa." But his interests were not self-centred or eccentric, and he identified himself with community life serving variously as churchwarden and county councillor, for one period, 1937-39, as chairman. His home was a centre of hospitality and he was always willing to give illustrated talks to any local gathering.

When his reputation as a lecturer spread beyond Stewart Island, audiences throughout New Zealand were privileged to hear him and see his remarkable nature films on visits which he undertook entirely at his own expense. Particularly he was interested in sponsoring or joining expeditions to out of the way places. He voyaged on the Government Steamer *Tutanekai* on the last complete round trip to close castaway depots on the subantarctic islands in 1927. An ambition to go back prompted him to offer a substantial sum as a subsidy for a scientific expedition in 1934 but the Marine Department was unable or unwilling to respond, and it was another thirty years and near the

end of his life before Turner was able to re-visit the Auckland Islands in a small fishing boat which was prospecting for crayfish and spider crabs. He took an active and helpful part in scientific expeditions to the Three Kings in 1934 and Codfish Island in 1949. He married late, and his wife Kathleen, by whom he was pre-deceased, was a loyal partner in the later Stewart Island years and in their retirement home in Nelson.

Apart from articles on muttonbirding contributed to *Wanderlust* magazine and a few others to newspapers, Turner confined his recording to photography. His still photographs have been widely used by many authors. His silent films, less widely known of course, have not only historic value in such topics as past methods of muttonbirding, but also permanent value as a natural history record. One sequence showing the movements of a compact autumn flock of Red-breasted Dotterel in Paterson Inlet depicts more birds in a single flock than have been recorded by any other observer of this species. Negatives and original film footage have been acquired by the New Zealand Forest Service and are held by the Southland Conservancy.

R. A. F.

[An obituary of Captain Turner appeared under the heading "Had close links with Stewart Island" in the *Nelson Evening Mail* of 24 October 1973. — Ed.]

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ABOUT OUR AUTHORS

JOHN COOPER is a Research Assistant of the Percy FitzPatrick Institute of African Ornithology, University of Cape Town, South Africa. He received his undergraduate training at the University of Rhodesia. During 1971/1972 he was employed by the South African National Foundation for the Conservation of Coastal Birds (SANCCOB) under a grant from the South African Nature Foundation to study the Jackass Penguin, *Spheniscus demersus*. The penguin is threatened by oiling and the fishing industry.

Present interests centre on physiological/ecological investigations into growth, diet, guano production, metabolic rates and thermoregulatory behaviours of South African seabirds. Species studied to date include the Jackass Penguin, the Cape Gannet *(Sula capensis)* and the Dominican Gull *(Larus dominicanus)*.

Other interests include the distribution of pelagic seabirds in South African waters, ringing and censusing migrant waders and the conservation of bird habitats.

REVIEWS

Bibliography of N.Z.A.R.P. Publications 1956-1972. Supplement No. 1. [Christchurch]: Antarctic Division, Department of Scientific and Industrial Research, March 1974.

The Antarctic Division of the DSIR has responded quickly to the need for up-to-date information on scientific publications by issuing quite promptly the first supplement to the "Bibliography of N.Z.A.R.P. Publications 1956-1972," reviewed in the previous issue of *Notornis* (21 (1): 95-96, March 1974). Readers who like to keep up with ornithological research in the Antarctic by perusing the *Antarctic Journal of the United States* will be grateful, nonetheless, for this supplement (which promises to be No. 1 of an annual series) since the background information which they so often seek is now well documented: General (5 items), Biology (9), Geology (22), Ice & Snow, Oceanography, and Physics (atmospheric and terrestrial). Most of the items have been published during 1973 but a number of items omitted from the 1956-1972 period are now included and are placed at the beginning of the appropriate subject categories which, incidentally, are those used in the currently-appearing *Antarctic Bibliography* produced by the Library of Congress.

Of the 9 items in the section "Biology," 5 are from the 1956-1972 period and include 3 on birds published in *Notornis* (1966, 1967, 1968) and 2 of the 1973 publications are from *Notornis* Vol. 20 (by J. A. Fowler) with the listing also of a Ph.D. thesis in the University of Canterbury by E. B. Spurr entitled "Social organisation of the Adelie Penguin *Pygoscelis adeliae*."

It might be some time yet before all the 1956-1972 publications are discovered considering the great variety of journals in which they have appeared (recalling that the 69 bird papers listed in the *Bibliography* appeared in over a dozen different periodicals).

Those who know of others which have been published and not noted (or are likely to appear in obscure places) would help by informing the Antarctic Division so the listings can be perfected. We are pleased to commend this effort to document the already too widely scattered literature of Antarctic birds and their surroundings.

E. W. D.

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Pelagic studies of seabirds in the central and eastern Pacific Ocean. Edited by Warren B. King. *Smithsonian Contributions to Zoology*, No. 158. 1974, US $3.70 (for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

In 1963 the Smithsonian Institution began an ecological survey of the central Pacific Ocean, a project known as the Pacific Ocean

Biological Survey Program (or POBSP for those who like acronyms). The area under study included about 4 million square miles of the central Pacific between 30°N - 10°S and 138° - 180°. An account of this project and its origin can be read in the *Annual Report of the Smithsonian Institution* for 1965, pp. 24-30. This volume of seabird studies is the first in a series summarising the observations made at sea by the POBSP. Some readers may be familiar with the *Pacific Bird Observer,* a bimonthly newsletter issued from September 1965 by the POBSP " in an effort to promote the understanding of birds and their relation to man in the Pacific." Much of this publication has had notes of interest to New Zealand marine ornithologists. The present volume shows the results of its stimulation of interest in banding returns from the inhabitants of various island groups and other information from both POBSP personnel and observers of other countries.

" *Pelagic studies . . .* " consists of seven papers by various authors based on the results of the POBSP activity from 1963 to 1968. Patrick J. Gould introduces the series, outlines the development of the Program, describes the study areas and their features, discusses methods and procedures in observing bird species and recording information, gives a general account of the oceanography and marine biology of the area related to the distribution and movements of the seabirds. He follows this with a separate account of the biology of the Sooty Tern *(Sterna fuscata),* stressing behaviour, distribution and abundance and correlations with physical conditions and showing, in particular, how its distribution at sea depends on erratic food supply, location of breeding islands, breeding timetable and post-breeding dispersal pattern. Other authors treat their species in a similar way but varying according to the nature and detail of the information available: Gerald A. Sanger on (a) the Black-footed Albatross *(Diomedea nigripes),* (b) the Laysan Albatross *(D. immutabilis);* Richard S. Crossin on the Storm Petrels (Hydrobatidae), although with little of specific interest to a New Zealand ornithologist apart from a general discussion on habits and feeding behaviour of storm petrels. However, the bar diagrams of seasonal moult stages of various species are especially informative. Despite the author's statement that " the major reason for lack of positive knowledge regarding Pacific Ocean hydrobatids is the logistics problem with which the student of these seabirds must contend . . . ," the figure illustrating the winter density of Leach's Storm Petrel based on POBSP field work is a good example of graphic presentation of an oceanic distribution. Movements of White-faced Storm Petrels which might be of New Zealand origin are also discussed; Patrick J. Gould, Warren B. King and Gerald A. Sanger on the Red-tailed Tropicbird *(Phaeton rubricauda),* in which an appendix tabulating published data on the distribution of the species (including New Zealand records) is especially valuable, and Chandler S. Robbins and Dale W. Rice on recoveries of banded Laysan and Black-footed Albatrosses. The bibliographic references for each paper are lumped together as six pages of " Literature cited " which contain a numer of citations not so well known.

The most interesting paper for New Zealand users is doubtless that on the Wedge-tailed Shearwater *(Puffinus pacificus)* by Warren B. King.

The Wedge-tailed Shearwater breeds on many islands of the tropical and subtropical Pacific. King points out that the infrequent sightings of this species at sea (in the POBSP area, at least) belie the fact that it is abundant and widespread and he shows how some of its subtropical populations make extensive migrations whereas tropical populations are present at sea near their breeding islands most of the year and may not migrate. King writes about the light-phase and dark-phase morphs of the subspecies, *P. p. chlororhynchus* from all the islands in the Pacific and Indian Oceans except the Kermadecs, Norfolk Island and Kandavu (Fiji) where *P. p. pacificus* an all-dark form occurs, and his discussion is very relevant to the New Zealand scene in which a northern subspecies, *P. p. cuneatus* has been identified in addition to straggling *P. p. pacificus*. King notes (on p. 54) that the southernmost record of the Wedge-tailed Shearwater is a U.S. Fish and Wildlife Service band return from Cook Strait on 8 November 1965, a light-phase bird banded as an adult on 19 September 1963 on Johnston Atoll. He comments on another light-phase bird reported on by Falla (1962; *Notornis* 9 (8): 278-9) from Makara, near Wellington; " On tenuous grounds Falla assigned this bird to one of the north Pacific light-phase breeding islands, rather than the Shark's Bay, Western Australia, breeding grounds where light-phase birds occur as well." Readers of Falla's conclusions (based, as he said, " on the evidence of specimen comparison as distinct from theoretical possibilities . . .") will know whether " tenuous " is really a fair assessment of his examination, which should certainly be studied again while King's review is being read. The breeding " phenology," as King calls it (= " the study of the times of recurring natural phenomena " — OED), i.e. the breeding cycles, at northern subtropical, tropical Pacific and southern subtropical localities are discussed. Published pelagic records of " scattered individuals or small groups of dark-phase birds " in the Southwest Pacific close to New Zealand are listed. Distribution and abundance are correlated with currents and a similar attempt is made for sea surface temperatures and salinities at which Wedge-tailed Shearwaters were observed but here correlations are hardly demonstrable and only the ranges themselves appear significant. Specimens, moult and band recoveries are detailed. The sequences of moult of light-phase and dark-phase birds are of special interest to us. Feeding behaviour is also usefully outlined.

The series of papers in this first collection of POBSP results make some fine correlations of pelagic distribution in relation to breeding cycles, location of breeding sites, feeding behaviour and food supply, and to the physical features of the marine environment. All those interested in the " why and wherefores " of seabird distribution (and especially of those that straggle to New Zealand waters from the equatorial Pacific) will find this volume both stimulating and informative.

E. W. D.

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LITERATURE AVAILABLE

From all bookshops:

Annotated checklist of the birds of New Zealand. (OSNZ) $4.95

A field guide to the birds of New Zealand, by R. A. Falla, R. B. Sibson and E. G. Turbott, 2nd rev. ed. $5.00

From B. D. Heather, 10 Jocelyn Crescent, Pinehaven, Upper Hutt:

A biology of birds, by B. D. Heather. $1.33

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

Field guide to the waders, by H. T. Condon & A. R. McGill. Post Free $1.20

The following are available from Mrs. H. R. McKenzie, P.O. Box 45, Clevedon:

Back numbers of Notornis at 75c (Vols 2-13) and $1 per part (Vols 14-19). Complete sets available.

OSNZ Library catalogue, 70 pp. 50c

Banding reports, Nos 8-14, 50c each.
Nos 1-7 are incorporated in early issues of Notornis.

Kermadec Expedition, 1964, by A. T. Edgar. 45c