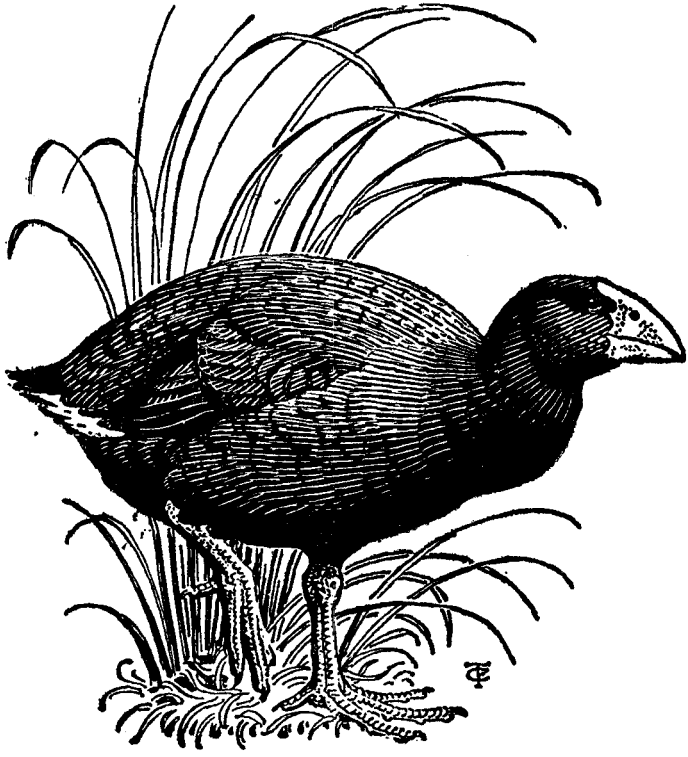
NOTORNIS

Journal of the Ornithological Society of New Zealand



Volume 24 Part 1 March 1977

OFFICERS 1976 - 77

———★———

President — Mr. B. D. BELL, Wildlife Service, Dept. of Internal Affairs, Private Bag, Wellington

Vice-President — Mrs J. B. HAMEL, 42 Ann Street, Roslyn, Dunedin

Editor — Mr. E. W. DAWSON, P.O. Box 41-002, Eastbourne

Treasurer — Mr. H. W. M. HOGG, P.O. Box 3011, Dunedin

Secretary — Mr. P. D. GAZE, P.O. Box 30466, Lower Hutt

Council Members:

Dr. BEN D. BELL, 45 Gurney Road, Belmont, Lower Hutt
Dr. P. C. BULL, 131 Waterloo Road, Lower Hutt
Mr. M. L. FALCONER, 188 Miromiro Road, Normandale, Lower Hutt
Mr. F. C. KINSKY, C/- National Museum, Private Bag, Wellington
Mr. D. V. MERTON, Wildlife Service, Dept. of Internal Affairs, Private Bag, Wellington
Mrs. S. M. REED, 4 Mamaku Street, Auckland 5
Mr. R. R. SUTTON, Lorneville, No. 4 R.D., Invercargill

Conveners and Organisers:

Rare Birds Committee: Mr. F. C. KINSKY, C/- National Museum, Private Bag, Wellington

Beach Patrol: Mr. C. R. VEITCH, Wildlife Service, Dept. of Internal Affairs, P.O. Box 2220, Auckland

Card Committee: R. N. THOMAS, 25 Ravenswood Drive, Forest Hill, Auckland 10

Field Investigation Committee: Mr. B. D. BELL

Librarian: Miss A. J. GOODWIN, R.D. 1, Clevedon

Nest Records: Mr. D. E. CROCKETT, 21 McMillan Ave., Kamo, Whangarei

Recording (including material for Classified Summarised Notes): Mr. A. T. EDGAR, Inlet Road, Kerikeri

Representative on Member Bodies' Committee of Royal Society of N.Z.: Mr. B. D. BELL

SUBSCRIPTIONS AND MEMBERSHIP

Annual Subscription: Ordinary membership $6; Husband/Wife membership $9; Life membership $120 (age over 30); Junior membership (age under 20) $4.50; Family membership (one *Notornis* per household) other members of a family living in one household where one is already a member $3; Institutional subscriptions $10; overseas subscriptions $1.50 extra.

Subscriptions are payable on a calendar year basis at the time of application for membership and on receipt of invoice each January. Prompt payment of subscription will ensure continued receipt of *Notornis*.

Applications for membership, changes of address and letters of resignation should be sent to the Treasurer.

Editorial matters only should be addressed to the Editor. Exchanges and library subscriptions should be referred to the Treasurer.

[Registered with POHQ, Wellington, as a magazine]

CONTENTS

Printed by TE RAU PRESS LTD., Peel Street, Gisborne

REGIONAL REPRESENTATIVES

FAR NORTH:
NORTHLAND: } D. E. Crockett, 21 McMillan Ave., Kamo, Whangarei

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

SOUTH AUCKLAND: Mrs. Beth Brown, 39 Red Hill Rd., Papakura

WAIKATO: R. Day, 9-236, Old Farm Road, Hamilton

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

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

GISBORNE/WAIROA: J. C. Henley, 9 Mason Street, Gisborne

TARANAKI: R. W. Wheeler, 307a Carrington Street, New Plymouth

MANAWATU: Dr L. J. Davies, DSIR, Private Bag, Palmerston North

HAWKES BAY: N. B. Mackenzie, Wildlife Trust, Main Road, Westshore, Napier

WAIRARAPA: Miss H. Cook, 15 Wallace Street, Featherston

WANGANUI: Vacant

WELLINGTON: M. L. Falconer, 188 Miromiro Road, Normandale, Lower Hutt

NELSON: F. H. Boyce, 19 Marybank Road, Nelson

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

CANTERBURY: R. Guest, P.O. Box 13343, Christchurch

WEST COAST: Miss Joan Douglas, C/- Millerton P.O., via Westport

OTAGO: A. C. Wright, 726 Portobello Road, Broad Bay, Dunedin

SOUTHLAND: R. R. Sutton, Lorneville, No. 4 R.D., Invercargill

———★———

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. A. Howell, 27 Tiri Road, Whangaparaoa:

Back numbers of 'Notornis' at $1.00 (Vols 2-13) and $1.50 (Vols 14-21) and $2.00 (Vol 22-) per part, plus an additional 10% of order cost to cover postage. Complete sets available.

OSNZ Library catalogue (1976 ed), 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

NOTORNIS

is the journal of the Ornithological Society of New Zealand (Inc.)
Editor: E. W. Dawson,
P.O. Box 41-002,
EASTBOURNE

VOLUME 24 PART 1 MARCH, 1977

FOOT-TREMBLING BY THE BLACK-FRONTED DOTTEREL

By B. D. HEATHER

ABSTRACT

Several puzzling cases of foot-trembling are described in the Black-fronted Dotterel *(Charadrius melanops)* in the southern part of the North Island, preceded by an account of its normal habitat and feeding methods during the year. The significance of foot-trembling is discussed in the light of discussion in *British Birds*. Similar observations on any New Zealand birds are called for.

INTRODUCTION

During a study of the Black-fronted Dotterel *(Charadrius melanops)* being carried out in the Wairarapa district since 1972 (Heather 1973), it has been found that this dotterel has in its repertoire of feeding methods a seldom-used version of "foot-trembling" (Simmons 1961a: 34). Since I do not recall having seen other waders in New Zealand using any version of specialised foot movements and since the purpose of such movements is still debatable, I hope by drawing attention to the subject to attract the records which other observers may have on any New Zealand species. The usual habitat and feeding of the Black-fronted Dotterel are outlined first, to give perspective to the foot-trembling habit.

NORMAL FEEDING

The Black-fronted Dotterel, which is a recent colonist from Australia, is a freshwater feeder which prefers the fine silty mud freshly exposed by falling river and pond levels. Normally it feeds in the typical plover manner by picking from the surface, with legs straight, pivoting from the hips. In some mud conditions it probes to a depth about half the length of its bill, which corresponds roughly to the extent of the black tip of its bill. While feeding, it walks carefully and quietly, picking as it goes, without the conspicuous run-and-stop, pick, run-and-stop, pick of the commonest New Zealand plover, the Banded Dotterel *(C. bicinctus)*.

On the Ruamahanga River in the Wairarapa the prime habitat for the Black-fronted Dotterel is any portion of river channel that has been dammed off by a shingle bank built up during the high river level of winter. The resulting backwater has a surface of soft fine wet silt, very slippery for humans. Often the silt remains moist with water filtering through the shingle bank. In such a site the birds will nest on the shingle ridge and feed themselves and their chicks on the nearby silt. Similar sites sometimes occur where shingle is excavated for human use.

In spring such feeding places are plentiful in the backwaters and runnels as the river drops. If the river remains low, the mud dries out and the dotterels spread out along the river to breed by the favoured places that remain. As the wet silt dries, the dotterels shift their feeding with the change in level, keeping to the freshly exposed slippery mud. In extreme summer conditions they will feed among the shingle at the water's edge, particularly where algal growth has been stranded and is rotting. Non-breeding birds seem then to wander the river. The dotterels do not move to the dry shingle of the river bed unless they are disturbed by an intruder or unless they are moving to or from a nest.

In these conditions I have seen them feed, during many hours of watching, only by picking and probing.

WINTER FEEDING

My observations since 1973 have been confined mainly to a six kilometre stretch of the Ruamahanga River above and below the mouth of the Waiohine River. This stretch supports five or six breeding pairs, a strong population for this district. It has been hardly practicable to cover the river banks and adjacent fields thoroughly in winter conditions and my few visits have been mainly to the most obvious and accessible places.

For as long as possible the birds remain in their summer quarters but, as the river rises, they are forced at first into small bickering groups and finally right off the river. Although all the places they use are not known, they do not seem to move far from the river since many return there whenever the river drops enough to expose silty margins on the higher channels. Occasionally birds are seen on effluent pits from milking sheds, and on muddy spots churned up by cattle or tractors, and such spots must abound in winter. Normal flooded pasture is not favoured.

Wintering birds have been most easily found on the two Greytown sewage ponds which are situated only 600 metres from the river, and on the banks of the Papawai Stream which flows past the sewage ponds, which discharge into it, on through open farmland to the Ruamahanga at the southern end of the study area. The stream has a controlled channel regularly cleared by drag-line, with the spoil

heaped along the top of one bank. When the river is in flood the stream floods also, depositing a thin layer of soft wet silt on the field that lies between them. Between 9 and 25 Black-fronted Dotterels have wintered on ponds and stream; fluctuation of numbers and sightings of colour-banded birds show that there is an irregular interchange of individuals.

Because of leakage problems, one or other of the two sewage ponds is always empty. The pond floor, formed from a willow swamp, is a roughly levelled confusion of pools, mud patches, irregular heaps of peaty soil mixed with clay and shingle, and charred willow stumps. Except when heavy rain has flooded the floor, many of the local dotterels have wintered here, sheltered from cold winds by the high gravel walls.

FOOT-TREMBLING

In the winter of 1974 I began to trap and colour-band Black-fronted Dotterels in the ponds. Early in May one pond was smoothed over by bulldozer, some effluent pumped in and then discontinued. Much of the floor was usually covered by shallow cloudy water but from one third to one half of the one hectare floor was a mixture of wet silt flats, bulldozer tracks filled with silty pools, and irregular heaps of waterlogged soil interspersed with silt-edged pools. These conditions lasted from mid-May to July, when the pond became flooded by heavy rain. From 9 to 11 birds were seen, not always the same individuals.

On 17 May foot-trembling was first noticed but I was preoccupied by trapping and assumed the trembling to be an attempt to shake off the bands. On 1 June, R. N. Cotter, M. L. Falconer and I noticed it again but were again too busy to take detailed notes. On 2 June, MLF and I, from a car on the top of the gravel wall, carefully studied the foot-trembling which all birds, whether banded or not, were doing from time to time. It was clear that the action was not to shake bands, water or mud from the feet but was a deliberate feeding device.

The whole tarsus and foot were held well above the ground, slightly lower than 45° from the vertical, and vibrated rapidly. Each vibration was often followed by a step forward and the other leg then vibrated, but equally often the same leg would be vibrated after a few steps. Sometimes there would be no apparent result but frequently a vibration was followed by a short dash forward or obliquely and a grab at what was usually an earthworm, fully visible to us and requiring a dragging action to secure. One bird even was trapped with an earthworm still protruding from its beak. Occasionally something else was taken, still large enough for the mandibles to be brought up in a partly open position with food visible between them. Normal surface picking, when food usually is not visible and the mandibles appear closed, was not used after trembling.

While trembling, although held stiffly hanging downwards, the foot did not touch the ground on any occasion so that, if the purpose was to transmit vibration to the ground, it could only have been through the stationary leg. On rare occasions, when a bird had moved into shallow water, trembling was continued once or twice when the foot, still held at the same angle, did touch the water, but there was no following dash and capture of food.

The trembling occurred whenever a bird was feeding on a patch of higher ground a few inches above water or silt level, where it was on the rich soil-clay-shingle mixture. As long as it remained on this soil, foot-trembling was used and worms captured. As soon as it moved in its wanderings to silt or shallow water the trembling stopped and normal picking was resumed.

In fact it was remarkable at the time that on that part of the pond where silt flats predominated, the birds were all picking, whereas on the part where soil heaps interlaced by bulldozer tracks predominated, birds were picking in the silty spots and foot-trembling on the soil parts. For instance birds feeding in the wet silt of the tracks would switch to foot-trembling on shifting to the soil thrown up at the edge of the tracks.

Although the soil was waterlogged and earthworms (small and probably *Allolobophora*) were abundant and unusually accessible to the dotterels, close to the surface, it is hard to see how the trembling could assist the capture of the worms. The consistency of the soil did not seem fluid enough for there to be a quicksand effect such as is achieved by the more familiar trampling and puddling movements of, for example, ducks and gulls; nor did the birds examine the ground about their feet as though expecting a result there.

FURTHER SIGHTINGS

The 1974 state of the pond has not been repeated. Foot-trembling was not seen again until 9 July 1976 when 17 Black-fronted Dotterels were feeding on the sloppy mud which had recently been dredged from the Papawai Stream and dumped on the bank. The birds were very restless, squabbling and displaying, and feeding as usual by picking from the surface. However, I noticed several birds foot-trembling several times, again without touching the surface, and at least twice earthworms were taken. Unfortunately the position was impossible to approach without disturbing the birds and I could learn nothing positive about their behaviour. On 24 July this mud had hardened and most birds were feeding on the fresh silt deposited by a recent flood on the adjoining pasture while others were on the stream bank. No foot-trembling was seen.

Shortly afterwards, M. Dennison reported that he and H. Robertson had seen Black-fronted Dotterels foot-trembling in the Manawatu district. The site was a 1000m^2 pit behind the Longburn freezing works

near Palmerston North, two kilometres from the Manawatu River. Into this pit by day trickled a stream of blood and offal washings which had accumulated to form a repulsive sludge up to a metre deep. During June 1976 between 15 and 39 dotterels were seen feeding here. Although no close study was made, 5 or 6 among a fairly close group of 15 on 16 June were noticed to be foot-trembling. Their action differed from the Wairarapa birds in that the foot trembled either in contact with or just above the surface, was then retracted and then the bird would pick at the spot. Birds gave the impression of testing the surface before moving ahead on it, although this is not intended to be an explanation. The 5 recognisable juveniles present were not foot-trembling. The birds which were, did so only intermittently, but one individual foot-trembled almost constantly during the fifteen minutes they were watched.

Foot-trembling was seen again on 4 September 1976 at a site in the Wairarapa near Featherston, reported by Miss H. Cook. This site was the ditches beside a gravel road giving access to the west bank of the Tauherenikau River, a river which has a small population of dotterels. The road is only 700 metres long and for 500 metres has ditches 2 metres wide with a sloping profile starting about 0.3 metre below road level and sloping away to about 0.6 metre deep. On the north side is a pig farm from which effluent has reached the ditches during the winter. On 28 August M. Dennison and I found two pairs of Black-fronted Dotterels feeding on different parts of the northern ditch which was filled with a soft porridge of sludge to MD's eye very similar to the Longburn sludge, but liberally sprinkled with unsightly plastic bread wrappings blown from the adjacent pig field. The surface was so soft that at each step the birds were sinking to about a third up the tarsus. Feeding was by picking and probing and both large and minute food was taken. Foot-trembling was seen once when a bird moved to the firm mud slope up to the road. The southern ditch had clearly been suitable for the birds until recently but had dried out to a firmly caked surface.

On 4 September the northern ditch had been flooded by recent rain but parts of the southern ditch had become sludgy and even the crust had softened and had small pools of sludge in its hollows. I spent an hour here, joined for the last quarter by M. L. Falconer, W. Cash and A. Gollop who had been looking for dotterels on the lower Tauherenikau. For the first quarter hour a single bird fed quietly on the only large soft portion. A second bird joined it for the second quarter hour. Both fed by picking and probing, sinking again to a third up the tarsus. Then a third bird, recognisable by a metal band, arrived and was chased away. On their return, the two original birds, which had not been out of sight, landed on a crusted portion of the ditch. Immediately one began to foot-tremble. It continued to do so for the final half-hour of watching, whether on the crust, the small pools or the original large soft portion, to which they returned for

the last few minutes. Its companion did no foot-trembling although always quite close. The trembling bird seemed a specialist, rather like one of the Longburn birds. The trembling and dash to grab food were as in the sewage pond except that, usually when the bird was sinking in a soft pool, its foot sometimes did touch the surface. This apparent foot-tapping produced no different behaviour than did the leg-shaking, and did not result in picking at the tapped spot, as at Longburn.

In spite of the leg-shaking of one, both birds seemed to feed with equal success on a variety of large and minute food and in the same sorts of place. There seemed no advantage in the circumstances by foot-trembling; it may simply have been triggered off by the crusty surface and continued whether appropriate or not. Earthworms were not present, although a small dark worm was commonly taken by all birds on both days.

In these cases from three unconnected populations, it seems that foot-trembling may be a response to some feature of the substrate which may in some circumstances be associated with earthworms. The threshold of this response varies in individuals.

DISCUSSION

Literature surveyed by Simmons (1961 a, b) and Sparks (1961) supports the view that foot-trembling is a specialty mainly of plovers. Cases are cited for the Lapwing *(Vanellus vanellus)*, Golden Plover *(Pluvialis apricaria)* and Dotterel *(Charadrius morinellus)* on farmland and the Ringed Plover *(C. hiaticula)*, Little Ringed Plover *(C. dubius)* and Kentish Plover *(C. alexandrinus)* on mud. The Three-banded Plover *(C. tricollaris)* is mentioned from Africa and Madagascar and, alone among scolapacine waders, the Black-tailed Godwit *(Limosa limosa)*. Foot-trembling on lawns by the American Hermit Thrush *(Hylocichla guttata)* widens the field of interest to the passerines.

Two-footed feeding movements (variously termed paddling, puddling, trampling, dancing, marking time, jumping, and so on) are better documented, probably because more conspicuous and often involving larger birds. Scolapacine waders such as the Woodcock *(Scolopax rusticola)*, Dunlin *(Calidris alpina)*, Semipalmated Sandpiper *(C. pusilla)* and Redshank *(Tringa totanus)* are cited, as well as various gulls and a mention of ducks, geese, swans, flamingoes, herons and the Sandwich Tern *(Sterna sandvicensis)*.

Because the terminology of foot movements is confused in literature and to clarify future discussion I propose, following Simmons, to divide the movements into (a) *foot-trembling*, involving the use of one leg at a time, which I would sub-divide into *foot-tapping*, where the foot clearly hits or stirs the surface, and *leg-shaking*, where the foot does not touch the surface; (b) *foot-paddling*, involving both feet together or in rapid succession, which may be sub-divided into *trampling* and *jumping*.

As a result of their discussion Simmons and Sparks agree on the hypothesis that foot movements are adapted " to exploit the properties of intertidal muddy sand, in order to expose or incite movement in cryptic invertebrates of the intertidal zone " (Sparks 1961: 340). It is persuasively argued that the purpose of the movements is not to capture marine worms, generally too deep for small waders and gulls to reach, however much they punish the surface. Rather the purpose is to produce local quicksand conditions from which amphipods and other invertebrates will scurry, thus revealing themselves. Similar views had been expressed earlier by Tinbergen (1953: 33-35).

They disagree however on whether similar foot movements on firm surfaces inland are a carry-over from estuarine habits which is functionless (Sparks) or still serves to stimulate movement, however slight, from invertebrates close to or at the surface (Simmons). They agree in doubting the traditional belief that earthworms are the cause, since earthworms are often on or near the surface in winter conditions anyway and are therefore likely to be commonly taken. Tinbergen (1953, 1962) believes strongly that earthworms can be the purpose of inland paddling by Herring Gulls *(Larus argentatus)*.

Simmons and Sparks reach their conclusions by considering mainly sea-shore examples. The Black-fronted Dotterel however is not an estuarine bird and its foot-trembling cannot be a secondary use of an estuarine habit, although it may have originally evolved as one. Therefore the birds' foot-trembling cannot be a functionless action and is a response to special but still obscure circumstances in its environment, and persists as an efficient feeding method in these circumstances. While it is reasonable to accept that foot-tapping, as used by the Longburn birds, will produce localised quicksanding, on analogy with the more vigorous actions of foot-paddling, it is surprising that the Black-fronted Dotterel does not use this method in its normal habitat. Paddling in gulls can be innate (Rothschild 1962) and modified by experience but were this the case with dotterels, one could expect to see foot-trembling used most by juveniles, which is not true.

The cases of foot-trembling considered by Simmons and Sparks seem to be cases of foot-tapping and can therefore plausibly be thought to function by quicksanding. The leg-shaking of the Black-fronted Dotterel is unlikely to have much quicksanding effect, especially on firmer ground such as at the Greytown pond where the birds were not expecting food to appear at their feet. The vibrations are presumably enough to pass through the water of waterlogged soil and stimulate slight movement by invertebrates on or just below the surface. The presence of earthworms in the ponds may have been coincidental but the birds certainly *appeared* to be deliberately seeking them instead of their usual minute food. The fact remains that leg-shaking is used, as far as we know so far, only in circumstances when the surface is firmer and less homogeneous than the usual smooth silt, and when earthworms and other larger prey than normal are taken.

Further sightings and also food studies will be needed to shed more light on the function of foot-trembling in the Black-fronted Dotterel.

OTHER NEW ZEALAND BIRDS

Birds have limited feeding devices and one can expect other surface-feeding birds in New Zealand to use specialised foot movements. I lack the resources for a full search but a glance through some New Zealand literature reveals, as expected, reference to foot-paddling of Red-billed Gulls *(Larus novaehollandiae)* and Black-billed Gulls *(L. bulleri)* (Dawson 1966; Edgar, Hamel & Poppelwell 1972) and to foot-paddling (Edgar 1961) and foot-trembling (Soper 1963) of the South Island Robin *(Petroica australis)*. Other episodes must be known and often unpublished.

ACKNOWLEDGMENTS

I wish to thank Mr Michael Dennison for bringing the papers of Simmons and Sparks to my attention; and Messrs G. A. and J. A. Bicknell and W. H. Heckler of Papawai, R.D. 1, Greytown, for their tolerant interest in my activity on their farms.

LITERATURE CITED

DAWSON, D. G. 1966. "Paddling" in Red-billed and Black-billed Gulls. Notornis 13 (2): 97.
EDGAR, A. T. 1961. South Island Robin eating venison. Notornis 9 (6): 199.
EDGAR, A. T.; HAMEL, J.; POPPELWELL, W. T. 1972. Notornis Supplement. Classified Summarised Notes 1963-1970. 19: 58-59.
HEATHER, B. D. 1973. The Black-fronted Dotterel **(Charadrius melanops)** in the Wairarapa. Notornis 20 (3): 251-261.
ROTHSCHILD, M. 1962. Development of paddling and other movements in young Black-headed Gulls. British Birds 55: 114-117.
SIMMONS, K. E. L. 1961a. Foot-movements in plovers and other birds. British Birds 54: 34-39.
——— 1961b. Further observations on foot-movements in plovers and other birds. British Birds 54: 418-422.
SOPER, M. F. 1963. New Zealand bird portraits. Pp. 1-104, frontis., pls 1-76. Whitcombe & Tombs.
SPARKS, J. H. 1961. The relationship between foot-movements and feeding in shorebirds. British Birds 54: 337-340.
TINBERGEN, N. 1953. The Herring Gull's World. Collins. Pp. 1-255, pls 1-30.
——— 1962. Foot-paddling in gulls. British Birds: 55: 117-119.

BARRIE D. HEATHER, *10 Jocelyn Crescent, Silverstream*

SOME MORPHOLOGICAL DATA ON THE AUSTRALASIAN HARRIER (Circus approximans gouldi) IN NEW ZEALAND

By N. C. FOX

ABSTRACT

51 Australasian Harriers were trapped in North Canterbury during the winters of 1974 and 1975. Data on wing, tail and tarsus length, and weight, are presented. Trends in colour barring of the wings and tail are correlated with age as expressed by iris colour. Some questions are raised from these data concerning possible morphological and behavioural changes in the New Zealand population. Moult sequences are briefly described together with some notes and figures on disease and injuries.

INTRODUCTION

Although considerable numbers of harriers have been trapped and banded in New Zealand, not a great deal of information is available on their morphology. In the absence of competitors the harrier has adapted to fill a wide range of ecological niches in New Zealand, no longer being confined mainly to swampy areas as it still is in Australia. It is probable that recruitment of harriers from Australia is small and therefore that the New Zealand population could be evolving along different lines from the Australian population.

METHODS

Most harriers in this study were trapped incidently during a study of the New Zealand Falcon *(Falco novaeseelandiae)*. Traps used were two sizes of Bal-chatri (Mueller & Berger 1959) which are small cages, covered with nylon running nooses and baited with Feral Pigeons *(Columba livia)*, House Sparrows *(Passer domesticus)* or mice *(Mus musculus)*. Automatic bownets baited with carrion (specifically for harriers) were also used.

Sexing was done by examination of the legs and feet, which are considerably more massive in the female than in the male. This method appears to be reliable for experienced observers, especially if comparative material is available (Olendorff 1972). There were no problems sexing the birds in my sample and subsequent analysis of the data revealed no anomalies. Four birds sexed by dissection and the specimen skins in Canterbury Museum confirmed the reliability of this method. In adult harriers body coloration was also an aid in

sexing, males being more ashy grey dorsally and paler ventrally. However, juveniles of both sexes are similar in colour and it is quite feasible that aberrant adult coloration could occur due to shot damage or other injury.

The only ageing attempted was simply into ' juveniles ' or ' adults.' Newly-moulted young adult females were easily distinguished from juveniles by fault bars (Fig. 1) or stress marks (Hamerstrom 1967). Careful examination of the lesser primary coverts revealed one or two that had failed to drop at the last moult, indicating an adult.

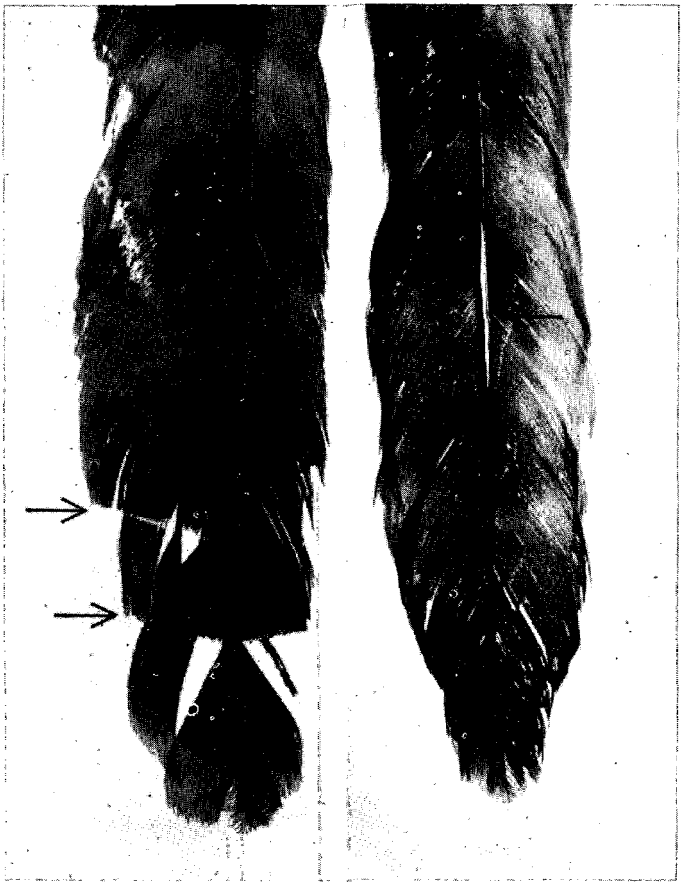


FIGURE 1 — (Left) Fault bars causing vane damage in a tail feather. (Right) Tail feather with a longitudinally split rachis.

The wing measurement was taken as the straight distance between the carpal flexure and the tip of the longest primary, without flattening the wing unduly. Specimens with the appropriate primary or central rectrix incomplete were excluded. Tarsal length was measured with vernier calipers and taken to exclude the overlapping portion of the tibio-fibula (Baldwin *et al.* 1931). Weights were obtained indoors by placing the hooded bird on a single-beam balance accurate to 1 g. Hood and crop weight were subtracted on the basis that 120 g is the weight of a full crop as found in a captive harrier.

Counting of colour barring tended to be slightly subjective in that some of the bars were very faint, often consisting of only a spot on one side of the rachis; these were included in the count, as was the broad terminal tail bar. The long black tip of the primary feather was not counted as a bar. Counting was done on the longest primary (number 8) and one of the central rectrices.

All 51 birds were obtained from North Canterbury apart from two from Marlborough and two from South Canterbury. No trapping was done during spring and summer.

RESULTS

Mean figures for the four main body measurements are shown in Table 1. By wing, tail and tarsus lengths males are about 94% of the size of the females, but by weight only 74%. The average weight of North Canterbury birds was slightly less than that recorded by Redhead (1969) in Otago. This may be due to differences in collecting techniques and seasons. Juveniles tended to be lighter in weight than adults and there is also a correlation in wing and tail length. This means that juveniles were not just lighter but also smaller in overall size than adults, a surprising result although not significant in my small sample ($p = 0.18$ t-test), but which, when considered with similar findings from Redhead, may indicate a definite trend. There is no further increase in size in this species after the age of about 8 weeks so it may well be that only the larger sizes of harriers are reaching adulthood. Perhaps ecological factors are selecting for larger size. Most *Circus* species have a wing loading (taken as wing area divided by body weight) of about 0.2-0.3 g/cm^2 (Brown & Amadon 1968) which makes them buoyant enough to perform the slow, flapping hunting flight so characteristic of the genus. *C. approximans,* with a wing loading of about 0.39 g/cm^2 (males) and 0.41 g/cm^2 (females), are much less buoyant and tend to hunt like buzzards *(Buteo),* circling and soaring at heights of about 20-100 m. This is in line with findings on hunting behaviour data by Schipper *et al.* (1975) on hunting methods in the harriers. They found that the Marsh Harrier *(C. aeruginosus)* with a wing loading of about 0.30 g/cm^2, tended to fly more slowly and at higher altitudes, with a correspondingly reduced surprise effect, than the Hen Harrier *(C. cyaneus)* which has a wing loading of 0.24-0.27 g/cm^2.

TABLE 1. VARIATION OF FOUR MAIN BODY MEASUREMENTS OF THE HARRIER. (JUVENILES, J. ADULTS, A. MALES, M. FEMALES, F.)

	CLASS	NO.	MEAN	S.DEV.	S.ERR.	RANGE
WING LENGTH (mm)	J.M.	5	407.5	9.5	4.3	393-418
	A.M.	17	408.4	11.7	2.8	390-430
	TOTAL M.	22	408.2	10.4	2.3	390-430
	J.F.	6	422.5	6.7	2.7	412-431
	A.F.	23	430.0	10.2	2.1	414-450
	TOTAL F.	29	428.5	10.0	1.8	412-450
TAIL LENGTH (mm)	J.M.	5	226.0	4.6	2.0	220-234
	A.M.	17	230.0	5.9	1.4	220-240
	TOTAL M.	22	229.2	5.8	1.2	220-240
	J.F.	6	237.8	6.3	2.6	231-248
	A.F.	21	246.5	8.1	1.8	230-255
	TOTAL F.	27	244.5	8.4	1.6	230-255
TARSUS LENGTH (mm)	J.M.	5	89.9	3.1	1.4	84-92
	A.M.	17	88.8	1.9	0.5	87-91
	TOTAL M.	22	89.0	2.3	0.5	84-92
	J.F.	6	92.8	2.5	1.0	89-96
	A.F.	23	94.9	3.5	0.7	88-106
	TOTAL F.	29	94.5	3.5	0.6	88-106
WEIGHT (g)	J.M.	4	597.5	78.4	39.2	568-665
	A.M.	17	612.2	47.8	11.6	525-697
	TOTAL M.	21	609.4	45.6	9.7	525-697
	J.F.	6	784.7	55.9	22.8	724-880
	A.F.	23	829.8	68.7	14.3	700-1016
	TOTAL F.	29	820.5	68.7	12.8	700-1016

Although the New Zealand Harrier has become much more buteonine in its hunting behaviour, its selection of hunting perches — fence posts etc. — is still strictly circinine. It does not use high perches, such as telegraph posts or open trees, as hunting perches, as do the buzzards.

Very few pale adult male harriers were seen; it may be that this species is losing its extreme sexual dichromatism as it uses circinine hunting techniques less and less (Niebohr 1973).

TABLE 2. PERCENTAGES OF ADULTS (A), JUVENILES (J), MALES (M) AND FEMALES (F) WITH LISTED NUMBER OF BARS ON TAIL (TOP) AND PRIMARY FEATHERS (BOTTOM).

	NUMBER OF BARS							
TAIL	0	1	2	3	4	5	6	7
A.M.	5.9	11.8	5.9	11.8	17.6	29.4	17.6	-
J.M.	-	-	-	-	-	20.0	80.0	-
A.F.	-	-	-	4.8	4.8	14.2	71.4	4.8
J.F.	-	-	-	16.7	16.7	50.0	-	16.7
PRIMARIES								
A.M.	-	-	5.9	5.9	11.8	41.2	35.3	-
J.M.	40.0	-	40.0	-	-	20.0	-	-
A.F.	14.3	19.0	33.3	4.8	4.8	9.5	14.3	-
J.F.	100	-	-	-	-	-	-	-

Differences in barring are shown in Table 2 and the main trends illustrated in Figure 2. The underwing bars are more numerous and well-defined in adults than in juveniles and may possibly be used in territorial displays, as in the Buzzard *(Buteo buteo)* (see Weir & Picozzi 1975).

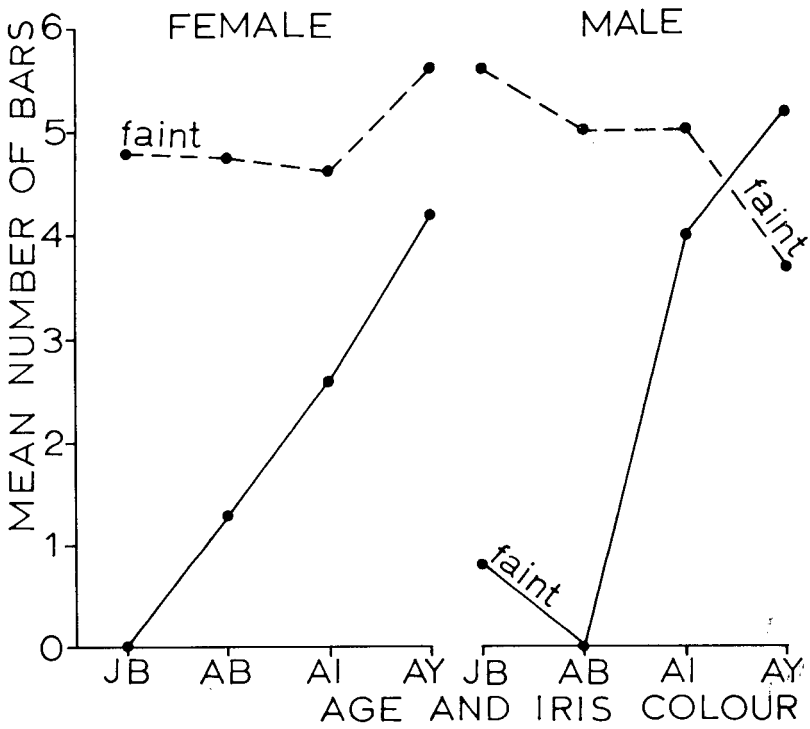


FIGURE 2 — Trends in tail barring (broken lines) and primary barring (solid lines) correlated with age (juveniles, J, and adults, A) and iris colour (brown, B, intermediate, I, and yellow, Y).

Iris colour was recorded simply as brown, intermediate or yellow (Table 3).

TABLE 3 — PERCENTAGES OF AGE AND SEX CLASSES WITH STATED IRIS COLOUR

	Brown	Intermediate	Yellow
Adult male	5.5	5.5	89
Adult female	39	39	22
Juvenile male	100	–	–
Juvenile female	100	–	–

No figures are available on the age at which iris colour changes in this species. Two captive females in Hawkes Bay still have brown eyes at 4½ years old (J. Powell pers. comm.) but diet or environment may well affect eye colour, possibly through gonad development. Female *C. cyaneus cyaneus* in Orkney, Scotland, retain the brown irides for 3-4 years (Balfour 1970) whereas in Wisconsin most female *C. c.*

hudsonius change in the second year (Scharf & Hamerstrom 1975). Data from known age *C. approximans* may reveal differences between the New Zealand and Australian populations.

62% of Redhead's sample of adult female harriers had yellow eyes and only 24% had brown eyes. This differs quite markedly from my sample and could indicate differences in age structure of the two populations. Additionally, 2 of my 17 adult males had brown or intermediate coloured irides.

MOULT

Data on moult are far from complete because harriers were only trapped between February and August. Numbering primaries from the carpal flexure outwards, secondaries from the carpal flexure inwards and rectrices (1-6) from the centre outwards, the following results were obtained:

February. Moult had progressed from the carpal flexure to P5 and inwards to S4. Tails averaged 2 old and 2 new complete feathers on each side. (n=4 birds).

March. Wing moult had reached P6 and S5, tails about the same as February. (n=3).

April. Primaries replaced to P8, secondary moult completed but with an irregular scattering of old feathers, tails had their last feathers growing. (n=4).

May. No sample.

June. About 60% had P9 and P10 still to moult but were otherwise completed. Tail moult completed. (n=17).

July. (n=4). and *August.* (n=7). Four had P10 still in sheath, the others were finished. Desultory body moult continued right into August.

No juveniles trapped in this study were moulting and there was no noticeable difference in completion dates between the sexes of adults. Tail moult was most irregular; usually the first feather to drop was T1 or occasionally T6. Intermediate feathers then moulted with T5 or T2 usually being the last to drop. About three feathers were involved with moulting at any one time at each moult centre; there was no evidence that three moult centres operated in the secondaries, as suggested by Miller (1941), but these may only be detectable at the beginning of the moult.

DISEASES AND INJURIES

Blood smears were obtained by puncture of the brachial vein. After bleeding, the puncture was disinfected with alcohol. This method proved satisfactory for this size of raptor once a little proficiency was reached. Blood smears from 14 harriers were examined by Professor A. M. Fallis, a visiting Erskine Fellow at the University of Canterbury, but no blood parasites were found.

Ectoparasites were identified by Mr R. Palma, National Museum of N.Z., Wellington. All proved to be a louse *(Degeeriella fusca)* which has been found on 5 other *Circus* species (Clay 1958) and is probably specific to the genus.

Two of the harriers were suffering from bumblefoot, one only mildly (Type 1. Cooper 1972), the other chronically (Fig. 3); the main lesion, about 14 mm in diameter, was removed surgically and the bird released after about two months, but with a poor prognosis.

FIGURE 3 — Chronic bumblefoot in an adult male Harrier.

Two other specimens were suffering from a peculiar complaint which looked at first glance like trichomoniasis (frounce), but no trichomonads could be identified microscopically. The base of the

FIGURE 4 — A ring of tissue constricting the base of a Harrier's tongue. At a later stage the tongue becomes so swollen that the tissue ring is barely visible.

tongue was extremely swollen and covered with caseous material which extended as foul-smelling lesions throughout the mouth. Probing eventually revealed a tight ring of tissue behind the backward pointing tips of the tongue in the region of the first copula (Fig. 4). This made the tongue swollen and necrotic by restricting circulation. The tissue ring was cut away and the mouth cleaned and treated with antiseptic. After 6 weeks the bird was fully recovered and was released. The next season another bird was trapped in a similar, but less advanced condition and was released immediately after treatment. On both occasions the constricting ring appeared to be animal tissue and, in the second case at least, probably consisted of a length of coarse tendon and muscle sheath about 8 cm long, which had become tightly wound round the base of the tongue. With the increased dependence which this species has in New Zealand on large carrion (Redhead 1968,

1969), this unusual problem could become fairly common (2% in this sample) and would probably eventually cause the deaths of the individuals concerned.

The only natural causes of death recorded in this study were a banded adult female recovered drowned in a waterhole and a juvenile male which starved to death. This bird weighed only 378 g when found just before death, only 64% of the expected weight of 597 g for a harrier of this size, sex and age.

Mechanical feather damage was quite extensive in some specimens, but usually confined to the tail. Two harriers had badly deformed tail feathers, possibly due to catching the tail in a rabbit trap so that several feathers were wrenched out. Forcibly removed main feathers almost always result in deformed or stunted replacements in the Falconiformes.

Some rectrices were split longitudinally about halfway down the rachis (Fig. 1); this type of damage was also seen in some of the New Zealand Falcons examined and may perhaps be due to the dry climate. The feathers appeared to be dry and brittle.

Two harriers had keyrings on their legs when trapped. Judging by the scarred and luxated toes of one bird it had been caught in a rabbit trap, tended in a cage for a period (damaging its cere in the process) and then released, only to be re-trapped and banded by me a month or two later.

ACKNOWLEDGEMENTS

Thanks are due to Professor Fallis for examining blood smears, to Mr Palma for identifying the lice, and to the staff of the Animal Health Laboratory, Lincoln, for solving the problem of the tissue ring round the harrier's tongue. I am most grateful to my wife, Sarah, and to members of the Raptor Association for assistance, and to Dr McLay and Dr Warham of the Zoology Department, University of Canterbury, for critically reading the manuscript.

LITERATURE CITED

BALFOUR, E. 1970. Iris colour in the Hen Harrier. Bird Study 17: 47.
BALDWIN, S. P.; OBERHOLSER, H. C. and WORLEY, L. G. 1931. Measurements of birds. Scientific Publications of the Cleveland Museum of Natural History 2: 1-165.
BROWN, L. H.; AMADON, D. 1968. Hawks, eagles and falcons of the world. New York: McGraw-Hill.
CLAY, T. 1958. Revisions of Mallophaga Genera. Bulletin of the British Museum (Natural History) Entomology 7: 121-207.
COOPER, J. E. 1972. Veterinary aspects of captive birds of prey. Pp. 1-45, tables 1-50, pls 1-16. Newent, Gloucestershire: The Hawk Trust.
HAMERSTROM, F. 1967. On the use of fault bars in ageing birds of prey. Inland Bird Banding Association News 39: 35-41.
MILLER, A. H. 1941. The significance of molt centres among the secondary remiges in the Falconiformes. Condor 43: 113-115.
MUELLER, H. C.; BERGER, D. D. 1959. The bal-chatri: a trap for the birds of prey. Bird-Banding 30: 18-26.
NIEBOHR, E. 1973. Geographical and ecological differentiation in the genus **Circus**. Ph.D. Thesis, Free University of Amsterdam. [Reviewed in Auk 1974. 91: 238.]
OLENDORFF, R. R. 1972. Weighing and measuring raptors. Raptor Research 6 (2): 53-56.
REDHEAD, R. E. 1968. An analysis of pellets cast by Harrier Hawks. Notornis 15 (14): 244-247.

REDHEAD, R. E. 1969. Some aspects of the feeding of the Harrier. Notornis 16 (4): 262-284.
SCHARF, W. C.; HAMERSTROM, F. 1975. A morphological comparison of two Harrier populations. Raptor Research 9 (1/2): 27-32.
SCHIPPER, W. J. A.; BUURMA, L. S. and BOSSENBROEK,P. H. 1975. Comparative study of hunting behaviour of wintering Hen Harriers **Circus cyaneus** and Marsh Harriers **Circus aeruginosus**. Ardea 63: 1-28.
WEIR, D.; PICOZZI, N. 1975. Aspects of social behaviour in the Buzzard. British Birds 68: 125-141.

N. C. FOX, *Department of Zoology, University of Canterbury, Christchurch, New Zealand*

—— ★ ——

SHORT NOTE

AUSTRALASIAN SEABIRD GROUP

In order to foster further Trans-Tasman co-operation in the study of seabirds, our Group has increased its sphere of interest to include the seas around Australia, New Zealand, New Guinea and their oceanic islands. Hence the change of name from Australian to Australasian Seabird Group of the Royal Australasian Ornithologists Union. Two New Zealanders have been co-opted to our organising committee and they will also act as regional representatives for New Zealand.

Subscriptions for New Zealand members will be payable in NZ$ to our Wellington address (P.O. Box 12397, Wellington North) and for all other members in Aust. $ to our Canberra address (P.O. Box 65, Civic Square, ACT 2608). Correspondence should continue to go to our Canberra address where material for the Newsletter will be assembled. *Matters pertaining to the Seabird Mapping Scheme will continue to be dealt with by the New Zealand Wildlife Service in Wellington. The Newsletter will be printed and distributed from Wellington.*

Survey forms for birds washed up on Australian beaches, and for Australian seabird island surveys are available from our Canberra address and should be returned there on completion. Beach patrols are organised regionally and the initial results are published in the local bird journals. Copies of the completed beach survey forms will be held for further analysis by the regional organisers and at Canberra. The island survey forms should assist the preparation and updating of the Seabird Island Reports which are being published by the Australian Bird Bander. Copies of the completed island reports will be held by the regional organisers, the Editor of the Australian Bird Bander, and at our Canberra address.

We hope to improve the recording of offshore movements of seabirds from land, sea and air, and of prehistoric deposits of seabird material. We would appreciate comments from our readers in a form suitable for publication in our Newsletter, of which No. 7 has recently appeared (September 1976).

Brian Bell
Peter Fullagar
Chris Robertson
Jerry van Tets

A BUSHMAN'S SEVENTEEN YEARS OF NOTING BIRDS

PART E — NEW ZEALAND PIGEON, NORTH ISLAND KAKA, YELLOW-CROWNED PARAKEET AND KINGFISHER

By R. St.PAUL
(Edited by H. R. McKenzie)

NEW ZEALAND PIGEON *(Hemiphaga novaeseelandiae novaeseelandiae)*

STATUS AND HABITS

Habitat

The New Zealand Pigeon is to be found in any kind of native bush but prefers the more heavily timbered country. It will often visit open country to feed on exotic flora but does not actually live there.

Flight

It can fly at great speed, with the flapping flight of other pigeons and can go very fast even when going through very thick bush. Soaring and aerial diving for pleasure are indulged in, especially in fine weather. On long flights it does not go as high as does the Kaka. In bad weather it keeps very low.

Perching

In fine cool weather the Pigeon likes to sit in the sun in a high tree, but in hot weather seeks shade.

Nesting

I have no detailed records of its breeding habits. It is, of course, well known that the clutch is of one egg and that raising of the young seldom fails.

Food

Its diet consists of berries, stone fruits, leaves, buds, flowers and shoots. It has been seen to swallow whole the flowers of Kowhai *(Sophora spp.)*. This pigeon, which drops seeds and stones, often far from where it has gathered them, is one of the most important agents in regeneration of the bush. When it moves from a patch of bush of mostly one fruiting tree species to another area of bush of a different tree species, seedlings of the first will come up in the second, even when the latter is almost entirely of one species. In time this will bring about radical changes of the forest flora.

Song

The Pigeon has no song other than a gentle "poo." For the most part the loud swishing of its wings indicates its presence.

Flocking

Flocks here are not large, say 12 or 14, and are getting smaller as the feeding grounds are being cleared away.

ANALYSIS OF MONTHLY CHARTS

(Brackets = total birds seen plus estimate of birds heard only).

Proportion seen to heard: 1 seen to 3 heard if the characteristic swishing wing noise is included.

TIHOI

The total of birds seen from May 1944 to April 1946 was 6047 (24,188).

Count days per month for 24 months averaged 21.62; days seen 19.79; days not seen 1.83.

Daily counts of birds ranged from 0 to 60, but there was one unusual record of 223.

Count days totalled 519 and the total birds seen 6047, giving an average of 11.65 (46.60) per count day.

Notes on Analysis

The monthly counts for 1944 and 1945 varied greatly, for instance 1944 having a peak of 1254 for July and 1945 only 80. The Pigeon ranges widely in search of local areas of heavy food crops. One species of tree may crop heavily only once in several years while others do so in different years in different places so the Pigeon has to cast around until the most abundant supply of food is found.

MINGINUI

The total of birds seen from part 1946 to part 1961 was 11,306 (45,224).

Count days per month for 170 months averaged 20.51; days seen 10.48; days not seen 10.03.

Daily counts of birds ranged from 0 to 120.

Count days totalled 3487 and the total birds seen 11,306, giving an average of 3.24 (12.96) per count day.

Notes on Analysis

From 1946 to 1961 at Minginui the New Zealand Pigeon showed a great seasonal variation in its numbers. Table 1 shows very high numbers seen per count day from February to May compared with the rest of the year. This would apply locally because of the heavy crop of fruit provided over this period by such food trees as Tawa *(Beilschmiedia tawa)*, Rimu *(Dacridium cupressinum)*, Maire (*Olea* spp.), Matai *(Podocarpus spicatus)*, Kahikatea *(Podocarpus dacrydioides)*, Miro *(Podocarpus ferrugineus)*, Makomako *(Aristotelia serrata)*, and Kotukutuku *(Fuchsia excorticata)*. Some of these bear fruit for the whole four months. Perhaps the Miro is the favourite. On 18 May 1945 I counted 19 pigeons feeding on one Miro tree. When the crop

in this area is finished the Pigeon scatters to the much greater areas of forest where it has to feed less sumptuously on Supplejack *(Rhipogonum scandens)*, Nikau *(Rhopalostylis sapida)*, other less palatable fruits and also leaves.

TABLE 1 — Monthly averages of birds seen per count day

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.94	5.87	12.94	9.24	6.43	2.21	1.22	0.82	0.79	0.50	0.63	0.51

The yearly numbers of Pigeon seen per count day at Minginui are shown in Table 2. They do not show any particular trend. My notes indicate that the irregularity is due to fluctuating food supply. For instance in 1954 there was a great abundance of Tawa and Rimu; in 1955 a very heavy crop of Kahikatea; in 1959 it was Miro and Matai. The lowest period for numbers was from 1950 to 1954 but this did not compare in severity with the 1952-53 drop of Whitehead, Pied Tit, North Island Robin and the disastrous falling off of the North Island Rifleman (St.Paul 1976).

TABLE 2 — Averages of birds seen per count day for the periods shown

1946	1.64	1954	0.40
1947	1.69	1955	3.75
1948	3.03	1956	1.97
1949	4.71	1957	4.83
1950	0.53	1958	4.46
1951	1.78	1959	14.18
1952	0.63	1960	7.24
1953	0.80	1961	1.10

WAIAU

The total of New Zealand Pigeon seen for parts of 47 months (from 1 to 24 days per month) was 2919 (11,676).

Count days per month averaged 5.00; days seen 4.89; days not seen 0.11.

Daily counts of birds ranged from 0 to 50.

Total count days were 234 and the total birds seen 2919, giving an average of 12.47 (49.88) per count day.

Notes on Analysis

This back country is mostly beech, but with heavy bush in the narrow valleys along the streams.

The Waiau rate of 12.47 seen per count day is far above the Minginui rate of 3.24 seen per count day. This, however, is misleading. My Waiau trips were nearly all in the period February to May, at the same time as Minginui had its highest counts, so that Waiau did not suffer the Minginui drag of lower counts from June to January, as shown in Table 1.

NORTH ISLAND KAKA *(Nestor meridionalis septentrionalis)*

STATUS AND HABITS

Habitat

The North Island Kaka is mainly a bird of the heavy bush. The podocarp forest is perhaps the first choice but the beech is favoured also, even to the highest tops in this area.

Flight

It flaps more evenly and slowly than the Pigeon and its massive head gives it the appearance of being out of balance. However, it cannot really be so as it makes long journeys with apparently little effort. When going a long distance it flies very high, often at about 1200 m, and is not likely to be noticed unless its occasional raucus screech is heard. Like the Pigeon it can fly very rapidly low down through the bush when disturbed.

Nesting

The usual site is a hollow tree. Often the entrance is a hole high up but the nest may be far down or at ground level inside the tree. One in a Matai tree which was being felled had the entrance 10.67 m up and the nest was 1.52 m below the entrance. A bird flew out after the tree hit the ground. Its two eggs were broken.

Food

The Kaka eats a wide range of native and exotic fruits, insects and their larvae, buds and shoots. It is particularly fond of opening cones of the Kauri *(Agathis australis)* for the seeds. Much use is made of the foot to hold such fruits as the Taraire *(Beilschmiedia tarairi)* while it peels off the flesh and skin with its heavily hooked bill. In over fifty years of observing the Kaka in North Auckland, the Hunua Ranges, Wanganui, Taupo, other places in the King Country and at Minginui I have seen it use only the right foot to hold fruits while eating them. This has recently been confirmed by Mrs Marie Perry (pers. comm.) who had one wintering in taraire trees by her house at Brookby, near Auckland, and also by R. B. St.Paul (pers. comm.) who recently photographed one on Little Barrier Island holding a date in its right foot while it ate it. However, Stidolph (1971: 110) stated of this bird on Kapiti Island " Kakas taking dates from the hand used the left foot." Also Wilkinson (1957: 67) showed a sketch by Nora Stidolph of one eating food held in the left foot. It appears, therefare, that the Kaka is not ambidextrous as a species but has a different habit in different places, the Kapiti Island ones perhaps being an exception. The seasonal feeding cycles of the Kaka have been broken up so much by the destruction of the bush that its future is not bright.

Song

It is known mostly by its grating call, which can be imitated by drawing a file across the sharp edge of a tin, but it has many

calls, some quite unusual for a parrot. A pleasing one is a chortling loud clear and musical whistle, made while it is on the wing and low down, sometimes throughout the night. Parties will often fly out over the bush at evening, making quite a din of harsh screeching.

Flocking

Besides flocking for the evening flights it will often feed in flocks where there is an abundance of food. I have seen about 16 on one fruiting Matai tree. High-flying flocks of any size are not common.

ANALYSIS OF MONTHLY CHARTS

(Brackets = total birds seen plus estimate of birds heard only)

Proportion seen to heard: 1 seen to 10 heard.

TIHOI

The toal of birds seen from May 1944 to April 1946 was 849 (9339).

Count days per month for 24 months averaged 21.62; days seen 12.79; days not seen 8.83.

Daily counts of birds ranged from 0 to 16.

Count days totalled 519 and the total birds seen 849 giving an average of 1.64 (18.04) per count day.

Notes on Analysis

From May to December 1944 numbers were much higher than for the rest of the Tihoi period, January 1945 to April 1946. No cause for this is evident.

MINGINUI

The total of birds seen from part 1946 to part 1961 was 7440 (81,840).

Count days per month for 170 months averaged 20.51; days seen 10.52; days not seen 9.99.

Daily counts of birds seen ranged from 0 to 15.

Count days totalled 3487 and the total birds seen 7440, giving an average of 2.13 (23.43) per count day.

Notes on Analysis

The monthly figures per year as shown in Table 1 are fairly stable but need some explanation. In winter, perhaps because of berry crops being low some birds scatter out to more open country, taking up residence in isolated small patches of trees, not always native, for some weeks. H. R. McKenzie (pers. comm.) has fifteen records of such occurrences from 1941 to 1976 in and near Clevedon. These records were March 1 Kaka, April 2, May 2, June 3, July 3, and August 4. In two cases in 1976 a single and a pair stayed into October. These records could perhaps explain the lower winter counts as shown in Table 1. Such wintering birds would almost certainly return to breed in the large areas of bush.

TABLE 1 — Monthly averages of birds seen per count day

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.08	2.01	2.01	2.45	2.80	1.58	1.59	1.97	2.17	2.18	2.52	2.61

The yearly numbers of Kaka seen per count day at Minginui are shown in Table 2. After 1946 the counts were low from 1947 to 1954. From 1955 to 1961 they were steady at a considerably higher rate. Though puzzling this is encouraging.

TABLE 2 — Averages of birds seen per count day for the years shown

1946	2.35	1954	1.21
1947	1.21	1955	4.58
1948	0.86	1956	2.08
1949	1.31	1957	5.12
1950	0.29	1958	4.44
1951	0.74	1959	4.68
1952	0.43	1960	3.73
1953	0.26	1961	3.86

WAIAU

The total of North Island Kaka seen for parts of 47 months (from 1 to 24 days per month) was 819 (9009).

Count days per month averaged 4.98; days seen 3.74; days not seen 1.24.

Daily counts of birds seen ranged from 0 to 25.

Total count days were 234 and the total birds seen 819, giving an average of 3.50 (38.50) per count day.

Notes on Analysis

In the Waiau area the Kaka has not followed the varied pattern of the Pigeon. The Kaka spends much time in the beech forest where it finds food by digging into dead trees so a fairly even proportion of its numbers stays there throughout the year, whereas the Pigeon has to go elsewhere when the main berry crop is exhausted.

YELLOW-CROWNED PARAKEET *(Cyanoramphus auriceps auriceps)*

STATUS AND HABITS

Habitat

This is truly a bird of the forest and is rarely seen elsewhere. It particularly favours the two main species of Totara *(Podocarpus totara)* and *(Podocarpus hallii)* and the beech *(Nothofagus spp.)* but will often be found in any kind of mixed bush. It uses the undergrowth more than does the Kaka. In all of this higher and rugged country it is moderately plentiful while the Red-crowned *(Cyanoramphus novaezelandiae novaezelandiae)* is completely absent in my experience.

Flight

Parakeets speed through the tops of the trees or just above

them, often in small close parties or pairs, flying straight for a while, then twisting suddenly and gracefully in unison.

Breeding

Like others of the parrot family it is a hole nester, using a hollow tree or branch where it is satisfied to use a very restricted space. It is pleasing to see the cock bird call the hen off the nest, caress her and take her away to feed, then escort her back to the nest tree. He often feeds her while she is sitting.

Food

The Yellow-crowned Parakeet takes many kinds of berry food, also buds, grass seeds, grubs and insects. In passing food to the young a large amount of saliva is imparted. Commonly it emits a high-pitched chatter. A. Blackburn (pers. comm.) advises that to attract the bird this chatter can be imitated by vigorously shaking a half empty box of matches. If a watcher hears a sadly plaintive call, " weep-weep-weep," it will be known that a nest is near.

Flocking

It is not usual to see here flocks of more than eight or so. Frequently, at any time of year, there will be only two. Solitary ones are not common.

ANALYSIS OF MONTHLY CHARTS

(Brackets = total birds seen plus estimate of birds heard only)
Proportion seen to heard: 1 seen to 20 heard and not seen.

TIHOI

The total of birds seen from May 1944 to April 1946 was 546 (11,466).

Count days per month for 24 months averaged 21.62; days seen 9.80; days not seen 11.82.

Daily counts of birds ranged from 0 to 12.

Count days totalled 519 and the total birds seen 546, giving an average of 1.05 (22.05) per count day.

Notes on Analysis

For some unknown reason the numbers were considerably higher for the period May 1944 to July 1945 than were those from August 1945 to April 1946. No seasonal movement was apparent, nor do I think it would be likely.

MINGINUI

The total of birds seen from part 1946 to part 1961 was 6202 (130,242).

Count days per month for 170 months averaged 20.50; days seen 12.63; days not seen 7.87.

Daily counts of birds ranged from 0 to 12, but were mostly in smaller numbers than 12.

Count days totalled 3487 and the total birds seen 6202, giving an average of 1.78 (37.38) per count day.

Notes on Analysis

Table 1 shows a very even rate per month, the exceptions being a "low" for May and a "high" for November. It appears to show that there is no appreciable seasonal movement.

TABLE 1 — Monthly averages of birds seen per count day

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.72	1.91	1.88	1.71	1.15	1.71	1.62	1.51	1.97	1.52	2.34	1.89

The yearly numbers per count day at Minginui are shown in Table 2. It is to be noted that the years 1950 to 1954 were low in comparison with the others and that the period includes the 1952-53 low-count years of the insectivorous birds. This parakeet does not depend greatly on insect food so it seems that there should be some other reason than a possible shortage of insects to account for the temporary drop in its numbers and also the numbers of the other species which were low in 1952-53.

TABLE 2

1946	2.64	1954	0.80
1947	2.14	1955	2.66
1948	2.89	1956	2.43
1949	3.81	1957	2.36
1950	1.21	1958	3.79
1951	0.49	1959	2.77
1952	0.14	1960	0.97
1953	0.01	1961	2.17

WAIAU

The total of Yellow-crowned Parakeet seen for parts of 47 months (from 1 to 24 days per month) was 319 (6699).

Count days per month averaged 4.98; days seen 3.38; days not seen 1.60.

Daily counts of birds ranged from 0 to 12.

Total count days were 234 and the total birds seen 319, giving an average of 1.32 (27.72) per count day.

Notes on Analysis

Contrary to what might have been expected the Yellow-crowned Parakeet was considerably lower in numbers than the Kaka, not only in the Waiau area but also at Tihoi and Minginui.

KINGFISHER *(Halcyon sancta vagans)*

STATUS AND HABITS

Habitat

In the breeding season here the Kingfisher frequents the heavy bush as well as the open areas along the rivers. In winter it is

extremely rare, or entirely absent. This indicates that in spring many make an annual movement from the coast and lowlands and after breeding return there to winter.

Flight

Its flight is very direct, rapid and darting, with a jerk now and then. The annual movements to and from the bush and the coast and lowlands must be made in short bursts as it does not seem to fly high or in flocks.

Nesting

A shortage of nest sites in the lowlands could well have brought about the partial movement to the high inland bush country. Here the nest tunnel is made in dead trees, there being little opportunity of finding clay banks such as are used so much in the lowlands. Breeding birds are very aggressive. I observed one pair screeching and making passes at a stoat which was robbing a nest.

Food

In large areas of solid bush, where it cannot get to the ground, the Kingfisher when breeding feeds itself and its young on insects caught in the tree canopy. Mice, lizards, small birds and their young are sometimes taken. Where streams here come out into the open the feeding is carried out as in the lowlands. Fish is by no means the main diet of the New Zealand Kingfisher.

Calls

It shouts its breeding call, a harsh " Kek-kek-kek " or " Krp-krp-krp " and has also a seemingly meditative churring note. When attacking it gives a harsh scream.

ANALYSIS OF MONTHLY CHARTS

(Brackets = total birds seen plus estimate of birds heard only).
Proportion seen to heard: 2 seen to 1 heard and not seen.

TIHOI

The Kingfisher was so scarce at Tihoi and Arataki and its occurrence so erratic that an analysis is not practicable.

The 1944-45 breeding season had for September 0; October 1 seen five times; December a 1 and a 2; January and February 0. 1945-46 had for September and October 0; November 13 records of from 2 to 4 birds; December a 1 and a 4; January and February 0.

There were no records in the winter months.

MINGINUI

The following summaries for Minginui and Waiau are not made according to calendar years but to the breeding seasons of the Kingfisher in these parts.

The annual arrival dates in September vary from 11th to 21st, the average being the 15th. The departures vary from February 8th

to 27th, the average being the 21st. This makes a stay of approximately 5¼ months per season. For the rest of the year there were none left at all or else only one or two. These overstayers are not being taken into account.

The total of birds seen for the 15 seasons, i.e., 1946-47 to 1960-61 was 6246 (9369).

Count days per month for the 78.75 months of the 15 seasons averaged 22.68; days seen 18.54; days not seen 4.14.

Daily counts of birds ranged from 0 to 12.

Count days totalled 1786 and the total birds seen 6246, giving an average of 3.50 (5.25) per count day.

Notes on Analysis

The Kingfisher is one of the birds I have counted in both bush and open. The estimate of 2 seen to 1 heard may seem odd but it is a bird which perches prominently, is conspicuous in flight and does not call very much.

Table 1 shows the average of birds seen per count day for each of the 78.75 months of the 15 seasons, mid-September 1946 to the end of the third week of February 1961.

TABLE 1 — Monthly averages of birds seen per count day

Sep	Oct	Nov	Dec	Jan	Feb
4.29	3.94	3.61	3.70	3.12	2.43
			(4.35)	(3.74)	

The figures for December and January need to be modified as shown in brackets in Table 1. They had incomplete records owing to my being away for the Christmas holidays for an average of 10 days in December and 6 in January, so that the December average should be at least one third more, i.e., 1.23, making the total 4.35 and January one fifth more, i.e., 0.62, making the total 3.74. It would appear that some, perhaps unsuccessful breeders, start to move out in January.

The range of fluctuation in the fifteen seasons is shown in Table 2.

TABLE 2 — Averages of birds seen per count day for the seasons shown.

1946-47	1.51	1954-55	2.75
1947-48	2.38	1955-56	3.90
1948-49	2.74	1956-57	2.50
1949-50	2.80	1957-58	3.01
1950-51	3.42	1958-59	2.31
1951-52	3.65	1959-60	3.18
1952-53	3.99	1960-61	2.84
1953-54	3.73		

It cannot be proved from these observations whether Tihoi, with its poor showing for the seasons 1944-1945 and 1945-46, was

just having a bad period at the time, or whether it did not ever have better seasons. Minginui had a low count for 1946-47, but consistently higher ones regularly from then on to 1960-61, the end of the counting period, so it could have been lower before 1946-47. It is to be noted that the Kingfisher at Minginui did not have the drop suffered by some of the more insectivorous birds in 1952-53 and 1953-54.

WAIAU

The total of birds seen for the 15 seasons, i.e., 1946-47 to 1960-61 was 136 (204).

Count days per month for parts of 16 months of the 15 seasons averaged 4.44; days seen 1.56; days not seen 2.88.

Daily counts of birds ranged from 0 to 10.

Count days totalled 71 and the total birds seen 136, giving an average of 1.9 (2.85) per count day.

Notes on Analysis

The low rate of 1.9 seen per count day I consider was due to the beech at Waiau being less suitable for nesting than the trees of the podocarp forest.

LITERATURE CITED

ST. PAUL, R. 1976. A Bushman's seventeen years of noting birds Part C — North Island Rifleman, Whitehead, Pied Tit and North Island Robin. Notornis 23 (3): 220-232.
STIDOLPH, R. H. D. 1971. The birds around us. Masterton: Hedley's Bookshop.
WILKINSON, AMY K. Kapiti Diary. Edited by R. H. D. Stidolph. Masterton: Masteron Printing Co. Ltd.

★

ABOUT OUR AUTHORS

NICK FOX is a graduate from St Andrews University, Scotland, where he studied zoology. After teaching biology in Fife for a few months, he and his wife left Britain and now live on a sheep farm in North Canterbury. For the past three years he has been involved in research for a Ph.D. thesis at Canterbury University on the biology of the New Zealand Falcon and hopes to complete this shortly. He is interested in all aspects of raptors, including captive breeding and management, as well as biology. He also enjoys working with dogs and horses and derives great satisfaction in communicating with animals as individuals.

BARRIE HEATHER, editor of the newly-appearing *OSNZ News,* has been a member of the OSNZ since his days in the Kings College Bird Club. A biographical note appeared in *Notornis* for March 1974. He is the author of a comprehensive account of what is known of the Silktail *(Lamprolia)* of Fiji to be published in the June issue.

KERRY POTTS was introduced to readers in the December 1976 issue of *Notornis.*

SOME OBSERVATIONS OF THE AGONISTIC BEHAVIOUR OF THE KEA, *Nestor notabilis* (Nestoridae), IN CAPTIVITY

By K. J. POTTS

ABSTRACT

Several agonistic displays of *Nestor notabilis* (a parrot species endemic to New Zealand) are described.

INTRODUCTION

Observations were made on a total of 28 Keas in captivity. The sex and approximate ages of birds were determined by external characteristics. No nestlings were available for study. Details of cage dimensions and periods and methods of observations have been given in an earlier paper describing the comfort behaviour of this species (Potts 1976).

The term " agonistic " is used to describe behaviour involving attack and escape, or modification of these tendencies. Displays are categorised as either threat or appeasement except allopreening which involves reciprocal interactions best described *in toto.*

This paper should be viewed as a broad descriptive treatment of the agonistic behaviour of the Kea. Further observations within the context of a known social order are needed to clarify the situations in which particular displays are likely to occur.

A. THREAT DISPLAYS

(i) *Turn-toward*

The first movement involved in most threat actions is the turn-toward in which an aggressive bird faces an opponent. This in itself is often sufficient to invoke an escape response in an opponent.

(ii) *Run-rushing*

This consists of a fast walk toward another bird while the head is lowered and the body held almost parallel to the substrate; bill-gaping *(q.v.)* often accompanies it. A high intensity of aggression is indicated when the carpals are held slightly away* or straight out from the body.

* Carpal-holding *i.e.* when both wings remain essentially in the normal position close to the body but with the carpal areas slightly away is defined by some authors (*e.g.* Dilger 1960, Buckley 1968) as a discrete threat component.

(iii) *Lunging and pecking*

Lunging consists of a sharp thrust of the head toward the feet, legs, bill or head of another bird, and, as in run-rushing is usually accompanied by bill-gaping. If an opponent fails to retreat lunging may be terminated by pecking and this is usually responded to by quick fleeing.

A rasping call, indicative of a high level of aggression, is often given prior to or following lunging or run-rushing.

(iv) *Clawing*

Clawing frequently occurs when birds are perched close together. An aggressor may sidle toward an opponent, turn partially toward it, raise a claw and strike out sideways in a pushing motion. The clawed bird may respond by walking or sidling away, usually slowly. Clawing in this context probably functions to maintain individual distance.

More intensive clawing is performed in fighting. It often precedes, follows, or is used together with pecking or bill-gaping. A victim is usually confronted head-on and the claw is raised and struck out in a pushing or swiping motion.

(v) *Bill-gaping*

This action involves holding the bill open for a few seconds while turning toward another bird. It seems to indicate a readiness to bite and is often performed in association with lunging and run-rushing or in response to these actions.

(vi) *Chasing*

Chasing is less stereotyped than the run-rush and is usually performed when an opponent is fleeing. It may be accompanied by lunging and bill-gaping.

(vii) *Crouching*

The body is lowered so that the breast almost touches the ground, the legs are spread out, the head extended forward and the wings are often raised and held slightly out from the body.

Bill-gaping and pecking are commonly associated with crouching. The position is also suitable for the launching of a lunge attack. The crouching stance is commonly held by two opposing birds, neither of which appears to be dominant.

(viii) *Wing-hitting* (Fig. 1).

Wing-hitting is sometimes performed by subordinate individuals which have assumed a hunched posture *(q.v.)* in response to continuing attacks or pursuit by one or more birds. The submissive hunched posture is not always successful in completely reducing attack and so the apparently more desperate, direct counter-measure of wing-hitting is employed.

Although the wing movements involved in wing-hitting vary little, the body movements associated with it vary, depending on the relative orientations of the actors and reactors. If a sub-

FIGURE 1 (a) — Wing-hitting.

FIGURE 1 (b) — Wing-hitting.

ordinate bird is approached side-on it will suddenly flick a wing straight out from its body and strike. If it is approached from in front by an aggressor it will flick the wing (in a manner similar to that described above, but slightly forward), while simultaneously twisting its body so that the opponent is struck with a completely extended wing. In this way both the strike

range and the velocity of impact are increased compared with what would be possible if the bird remained stationary.

Bill-gaping and sleeking of the plumage usually accompany wing-hitting.

(ix) *Wing-holding*

The wing-holding display indicates a strong motivation to attack. The wings are unfolded and held straight out from the body or over the back while facing an opponent. Some of the bright scarlet colouring of the under-wing coverts and axillaries is exposed.

Wing-holding may lead to lunging, pecking or run-rushing, and it may be associated with bill-gaping. It frequently develops into wing-flapping *(q.v.)* with or without striking an opponent.

(x) *Wing-flapping*

Powerful and rapid flapping of the wings is characteristic of high intensity aggression. It is often associated with fighting; the aggressor often pecks and beats its wings against an opponent.

Wing-flapping also appears to be an intimidatory display. The wings are opened and flapped as in flight several times, the legs are stretched and the body is held almost vertically. The bright scarlet under-wing coverts and axillaries are exposed.

(xi) *Redirected aggression*

When a bird flees from an aggressor it may in turn attack one or several others. Lunging, pecking and bill-gaping are commonly employed in these attacks.

B. APPEASEMENT DISPLAYS

(i) *Sidling*

This is a sideways walking movement and in the agonistic context often appears to be ambivalent *i.e.* the tendencies to attack and flee are in balance. I have frequently observed an approaching bird sidle away from another if it should make the slightest movement. Buckley (1968) suggested that since most attacks and threats are frontally directed, so the lateral approach used in sidling may be less provocative to the bird approached.

(ii) *Hunching* (Fig. 2)

The hunching posture is sometimes assumed by birds which have been, or are being, subjected to attack or which are being pursued. The rump feathers are fluffed and the tail is fanned out. The humeri are held slightly out and upwards from the body and the forewings are drooped. While the bird is immobile the head is directed downwards and the body is crouched (Fig. 2a); but on walking the head may be raised slightly and the body made more erect (Fig. 2b). Lowering of the head

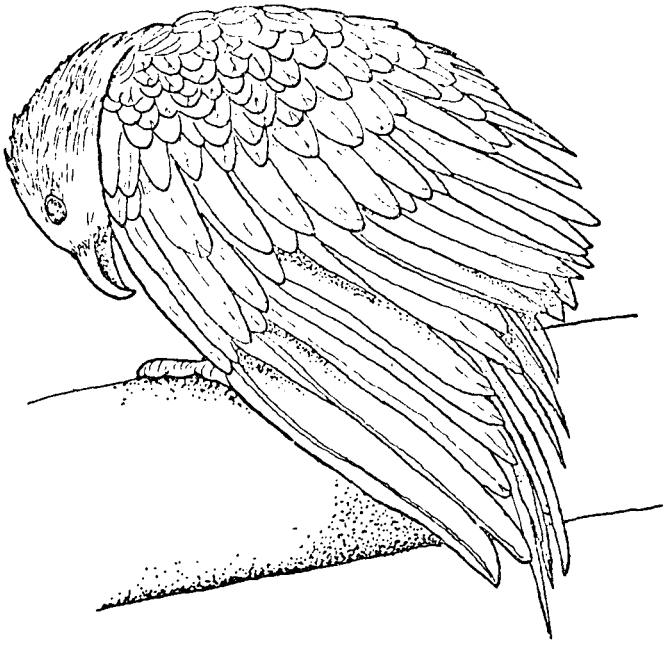


FIGURE 2 (a) — Hunching.

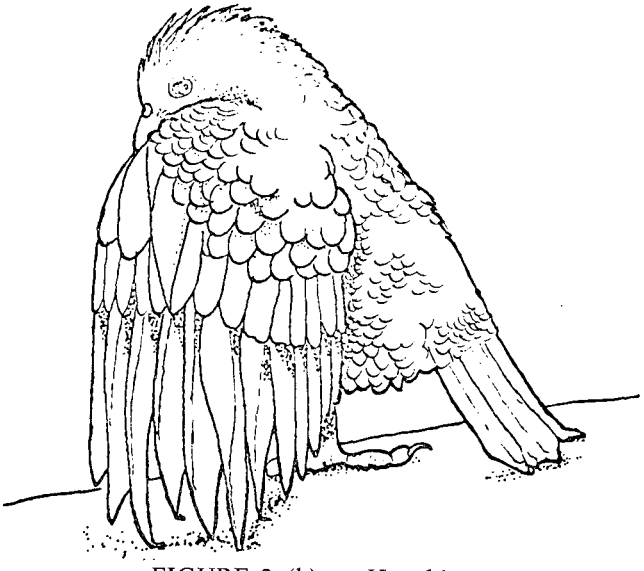


FIGURE 2 (b) — Hunching.

may serve what Chance (1962) called a " cut-off " function in that the bill, a potential weapon, is hidden from the view of an opponent and therefore does not act as a stimulus for aggression.

A hunched bird may be laterally or frontally oriented toward an aggressor. If it is pecked it may respond by raising its head to bill-gape, by slowly moving away, or both.

C. ALLOPREENING (Fig. 3).

The term allopreening was proposed by Cullen (1963) to describe the preening of one bird by another. Harrison (1965) used three additional terms to indicate the form that it may take: When one bird preens another but is not preened in return he refers to it as ' non-reciprocal allopreening.' When one bird preens another and is in turn preened during the same ' bout ' he calls it ' reciprocal allopreening.' ' Simultaneous allopreening ' occurs when two or more birds preen each other at the same time.

I observed non-reciprocal and reciprocal allopreening but did not see simultaneous allopreening. No quantitative record was kept of the sexes and ages of birds involved in allopreening associations. However, both male and female birds non-reciprocally allopreened although adult males were not observed being preened by female or identifably younger birds; in most cases preening was done by adult males to adults or immature birds of either sex. Reciprocal allopreening was quite common between young birds. Jackson (1963) reported having observed ' mutual preening ' in fledgling and year old Keas in the wild; but whether ' mutual preening ' refers to both reciprocal and simultaneous preening is not known.

The preening of one individual by another is similar to that done by a bird to its own plumage. Most attention is directed toward the head (the crown, nape feathers around the eyes and throat receive particular attention) but the hind-neck is occasionally preened; on rare occasions I have seen the breast, rump and wing feathers preened, although this generally resulted in the recipient moving away.

The recipient often adjusts its head in a way which suggests it may be facilitating preening, but this could be interpreted as a measure to evade the bill of the preener without moving away. The latter interpretation may apply in some instances, since I have observed adult male preeners using their bills to pull sharply on the head feathers of young birds, apparently to alter the position of their heads. If the recipient did not maintain the head position imposed the preener would once again seize the head feathers and abruptly pull the head into position for preening. I saw this occur three times on one occasion before the imposed head position was maintained. A young bird would not normally attempt to simultaneously or reciprocally preen an adult male; if it did it was immediately repulsed by a sharp peck, usually to the head.

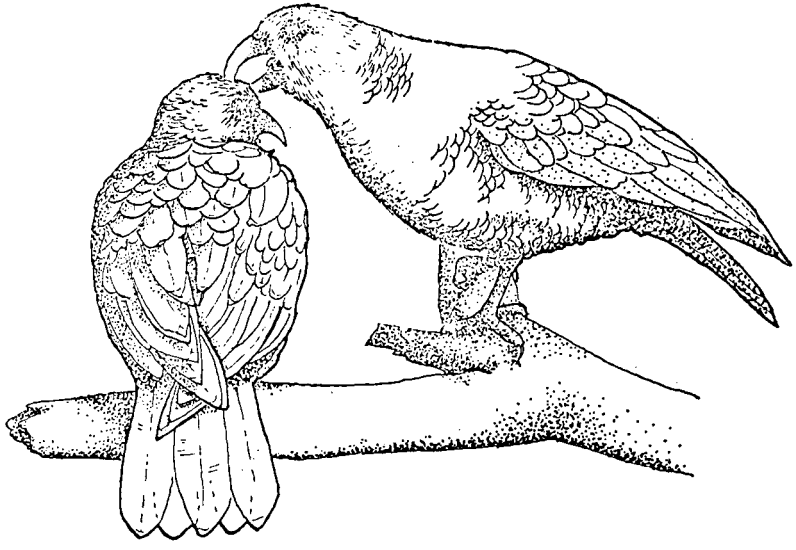


FIGURE 3 (a) — Allopreening.

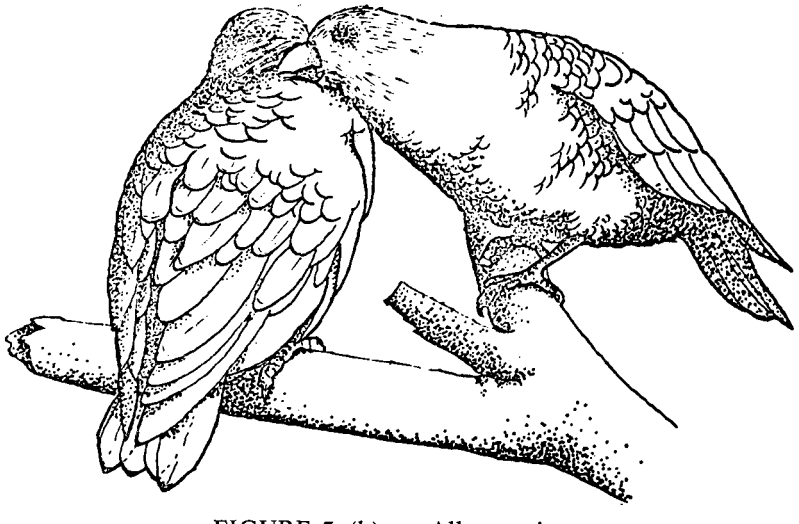


FIGURE 3 (b) — Allopreening.

Non-reciprocal allopreening may be applied continuously or intermittently for periods up to about 30 minutes. If intermittent the recipient usually remains in one place and is subjected to several preening sessions between which the preener may move away several metres and return again.

The posture assumed by a recipient of non-reciprocal allopreening is normally characterised by crouching and fluffing with the head in a downward position. This general posture has been described for many allopreening species and is commonly referred to as a ' preening invitation posture ' (Harrison).

The function of allopreening has been discussed at length by Harrison. He assembled data on allopreening in 41 avian families and concluded there was little evidence that it occurred as a normal form of preening behaviour, or that it was of value as plumage maintenance since ' it occurs in only a minority of species; there is no evidence that species which lack it are at any disadvantage, and in many cases when it does occur it occupies only a brief part of the breeding period.' He found considerable evidence that allopreening is closely linked to aggressive behaviour and that its expression is associated with the enforced proximity of individuals such as occurs in clumping together in colonies and in pair formation.

Goodwin (1956, 1959, 1960) studied allopreening in waxbills and doves and showed that a bird which preens another is usually dominant or aggressive at a particular point; whereas those which submit to preening are weak or subordinate. He described allopreening as " sublimated " or inhibited aggression. Harrison confirmed Goodwin's findings and quotes studies of several other species in which overt aggression appeared to actually give way to allopreening. He states,

> " If allopreening replaces aggression to differing degrees some evidence of the change can be expected. The usual form of attack is pecking at the head. From observations of captive birds it has been found that submissive postures appear to reduce attacks to light pecking, and that when allopreening species respond to attacks of individuals of other species although they were allopreening the attack is frustrated, and through habituation may decrease until it resembles allopreening. In the cowbirds preening invitation postures have induced allopreening in some species which do not normally show this behaviour. In such circumstances allopreening is considered to be the direct result of the frustration of the aggressive drive and to be a displacement behaviour having a similar intial movement."

The nature of the fluffed, head-down preening invitation posture was further discussed by Harrison. He summarises as follows:

> " Preening invitation postures are considered to be postures resulting from thwarted fleeing, appeasing, or withdrawing be-

haviour combined with head positions which initially result from attempts to protect the eyes from, or evade, the bill of the preened without moving away. These head positions could function as cut-off postures in which the aggressor ceases to be visible and the tendency to flee is reduced. Allopreening can be regarded as a form of agonistic behaviour in which the normal tendencies of attacking or fleeing, when two individuals are in close proximity, are in conflict with sexual and opposing attacking and fleeing tendencies. In the attacked bird thwarted fleeing will tend to result in a fluffed posture, while the head positions will " cut-off " the aggressor and reduce still further the fleeing tendencies. In the attacking bird the thwarting of the aggressive tendencies by the refusal of the other bird to flee, together with possible sexual and fleeing conflict, will create a situation where displacement behaviour might be expected, and where the confrontation of the aggressor with the raised feathers of the recipient will increase the likelihood of preening behaviour. This behaviour appears to have become fixed and ritualised in some species." (Harrison 1965).

General observations on the types of allopreening exhibited by Keas suggests that allopreening may indeed be related to dominance in this species. The old males were decidedly dominant in aggressive encounters with identifiably younger birds and they were never observed to be reciprocally preened by them. On the other hand, immature birds often displayed what appeared to be a more finely balanced dominance relationship in that they frequently reciprocally preened. One of the associates would preen for about only 2-8 seconds before it was itself preened, and so on; time spent preening before reciprocation varied, however, as did the total duration of the association. At any point a temporary recipient would often move about slowly or move right away without interference. No head feather pulling occurred in this context and the general impression was of a loose, unstable relationship between the birds. The formal stiffness, fluffing, crouching and head lowering associated with non-reciprocally allopreened birds was not so apparent.

It is probable that the enforced close proximity of the captive non-breeding Keas prompted a higher frequency of allopreening than would be expected from a similar age/sex grouping in the wild. Further observations on groupings of known social structure — preferably in the wild — are needed to establish situations in which allopreening is most likely to occur.

ACKNOWLEDGEMENTS

This paper was largely derived from a B.Sc. (Hons.) project submitted in 1969 to Victoria University of Wellington. Special thanks are due to my course supervisor, Dr R. W. Balham and to Drs G. R. and M. J. Williams (N.Z. Wildlife Service), for comments on the manuscript. I am also grateful to Mr C. Kuiper, Director, Wellington Zoological Gardens, for permission to observe captive Keas.

LITERATURE CITED

BUCKLEY, F. G. 1968. Behaviour of the Blue-crowned Hanging Parrot, **Loriculus galgulus,** with comparative notes on the Vernal Hanging Parrot **L. vernalis.** Ibis 110: 145-164.
CHANCE, M. R. A. 1962. An interpretation of some agonistic postures; the role of " cut-off " acts and postures. Symp. Zool. Soc. Lond. 8: 71-89.
CULLEN, J. M. 1958. Allo-, auto-, and heteropreening. Ibis 95: 121.
DILGER, W. C. 1960. The comparative ethology of the African Parrot genus **Agapornis.** Tier-psychol. 17: 649-685.
GOODWIN, D. 1956. The significance of some behaviour patterns of pigeons. Bird Study 3: 25-36.
——— 1959. Observations on Blue-breasted Waxbills. Avicultural Magazine 65: 149-169.
——— 1960. Observations on Avadavats and Golden-breasted Waxbills. Avicultural Magazine 66: 175-199.
HARRISON, C. J. O. 1965. Allopreening as agonistic behaviour. Behaviour 25: 161-209.
JACKSON, J. R. 1963. The nesting of Keas. Notornis 10: 319-326.
POTTS, K. J. 1969. Ethological studies of the Kea **(Nestor notabilis)** in captivity: non-reproductive behaviour. Unpubl. B.Sc. (Hons.) project submitted to Victoria University of Wellington, N.Z.
——— 1976. Comfort movements of the Kea, **Nestor notabilis** (Nestoridae). Notornis 23 (4): 302-309.

K. J. POTTS, *N.Z. Wildlife Service, Department of Internal Affairs, Private Bag, Wellington*

★

SHORT NOTE

DIET OF NESTING LITTLE OWLS

On 18 December 1976 I found the nest of a pair of Little Owls *(Athene noctua)* containing two owlets, near Loburn, North Canterbury. The nest was 1 m above the ground in the hollow trunk of an old Willow (*Salix* sp.) which had a spreading canopy 20 m across. The owlets had pale yellow eyes and were covered in about 70% down and about 30% feathers; they flew 18 days later.

White owl droppings marked perches in Macrocarpa trees *(Cupressus macrocarpa)* in a radius of about 50 m around the nest. Perches were mainly about 1-5 m above the ground and several had prey remains below them.

In a small hole alongside the nest was a food cache containing 1 Song Thrush *(Turdus philomelos),* 7 fledgling Starlings *(Sturnus vulgaris),* and 1 half-grown Brown Rat *(Rattus norvegicus);* all had had their heads eaten off. Below perches near the nest were found remains of 1 Chaffinch *(Fringilla coelebs),* 1 adult Starling, 2 juvenile Starlings, 2 adult male Blackbirds *(Turdus merula),* 2 Song Thrushes, 1 adult Silvereye *(Zosterops lateralis)* and 1 young feral Pigeon *(Columba livia).* Surprisingly, no pellets could be found so I was unable to tell if the owls were also catching mice and insects.

Although the Little Owl looks smaller than the Morepork *(Ninox novaeseelandiae),* 5 specimens had a mean weight of 182 g compared to 5 Moreporks which had a mean weight of 176 g (N. C. Fox pers. comm.). This may explain why the Little Owl appears to take heavier prey than the Morepork. Also many raptors, such as the Kestrel *(Falco tinnunculus),* switch to larger prey during the nesting period.

I would like to thank other Raptor Association members for their help in identifying the 19 prey items.

MICHAEL RULE, *2 Watkins Place, Rangiora*

SEABIRDS FOUND DEAD IN NEW ZEALAND IN 1975

By C. R. VEITCH

ABSTRACT

During 1975, 3681 kilometres of coast were patrolled by 163 members of the Ornithological Society of New Zealand and their friends: 21 425 dead seabirds and 192 non sea birds were found. Four wrecks contributed to this total. In February there was a wreck mainly of Fairy Prions *(Pachyptila turtur)* on Wellington West beaches. From late June to September there was a wreck of Diving Petrels *(Pelecanoides urinatrix)* and Prions (except *Pachyptila vittata*) with high numbers of six other species. In late August and September there were extra numbers of Antarctic Fulmars *(Fulmarus glacialoides)* and Kerguelen Petrels *(Pterodroma brevirostris)* with an increase in numbers of some other species. During October-November there was a record wreck of Sooty Shearwaters *(Puffinus griseus)* on west coast beaches.

INTRODUCTION

This paper records the results of the Ornithological Society of New Zealand's Beach Patrol Scheme for 1975. The coastline of New Zealand is divided into 15 sections (Imber & Boeson 1969) with an additional grouping of " OI " for outlying islands which this year includes patrols from the Chatham Islands. This year there were patrols on all sections of coast except Wairarapa and Fiordland. 575 Beach Patrol Cards and 61 Specimen Record Cards were filed.

Nomenclature follows the *Annotated Checklist* (OSNZ 1970), except that in some instances it is not possible for patrollers to identify birds to a subspecific level. Some trinomials have not been used in the tables to save space.

RESULTS AND DISCUSSION

The numbers of birds found and kilometres of beach travelled and covered per month and per coast are recorded in Table 1. Kilometres covered are the lengths of coast covered monthly; kilometres travelled (Table 1) are the total lengths of coast patrolled. Hence, if one kilometre of beach is patrolled three times in one month, then three kilometres have been travelled but only one kilometre covered.

The total distance travelled (4582 kilometres) is a 25% increase on the previous longest distance travelled (1974) and the total number of birds found (21 425) is a threefold increase on most previous years

TABLE 1 - NUMBERS OF DEAD SEABIRDS RECORDED AND KILOMETRES PATROLLED ON EACH COAST IN 1975

COAST	CODE		MONTH JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS KILOMETRES	TOTALS BIRDS	BIRDS /KM COAST
AUCKLAND WEST	AW	KM	38	122	73	39	44	190	314	206	243	229	137	297	1932		
		BIRDS	68	348	45	18	128	493	6859	1160	1560	2554	1419	1013		15676	8.1
TARANAKI	T	KM	-	4	31	-	5	24	62	30	39	23	12	1	231		
		BIRDS	-	14	10	-	1	41	950	95	86	41	35	1		1274	5.5
WELLINGTON WEST	WW	KM	8	56	21	9	21	46	57	55	80	11	4	-	368		
		BIRDS	8	1063	30	9	20	63	557	190	417	62	50	-		2469	6.7
WESTLAND	WD	KM	-	3	-	-	-	-	-	-	14	-	1	51	69		
		BIRDS	-	11	-	-	-	-	-	-	7	-	1	6		25	0.4
AUCKLAND EAST	AE	KM	44	34	19	42	26	23	35	68	48	6	19	20	384		
		BIRDS	109	99	76	68	14	13	12	65	33	4	18	37		548	1.4
BAY OF PLENTY	BP	KM	11	2	2	13	9	4	10	3	2	2	2	10	70		
		BIRDS	24	0	0	7	13	0	2	1	1	3	0	8		59	0.8
EAST COAST NORTH IS	EC	KM	-	7	-	-	16	4	4	-	-	4	4	-	39		
		BIRDS	-	4	-	-	18	3	11	-	-	6	5	-		47	1.2
CANTERBURY NORTH	CN	KM	1	7	5	-	-	6	6	1	3	6	9	6	50		
		BIRDS	0	23	0	-	-	1	4	1	3	10	15	2		59	1.2
CANTERBURY SOUTH	CS	KM	9	7	36	7	5	7	4	12	8	6	5	7	113		
		BIRDS	42	36	67	35	15	15	2	11	6	6	3	21		259	2.3
OTAGO	O	KM	6	2	5	-	2	-	2	-	-	-	4	4	25		
		BIRDS	23	4	13	-	1	-	1	-	-	-	2	1		45	1.8
SOUTHLAND	S	KM	-	5	6	5	5	5	5	6	5	5	5	1	53		
		BIRDS	-	6	6	17	0	0	10	13	1	3	5	1		62	1.2
WELLINGTON SOUTH	WS	KM	15	13	11	16	15	40	55	27	18	26	18	26	280		
		BIRDS	33	43	9	10	14	88	430	45	25	31	9	18		755	2.7
NORTH COAST SOUTH IS	NS	KM	4	3	6	2	7	3	5	3	12	3	3	7	58		
		BIRDS	30	6	19	4	6	5	5	6	30	15	2	6		134	2.3
OUTLYING ISLANDS	OI	KM	9	-	-	-	-	-	-	-	-	-	-	-	9		
		BIRDS	13	-	-	-	-	-	-	-	-	-	-	-		13	1.4
TOTAL KM TRAVELLED (NOT LISTED ABOVE)			160	283	257	178	177	406	742	479	579	450	266	455	4582		
TOTAL KILOMETRES COVERED			145	265	215	133	155	352	559	411	472	321	223	430	3681		
TOTAL BIRDS RECORDED			350	1657	275	168	230	722	8843	1598	2169	2735	1564	1114		21425	
BIRDS/KM COVERED/MONTH			2.4	6.3	1.3	1.3	1.5	2.1	15.8	3.9	4.6	8.6	7.0	2.6			5.8

No patrols were recorded for Wairarapa and Fiordland coasts

although less than the 1974 record of 24 747. The average number of birds found per kilometre covered (5.8) is more than twice the average of 2.34 for the years 1960 to 1974.

This year the usual pattern of lowest mortality in late summer and autumn and higher mortality in late winter and spring has been obscured by a wreck in February and a series of wrecks almost continuously from late June to November.

In February there was a small increase in numbers of Sooty Shearwaters *(Puffinus griseus)* and Fluttering Shearwaters *(P. gavia)* and a considerable increase in numbers of Fairy Prions *(Pachyptila turtur)* found dead. This Fairy Prion wreck was most noticeable on Wellington West beaches (15.7 birds/km covered) where they were recorded as being mainly juveniles. Gale force south west winds were recorded during the first week of February.

The major wreck of the year spread from late June to September with a peak in July. Weather during this period was varied. In June there were numerous depressions down to 970 mb south of Campbell Island and throughout June and the first three weeks of July there were more west and south west winds than usual blowing onto New Zealand. Diving Petrels *(Pelecanoides urinatrix)* were the most abundant single species found during July (3 155 birds, 36% of the monthly total) mainly on Auckland West, Taranaki, Wellington West and Wellington South coasts with highest densities on the Taranaki coast (12.8 birds/km covered). This is the first time that a wreck of Diving Petrels has been recorded (234 birds in 1973 being previous highest). Fairy Prions were almost as abundant with a total of 3 075 birds during July mainly on Auckland West (9.2 birds/km covered) with lesser numbers on Taranaki, Wellington West and Wellington South beaches. Other Prion species (except *Pachyptila vittata*) were also more numerous than usual during July and there were extra numbers of Blue Penguins *(Eudyptula minor)*, Grey-headed Mollymawks *(Diomedea chrysostoma)*, Giant Petrels *(Macronectes giganteus)*, Cape Pigeons *(Daption capensis)*, Blue Petrels *(Halobaena caerulea)* and Fluttering Shearwaters *(Puffinus gavia)*. These species all continued to be found in higher numbers than usual throughout August and into September.

In late August and September the weather reports show further deep depressions, down to 955 mb, south of Campbell Island. These were followed by a period of west and south west winds. This brought to New Zealand a numerically moderate, but ornithologically interesting, wreck of Antarctic Fulmars *(Fulmarus glacialoides)* and Kerguelen Petrels *(Pterodroma brevirostris)* and an increase in numbers of Grey-headed Mollymawks and Blue Petrels to higher levels than during the July wreck. White-headed Petrels *(Pterodroma lessoni)* were also more frequently found during September but did not reach a peak until October (114 birds). Nearly all these birds were found on west

TABLE 2 - SEABIRDS OF WHICH 1 to 5 SPECIMENS WERE FOUND DEAD IN 1975.

COAST AND MONTH OF DISCOVERY GIVEN

SPECIES OR SUBSPECIES	NUMBER FOUND	COAST(S)	MONTH(S)
Eudyptes pachyrhynchus pachyrhynchus	2	WD(2),	DEC(2)
sclateri	2	CS,).	MAR, AUG.
Diomedea cauta salvini	5	AW(3), WS, OI.	JAN, FEB, SEP(2), OCT.
Thalassoica antarctica	3	WW(2),AE	FEB, SEP(2)
Pterodroma spp*	2	AW(2),	JUN(2)
pycrofti	2	AE(2)	JAN(2),
leucoptera	1	AW	JUN
hypoleuca nigripennis	2	AW(2)	FEB, DEC.
Procellaria spp*	1	NS	JUL.
cinerea	3	AW(3)	SEP, NOV, DEC.
Fregetta tropica	1	WW	JUN
Phalacrocorax spp*	1	AW	OCT
melanoleucos	5	AE,EC,O,WS(2)	JAN,JUN,AUG,SEP,OCT.
Leucocarbo carunculatus chalconotus	3	S(3).	APR(2), AUG
Stercorarius skua lonnbergi	1	AW	JUL
parasiticus	1	AW	FEB
Larus spp*	1	AW	NOV
Sterna paradisaea	1	OI	JAN
albifrons sinensis	1	CS	OCT
TOTAL	38		

*Species could not be identified by patroller

TABLE 3 - COASTAL DISTRIBUTION OF THE MORE COMMON SEABIRDS FOUND DEAD IN 1975

SPECIES OR SUBSPECIES	COAST AW	T	WW	WD	AE	BP	EC	CN	CS	O	S	WS	NS	OI	TOTAL BIRDS
Megadyptes antipodes	-	-	1	-	-	-	-	-	-	7	-	-	-	-	8
Eudyptula minor	831	78	83	1	106	4	10	-	3	3	2	26	6	2	1161
albosignata	-	-	1	-	-	-	-	6	29	-	-	-	-	-	36
Diomedea spp*	19	3	7	-	1	-	-	-	-	-	-	2	-	-	32
exulans	27	-	1	-	1	-	-	1	-	-	-	3	-	-	33
epomophora	2	-	-	-	-	-	1	-	1	-	-	3	-	-	7
melanophris	18	-	-	-	1	-	-	-	-	-	-	-	-	-	19
chrysostoma	110	1	6	-	2	-	-	-	1	-	1	2	1	-	124
bulleri	9	1	1	-	-	-	-	1	-	-	-	1	-	-	13
cauta*	22	-	2	-	-	-	2	-	-	-	-	-	-	-	26
cauta	23	2	3	-	-	-	-	-	2	-	-	3	1	-	34
Phoebetria palpebrata	31	1	-	-	-	-	-	-	-	-	-	3	-	1	36
Macronectes giganteus	106	4	4	-	7	-	-	-	1	1	4	5	1	-	133
Fulmarus glacialoides	561	21	46	2	-	-	3	3	-	-	1	1	1	-	639
Daption capensis	250	15	19	-	4	1	1	1	2	-	-	13	-	-	306
Pterodroma macroptera	80	1	-	-	10	-	-	-	-	-	1	1	-	-	93
lessoni	249	10	11	-	2	-	2	-	-	-	1	-	3	-	278
inexpectata	27	-	-	-	-	1	-	-	-	-	-	1	-	-	29
brevirostris	133	2	21	3	1	-	-	-	-	-	-	1	1	-	162
cooki	9	-	1	-	13	-	-	-	-	-	-	-	-	-	23
Halobaena caerulea	63	8	6	-	10	1	-	-	-	-	-	1	-	-	89
Pachyptila spp*	819	17	452	-	2	-	-	1	2	1	6	23	2	-	1325
vittata	33	1	7	-	-	-	-	-	2	2	1	2	-	-	48
salvini	194	4	22	-	-	-	-	-	1	-	1	9	-	-	231
desolata	718	6	21	-	-	-	3	-	2	-	1	1	-	-	752
belcheri	411	11	28	-	1	-	-	-	-	-	3	1	-	-	455
turtur	3767	47	1101	10	16	1	4	16	1	-	8	113	30	4	5118
Procellaria parkinsoni	2	-	1	-	2	-	-	-	-	-	-	-	1	-	6
westlandica	2	1	-	-	-	-	-	-	-	-	-	5	-	-	8
aequinoctialis	6	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Puffinus spp*	6	1	3	-	-	-	-	-	-	-	-	-	-	-	10
carneipes	21	1	-	-	53	2	-	-	-	-	-	2	-	-	79
bulleri	170	4	4	-	29	1	1	1	4	-	-	3	-	-	217
griseus	3465	49	40	2	22	9	10	5	21	-	6	32	4	3	3668
tenuirostris	207	2	8	-	26	2	-	1	5	-	2	1	-	-	254
gavia	760	66	65	-	93	3	3	1	4	-	-	54	8	-	1057
huttoni	19	-	2	-	-	-	-	6	7	-	-	-	-	-	34
assimilis	61	-	-	-	3	1	2	-	-	-	-	-	-	1	68
Pelagodroma marina	9	-	-	-	4	7	-	-	-	-	-	1	-	-	22
Pelecanoides urinatrix	1981	839	409	1	33	6	2	-	-	-	3	307	-	-	3580
Sula bassana	232	4	12	-	42	2	1	3	-	-	1	4	2	-	303
Phalacrocorax carbo	3	2	1	1	-	-	-	-	-	-	-	1	-	-	8
varius	4	-	1	1	2	3	-	-	-	-	1	-	-	-	12
Stictocarbo punctatus	34	36	-	1	1	-	-	4	125	18	10	1	10	-	204
Larus dominicanus	114	32	51	1	7	3	2	7	22	4	4	82	49	-	382
novaehollandiae	9	-	12	-	28	10	-	2	12	2	-	41	7	-	155
bulleri	-	-	1	-	-	-	-	-	3	5	2	-	-	-	11
Hydroprogne caspia	11	-	1	-	1	-	-	-	-	-	-	-	2	-	15
Sterna striata	33	4	11	-	21	2	-	-	6	-	-	3	4	-	84
TOTALS	15661	1274	2466	23	544	59	46	59	257	43	59	752	133	11	21387

* Species or subspecies could not be identified by patroller

TABLE 4 - MONTHLY DISTRIBUTION OF THE MORE COMMON SEABIRDS FOUND DEAD DURING 1975

SPECIES OR SUBSPECIES	MONTH												TOTAL BIRDS
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Megadyptes antipodes	4	-	3	-	-	1	-	-	-	-	-	-	8
Eudyptula minor	35	71	31	37	25	80	455	105	177	66	20	53	1161
albosignata	6	12	8	1	1	1	-	2	-	4	-	1	36
Diomedea spp*	-	3	-	1	-	1	2	6	4	9	-	6	32
exulans	-	5	-	-	-	6	6	3	1	3	2	7	33
epomophora	-	-	-	-	1	1	-	-	-	-	1	3	7
melanophris	-	-	-	-	-	2	6	6	2	2	-	1	19
chrysostoma	1	-	-	-	1	1	16	11	52	34	4	4	124
bulleri	-	-	-	-	-	4	5	-	4	-	-	-	13
cauta*	-	3	-	-	2	3	3	3	2	1	3	6	26
cauta	-	2	3	1	-	5	5	2	7	6	3	-	34
Phoebetria palpebrata	1	2	-	-	-	6	8	4	5	8	-	2	36
Macronectes giganteus	-	3	3	3	-	9	49	21	23	8	6	8	133
Fulmarus glacialoides	-	2	1	-	-	-	-	4	462	147	17	6	639
Daption capensis	-	1	-	-	1	4	127	39	32	86	7	9	306
Pterodroma macroptera	4	22	-	1	3	12	12	6	7	5	8	13	93
lessoni	-	3	-	1	4	11	8	5	43	114	33	56	278
inexpectata	1	8	-	-	1	1	-	-	2	1	3	12	29
brevirostris	-	-	-	-	-	-	1	13	140	7	-	1	162
cookii	6	4	3	2	-	-	-	-	-	-	6	2	23
Halobaena caerulea	-	-	-	-	-	1	13	14	46	13	2	-	89
Pachyptila spp*	3	102	8	-	2	55	270	131	597	108	35	14	1325
vittata	4	-	2	-	-	-	21	4	6	9	2	-	48
salvini	-	5	-	-	6	21	161	22	9	4	1	2	231
desolata	-	-	-	-	1	33	581	113	11	12	1	-	752
belcheri	1	1	-	1	-	9	260	166	15	1	1	-	455
turtur	51	972	20	3	11	143	3075	491	183	77	50	42	5118
Procellaria parkinsoni	-	-	1	-	3	2	-	-	-	-	-	-	6
westlandica	-	-	-	-	-	2	2	1	1	1	1	-	8
aequinoctialis	-	4	-	-	-	1	-	-	-	-	-	1	6
Puffinus spp*	-	-	-	-	-	1	3	-	6	-	-	-	10
carneipes	15	25	11	7	2	2	1	-	1	1	2	12	79
bulleri	16	23	6	7	5	2	1	2	12	31	40	63	217
griseus	20	70	19	4	56	40	16	2	3	1748	1104	586	3668
tenuirostris	23	22	-	3	30	53	1	2	-	40	35	45	254
gavia	37	97	32	11	6	30	392	149	91	71	73	68	1057
huttoni	4	4	2	1	-	-	1	-	1	1	17	3	34
assimilis	1	3	-	-	1	2	33	5	7	4	8	4	68
Pelagodroma marina	7	2	1	-	1	1	-	-	3	1	2	4	22
Pelecanoides urinatrix	23	15	1	-	-	83	3155	175	89	19	10	10	3580
Sula bassana	20	37	3	8	8	9	51	20	51	35	34	27	303
Phalacrocorax carbo	-	-	-	-	-	-	5	2	-	-	-	1	8
varius	-	4	1	-	3	-	1	2	-	-	-	1	12
Stictocarbo punctatus	22	30	23	42	39	12	7	3	6	5	4	11	204
Larus dominicanus	17	63	46	14	7	34	57	43	46	34	10	11	382
novaehollandiae	11	15	20	9	9	26	22	14	7	13	3	6	155
bulleri	5	-	2	2	-	-	1	-	-	-	-	1	11
Hydroprogne caspia	3	5	-	-	-	1	2	-	4	-	-	-	15
Sterna striata	4	13	24	7	1	6	5	4	5	2	5	8	84
TOTALS	345	1653	274	166	230	717	8841	1595	2163	2731	1564	1110	21387

* Species or subspecies could not be identified by patroller

coast beaches, the majority on Auckland West. Three Antarctic Fulmars were found on East Coast N.I. and three on Canterbury North beaches and 10 Blue Petrels on Auckland East.

During the 15 years of beach patrol records prior to 1975 Antarctic Fulmars have been recorded during 7 years:— 1964, 1; 1965, 1; 1970, 16; 1971, 3; 1972, 5; 1973, 134; 1974, 19. The total for 1975 was 639. Kerguelen Petrel records show a similar pattern. This year's total for White-headed Petrels (278) is a threefold increase on the previous highest (1970, 99).

The last wreck of the year was of Sooty Shearwaters *(Puffinus griseus)* which occurred during October and November on west coast beaches. Sooty Shearwater wrecks have been a regular occurrence at this time of the year when the southward migration reaches New Zealand. This year's wreck was slightly earlier and considerably more numerous than in previous years (Fig. 1). In October the average for all of New Zealand of 5.4 birds per kilometre covered was some ten times higher than the previous highest in 1963. The November average of 4.9 was some two and a half times higher than that of the previous best in 1971.

This is the second year that Antarctic Petrels *(Thalassoica antarctica)* have been recorded in the Beach Patrol Scheme (2 birds in 1973). This year's records followed the periods of south west winds in February and August-September. It is the third time that the following species have been recorded:— Erect-crested Penguin *(Eudyptes pachyrhynchus sclateri)* (1963, 2; 1974, 2), Black-bellied Storm Petrel *(Fregetta tropica)* (1963, 1; 1968, 1), and Arctic Tern *(Sterna paradisaea)* (1963, 1; 1969, 1).

The one Eastern Little Tern *(Sterna albifrons sinensis)* found in Canterbury South in October is a new record for beach patrolling. This species is a regular summer migrant to New Zealand although it has only recently been recorded from areas south of the Firth of Thames (Falla, Sibson & Turbott 1970).

Miscellaneous birds recorded, but not considered to be seabirds, totalled 192. These were:— 24 Magpies (both subspecies), 19 Black Swans, 16 each of Blackbirds and Mallard Ducks, 15 Rock Pigeons, 13 Starlings, 12 Song Thrushes, 8 Kingfishers, 7 South Island Pied Oystercatchers, 6 House Sparrows, 5 each of Harriers and Pukekos, 4 Chaffinches, 3 each of Bar-tailed Godwits, Variable Oystercatchers, Pheasants, Tuis, Silver-eyes, Mynas, White-faced Herons and unidentified Passerines, 2 each of Paradise, Shoveller and Grey Ducks and Eastern Rosellas, and one each of Bellbird, Pipit, Goldfinch, Skylark, Canada Goose, Shinging Cuckoo, Californian Quail, N.Z. Dotterel and Morepork.

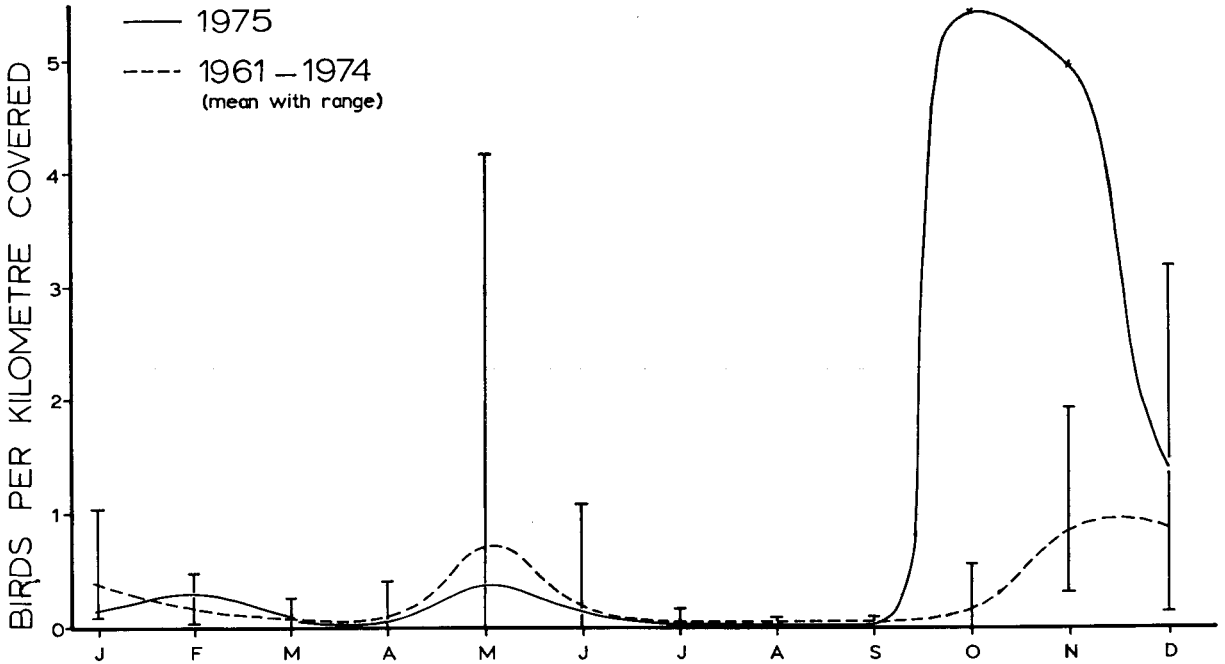


FIGURE 1. SOOTY SHEARWATERS FOUND DEAD ON NEW ZEALAND COASTS.

ACKNOWLEDGEMENTS

The success of the Beach Patrol Scheme in 1975 is due to the people listed below, who are known to have taken part, and all the others who took part but whose names were not entered on the cards.

K. Alistair, Auckland team, Mrs M. L. Barlow, J. A. Bartle, A. Bedford, Dr B. D. Bell, Mr & Mrs R. J. Bellamy, D. J. Bettesworth, D. & J. Biddle, B. & A. Blair, L. D. Boot, D. Booth, F. N. Boyce, G. R. Brown, J. R. Brown, Dr P. C. & M. Bull, H. Bunt, D. J. Campbell, Mr & Mrs W. J. Campbell, W. Cash, S. Chamberlain, Mrs E. M. Cheek, N. Cheshire, C. D. Clunie, Mrs R. Cole-Baker, M. Collier, E. W. Collins, S. Cook, T. Cooper, R. N., S. D. & A. M. Cotter, R. Court, B. & F. Cowan, P. Cozens, Mr & Mrs D. E. Crockett, P. Crombie, Crosby family, T. & M. Damerall, Mr & Mrs A. F. Davis, P. Daysh, S. J. Donaldson, R. & J. Douglas, C. Duval, D. Elder, H. Elder, Mrs G. Eller, B. A. Ellis, L. Esler, M. L. Falconer, H. Ferris, T. P. Fisher, Dr & Mrs C. A. Fleming, R. Forbes, G. Foreman, R. Gallienne, K. Gates, P. Gaze, D. G. Geddes, A. & I. Gollop, Mr & Mrs A. Gordon, K. & M. Green, A. Habraken, W. Hamlet, K. & R. Harlow, P. C. & J. Harper, T. & R. Harty, R. Hatwell, J. Hawken, B. D. Heather, T. Hedges, V. Hensley, B. Hibbert, Mr & Mrs L. Howell, N. Hyde, M. J. Imber, R. Jackson, S. Jenkins, I. Johnson, A. B. Jones, Mr & Mrs R. Kearns, B. Kee, C. & J. Kirkbridge, R. E. Lambert, Mrs M. Lane, D. A. Lawrie, Mr & Mrs G. Leary, Mr & Mrs G. le Vac, A. Makgill, D. G. Medway, S. Mercer, S. M. Merton, P. J. Miller, Mrs R. M. Miller, Mr & Mrs J. Morrison, Mr & Mrs D. P. Murray, Miss M. S. Moody, S. Neville, P. Nunn, Mrs R. C. Ogle, C. O'Donnell, M. O'Reilly, N. Paton, C. D. Paulin, R. Pierce, S. Pitt, Mr & Mrs A. J. Poulton, R. Powlesland, N. & K. Prickett, S. E. Quin, Mrs S. M. Reed, Mr & Mrs Ringer, A. Roberts, P. E. & H. A. Roberts, H. A. Robertson, K. N. Sampson, E. K. Saul, B., R. & J. Searle, D. Shand, M. Shanks, F. Short, D. Sim, R. S. Slack, Mr & Mrs P. G. Smith, G. Stilwell, R. R. Sutton, T. C. L. & E. M. Symmes, Dr & Mrs M. Taylor, Mr & Mrs R. Thomas, M. Twyman, C. R. Veitch, C. Vooren, W. A. Walters, J. & D. Wardle, J. Wharm, P. & E. Watkins, K. A. Westbrook, Mr & Mrs R. W. Wheeler, T. Worthy, A. Wright.

E. & O. E.

I am also personally indebted to Mrs M. L. Barlow, Mrs B. Brown, Mr P. Roberts and Dr G. R. Williams for their helpful comments during the preparation of this paper.

LITERATURE CITED

FALLA, R. A.; SIBSON, R. B.; TURBOTT, E. G. 1966. A field guide to the birds of New Zealand. Collins, London.

IMBER, M. J.; BOESON, B. W. 1969. Seabirds found dead in New Zealand in 1964. Notornis 16 (1): 50-56.

OSNZ, 1970. Annotated checklist of the birds of New Zealand, The Checklist Committee (F. C. Kinsky, Conv.), Ornithological Society of New Zealand Inc. 99 pp. Wellington: A. H. & A. W. Reed.

C. R. VEITCH, *N.Z. Wildlife Service, Dept of Internal Affairs, P.O. Box 2220, Auckland*

SHORT NOTES

———★———

THE RELATIONSHIPS OF *FINSCHIA* AND *MOHOUA* (FAMILY MUSCICAPIDAE)

The New Zealand " tit-warblers " *Finschia* and *Mohoua* are placed in the Subfamily Malurinae (Australian Warblers) in the *Annotated Checklist of the Birds of New Zealand* (OSNZ 1970), following the arrangement of Mayr & Amadon (1951). In a recent paper the writer (Keast 1976) noted that they had no obvious relatives amongst the Australian warblers and that they were sufficiently distinct to warrant sub-family or tribal status.

Further consideration of the morphology of these three species indicates that their relationships actually lie with the pachycephalines and that they are descended from ancestral stocks of these. Thus —

(1) The maxilla is distinctly arched or rounded (diagram in Keast 1976). A rounded maxilla is present in the pachycephalines whereas such is poorly developed in the acanthizines and in the meliphagids the maxilla is straight. The shortening of the bill in the mohouines (? secondary) exaggerates the feature here. In the short-billed *Aphelocephala* amongst the acanthizines, and in *Pachycephala* most of the thickening of the bill is achieved by swelling of the mandible.

(2) The nostril is circular as in the pachycephalines. In the acanthizines it is slit-like.

(3) The colour pattern is simple, lacking striations, spotting, scalloping, iridescence (as in *Dasyornis*), and is variously dominated by plain brown *(Finschia)*, plain yellow *(Mohoua ochrocephalla)*, or white *(M. albicella)*. This is also the colour range in *Pachycephala* but occurs in a few of the plainer plumaged robins, *Sericornis* and *Gerygone*.

(4) The nest is cup-shaped, as in *Pachycephala* and flycatchers, and contrasts with the dome-shaped one of the Australian warblers.

Many of the characters of the Mohouinae are of a generalized type that might be expected to persist in forms with a long continued evolution under forest conditions. Moreover traces of a range of characters " basic " to the wider Australian warbler-flycatcher assemblage can be seen. Thus *Finschia* has an incomplete black subterminal tail band, a typical acanthizine character but that also crops up in the New Guinea pachycephaline *Pachycare*. The wing is very rounded, with primary 5 being longest, or p. 4, 5, and 6 being equally long, followed by p. 7 that exceeds p. 3, and the individual feathers are

relatively broad. Such a rounded wing is quite atypical amongst the open country and arboreal Australian warblers but has a counterpart in low thicket forms such as *Pycnoptilus* and *Crateroscelis,* and the " intermediate feeding zone " *Sericornis nouhousi* and *magnirostris.* Amongst the pachycephalines the New Guinea *Pachycephala sufuriventer* has a very rounded wing. The rounded tails of the mohouines (exaggerated in *Finschia*) contrasts generally with the square ones of pachycephalines. Generalized or " archaic " thicket-dwelling warblers like *Dasyornis, Pycnoptilus* and *Cichlornis* have very rounded tails. The tarsus/wing ratio is 34-35% and hence rather " average " despite the somewhat massive legs and strong hind claw of *Mohou ochrocephala.* The hind to tarsus ratio (56-65%) is also in the middle of the Australian warbler-pachycephaline range. The poorly developed rictal bristles (well developed in many *Pachycephala* but poorly so in *P. simplex*) is of no immediate taxonomic importance and simply reflects the absence of aerial feeding.

The feeding zones of the mohouines are very wide. Whilst *Mohoua albicella* feeds extensively in the canopy it also does so from trunks, logs and, occasionally, on the forest floor (A. S. Wilkinson's note quoted by Falla *et al,* 1966). The feeding of the other two species also combines foliage and branch-trunk feeding (see Oliver 1966, Falla *et al.* 1966). Whilst such generalized habits might be expected in depauperized insular faunas a combination of foliage, outer branch, and trunk feeding is highly characteristic of the pachycephalines (vide *Pachycephala pectoralis, P. rufiventris, Colluricincla harmonica*). The acanthizines do not have a branch and trunk feeding component, other than very incidentally *(Acanthiza reguloides).* On the other hand all three mohouines commonly feed hanging head downwards. This is absent in *Pachycephala* but occurs in *Gerygone, Acanthiza lineata,* et. *Falcunculus,* a close relative of *Pachycephala,* shows the habit strikingly.

Another " basic Australian " behavioral feature of the mohouines is that young in the nest may be fed by multiple adults (H. Guthrie-Smith, quoted by Oliver; and M. F. Soper quoted by Falla *et al.*). " Cooperative breeding " is unusually common in Australian birds and may characterize 30-40% of species (Hugh Ford, personal communication).

The sum total of characters of the Mohouines shows them to be members of an old Australian pachycephaline-warbler-flycatcher lineage. Within this they are apparently derived from an early generalized, forest-dwelling proto-pachycephaline stock. Such stocks presumably occurred in eastern Australia when forest (? temperate rain forests) were more widespread. It might be noted that the more simple and generalized genera in many groups occur today in the forests of New Guinea. Southeastern Australian forest and thicket birds provide examples of relictual (i.e. secondarily contracted) distributions, vide

the poorly dispersing *Dasyornis* and *Pycnoptilus* amongst the warbler, and the pachycephaline *Pachycephala olivacea.* The high level of seasonal mobility and exaggerated sexual dichromatism of the open forest dwelling *P. pectoralis* and *P. rufiventris* shows these to be later-evolved types adapted to contemporary Australian conditions.

LITERATURE CITED

FALLA, R. A.; SIBSON, R. B.; TURBOTT, E. G. 1970. A Field Guide to the Birds of New Zealand. 2nd ed. London: Collins.

KEAST, A. 1976. Adaptive morphology and biogeography relative to the evolution and classification of the Australian and Pacific Island warblers. Proc. 13 Intern. Ornithological Congress, Canberra. In press.

MAYR, E. and AMADON, D. 1951. A classification of recent birds. Am. Mus. Novit., No. 1602: 1-17.

OLIVER, W. R. B. 1955. New Zealand Birds. 2nd ed. Wellington: A. H. & A. W. Reed.

OSNZ 1970. Annotated checklist of the birds of New Zealand. The Checklist Committee (F. C. Kinsky, Conv.). Ornithological Society of N.Z. Inc. 99 pp. Wellington: A. H. & A. W. Reed.

ALLEN KEAST, *Department of Biology, Queen's University, Kingston, Ontario, Canada K7L 3N6.*

★

BRIEF OBSERVATIONS ON THE KAKAPO

During the period 12 February to 2 April 1974, a Wildlife Service Expedition in search of the Kakapo, *Strigops habroptilus,* in the Cleddau watershed, south-west Fiordland, located two birds c. 700 m apart in the Esperance Valley. Both Kakapo were transferred to Maud Island (Merton 1976, *Forest and Bird* 199: 2-10).

The first of these two birds was captured on 6 March 1974 and held in a large temporary aviary erected within the bird's presumed "territory." This Kakapo was watched over a period of 18 days while it was in the aviary. Due to the bird's nocturnal habit, observations were brief, lasting 15-90 minutes each evening, usually until dark.

Preening was observed once. The bird preened its facial disc, using its foot much like a cat would wash its face with a paw. The Kakapo balanced on its right foot and, with the left, proceeded to comb the hair-like feathers about the face and chin. The two front claws of the left foot were brought upwards, combing the chin feathers forwards. The upper surface of these two toes was then drawn down over the chin feathers, settling them back into place. This movement was repeated many times on both sides of the chin with the one foot.

Occasionally, the foot was moved in a circular motion around the face and bill. Thus the two front claws were brought up through the chin feathers to a point where the upper surface of these two toes brushed across the cheek and lores at the side of the bill and cere, before brushing across the feathers of the forehead, down the other side of the face and back under the chin. Sometimes the bird would

pause to nibble the scales on the upper surface of the toes before repeating the movement. It is likely that this preening was to remove food particles from about the bill.

When threatened, the Kakapo sometimes drew itself into a fully erect, stiff posture. The legs were fully extended and straight, and the bird " glared " down at the disturbing object. If the object came closer, the bird slowly raised and pushed one foot forward with the toes spread and held in a vertical plane so that the claws were directed at the object. On two such occasions, the Kakapo actually grasped the edge of the food dish, when it was held too close, and pushed it to the ground.

In Fiordland the Kea, *Nestor notabilis,* behaves in a similar fashion when threatened or disturbed (pers. obs.). Individual Keas sometimes extended an opened foot towards other Keas (and on one occasion a weka) to ward them off when they attempted to drive the " owner " from carrion upon which it was feeding.

Kakapo make extensive use of their bills whilst climbing. Once the bird climbed up a branch and, in typical parrot fashion, used both bill and feet to reach the end, where he balanced, bobbed his head several times and then leapt to another branch c. 0.6 m distant, landing clumsily on both feet as well as grasping the branch with his bill. The bird occasionally pulled itself through dense vegetation with its bill where leg movements were restricted. When climbing through Snow Totara, *Podocarpus nivalis,* the Kakapo was able to reach almost 0.2 m from one branch to the next with its bill.

Subsequent to the birds' liberation on the island on 3 April 1974, one Kakapo was observed in the coastal forest where they were released. A small compound has been erected to hold the birds prior to liberation. After their release, at least one Kakapo returned to this compound on most nights to take food left for it. At 7.15 p.m. on 22 April 1974, a Kakapo came downhill to the compound, then climbed a gently-sloping log which was leaning against a nearby tree. The bird perched approximately half-way up the log c. 1.6 m from me. It sat very still for some time with back toward me, occasionally stretching a leg or wing, and preening the feathers on its back. Then it walked very carefully up the log, using its head in the manner of an old man with a walking stick — head and neck out — stretched and lowered with the whiskers beneath its chin brushing against the log. Its head was moved from side to side, occasionally knocking the log with its bill, apparently feeling its way. On reaching the end of the log, 2.3 m above the ground, it sat quietly for about 3 minutes " gazing " around, then turned and came slowly back down with head lowered but no longer touching the log. At the bottom, it jumped off the log and moved out of sight across the forest floor. At about 11.30 p.m., I again saw the bird, perched above the ground on the trunk of a leaning Kohekohe, *Dysoxylum spectabile,* c. 10 m from where I first observed it. As I passed the tree, the Kakapo cautiously

moved higher until it was 3 m from the ground. When I examined this tree the following morning, I found that it was leaning at an angle of about 35° to the ground. There were two or three small Kakapo chews on the climbing fern *Arthropteris tenella* found growing on the trunk.

This brief night observation was made with the use of a dim red light which enabled me to see c. 4 m. On several occasions I had moved while the light was switched on. The Kakapo appeared to have excellent hearing and would quickly look in my direction at such times. Its subsequent actions indicated that it could not actually " see " me (or the light) unless I moved.

Prior to my arrival in the Esperance Valley, Mr D. V. Merton and Mr J. L. Kendrick (N.Z. Wildlife Service) had tape-recorded a variety of calls made by a Kakapo before it was captured. These calls were used to locate a second bird in the Esperance Valley. On one occasion, a taped call was played to this second bird, with no response. However, about three minutes later, an avalanche fell in the Donne Valley 1.6 km distant. The bird immediately responded with two long, wailing calls.

The variety of calls heard by the party cannot be easily described. They fall into two basic forms — croaks and wails. Croaks were similar to the " kraak " made by kakas, usually short and, frequently, repeated only once although occasionally more often when they were followed by a wail. The wail has been likened to a pig or opossum squeal, usually fairly long and occasionally continuing until the bird sounded as if it was out of breath. No " booming," for which the bird is noted, was heard.

Although the Kakapo each occupied areas some 700 m apart, their calls carried easily over this distance and it is, therefore, probable that the birds were in vocal contact.

R. B. MORRIS, *Wildlife Service, Department of Internal Affairs, Private Bag, Wellington.*

★

OBSERVATIONS OF TAKAHE NESTING BEHAVIOUR AT MOUNT BRUCE

Hide observations were carried out on a captive pair of Takahe *(Notornis mantelli)* at Mt Bruce, over the period 3 September to 26 September 1975.

These birds were watched on 15 days, and during this time several aspects of behaviour, mainly related to nesting, were noted. Observations commenced while the birds were still engaged in nest-building activities, and by the end of the observation period one egg had been laid and incubation was into its 14th day.

Grazing: Prior to egg-laying the female grazed almost continuously throughout the day. The male's grazing was not as intensive as his mate's and he spent considerable time standing about preening or pacing the barrier between his pen and the enclosure next door which also contained Takahe. At times he would stand at the neutral zone which provided virtually the only visual contact with the pair on the other side of the barrier.

The nesting pair would sometimes drift up to 15 m apart while grazing but generally they fed within 5 m of each other, whereas a younger pair in the next pen often fed independently for long periods during the day.

The male of the nesting pair always appeared to take the initiative whenever both birds travelled any distance — it was always the female who followed.

Although they both made some limited use of their feet to hold food during feeding, the birds were most frequently observed grazing on the short (more palatable) sward grasses. Very little of the taller grasses was touched. In Fiordland the opposite is true; tussock species are taken more frequently than sward species. However, this may be due to availability; tussock grasses are more abundant in Fiordland.

Nest building: When observations commenced, the nesting pair had three trial nests in various early stages of construction. The nest most frequently visited was situated about 5 m from the tower hide and just in from the bush edge. Although both birds visited this nest throughout the day, the male did so more frequently than the female. On every occasion he carried nest material with him. This consisted primarily of clumps of short grass with some turf during the early nest building period. Most was collected not more than 4 m from the nest. The female only carried nest material once or twice on her visits to the nest and these ' tokens ' she also collected close to the nest.

As the season developed and laying time approached, the number of visits made by the male to the nest increased considerably. He began to collect beakfuls of longer grass (tall fescue) in preference to the shorter turf growing nearer the nest. He was now travelling much further from the nest to get material. The female also carried ' tokens ' more frequently but these were still collected close to the nest and the nature of the material she collected remained the same.

Even into early incubation the male continued to visit the female on the nest with nesting material, but his visits became less frequent as incubation progressed. As the birds adopted a more steady routine, the male commenced visiting the nest without any nest material.

Soliciting and Copulation: Prior to the act of copulation the female solicits the male by adopting a submissive posture, crouching low to the ground with tail down and the carpal flexures of her wings slightly

out from her body. The primaries of the wings are slightly splayed and held against the side of the body. Her head is held low and her body is close to the ground. The shoulders are slightly hunched. Posturing is accompanied by a soft clucking call.

The male approaches the female from behind, standing rather erect, he places a foot on her back while she lies closer to the ground with head and neck outstretched. The male mounts her, maintaining his balance with wings flapping. He straddles her, placing his feet just behind her shoulders, and standing with his head slightly lowered. While the male is balancing, the female stands up quietly and raises her tail, her neck is stretched forward, with her bill resting on the ground. This gives her three points of contact with the ground and provides a more stable 'platform' for the male. It is the same stance that is adopted by female wekas during copulation.

Cloacal contact is brief, accomplished by a few sideways 'wipes' of the male's tail. Should copulation be successful (i.e. if the male does not lose his balance), he then dismounts stepping over the female's head. On the ground immediately in front of her, the male adopts an erect posture. He turns to face the female who has also adopted an erect posture, and they lightly 'grapple' bills. Sometimes the female's head is a little below that of the male's and, as both birds' bills are slightly open, the 'grapple' appears almost to be a ritual of the male feeding the female. This was after successful copulation, and was usually followed by mutual preening.

Often the copulation attempt was unsuccessful, usually because the male lost his balance through the female moving underneath him or because of wind gusts. At such times he toppled off the female sideways instead of stepping off over her head. The 'grappling' that followed unsuccessful copulation often appeared more vigorous (? aggressive) on the female's part — more of a bill clashing. But it was always brief and was usually followed by mutual preening.

The male bird was once observed assuming the soliciting posture before the female. A short time later she assumed the same posture and the male mounted her. This soliciting of the male before the female was commonly observed with a young male in the next pen. This young male once assumed this posture for over three minutes before moving away to graze. His mate displayed no interest and was obviously not ready for copulation — it would seem that the young male was.

With the nesting pair, copulation continued after the first egg was laid. The birds were observed copulating 10 days after incubation commenced.

Incubation and Changeover: On 12 September 1975 one egg was laid and incubation commenced. For the final 14 days until observation ceased, one bird was almost always on the nest, the exception being very brief periods early on in incubation.

Early in incubation the female would be relieved from nest duties several times through the day. She would appear rather furtively and feed close to the nest. Sometimes she would only be out for 20 minutes before returning to the nest. However, as incubation progressed the birds adopted a more steady routine. The male would relieve the female on the nest at about 11 a.m. She would then graze for 1-4 hours, perhaps visiting the male on the nest briefly several times to 'converse' with him. She grazed further from the nest than she did during early incubation. If she was out for only 1-2 hours, the male would again relieve her sometime between 2 and 4 p.m. in the afternoon.

During early incubation nest changeovers appeared prolonged and there was much 'conversing' at the nest as if the relieving bird was ready to take over the other's duties before the sitting bird was prepared to give up the nest. As incubation progressed however, changeovers were accomplished more quickly and quietly.

Greeting: This form of display was most frequently observed when the pair reunited after being apart briefly. Either bird would rush up to its mate with head and neck held erect and wings held high on its back — the wings remained unopened but the primaries were flared (referred to as the 'sail' position). The tail was raised, revealing the white underside.

As with bill 'grappling,' 'greeting' appeared to have slightly aggressive connotations at times. The male once chased the female around the enclosure, both birds holding their wings in the 'sail' position as they ran. When the male finally caught up with the female he pecked at her sharply. The display may indicate excitement, just as tail flicking is an indication of excitement or distress, or it may be a courtship activity or both. Greeting between birds of a pair was often followed by bill grappling and then mutual preening.

Bathing and Preening: Takahe bathe frequently and in all weathers and this is usually followed by a prolonged bout of preening. A bird will wade out into the water until the water at least reaches the top of its legs. The bird may then crouch in the water, especially if it is a bit shallow.

Bathing sometimes appeared to arise out of feeding in the water. The bird would place its bill and sometimes its entire head underwater to grasp at roots and vegetation growing below the surface. These were pulled to the surface and dropped. This developed into a head bobbing exercise, where the whole body dipped each time but only the head was submerged. Water from the head ran down the bird's neck and on to its back as droplets, or else water from the head was shaken on to the back. Usually the wings are shuffled as bathing develops but the action is ponderous, unlike the vibrant fluttering of bathing passerines (although the method of bathing is identical).

When bathing in heavy rain, the birds stood out in the water and wet their heads only, probably because the back was already wet, nevertheless bathing as such was practised, even in the heaviest rain.

Once bathing is over, the bird steps out onto the bank and walks some distance from the water to preen, always it seems with its back to the pond — this is probably not significant. During preening Takahe often stand with both wings outstretched. This is understandable when the bird has just bathed — it probably assists in the drying process. However, Takahe preen regardless of weather conditions and without necessarily bathing first. Not infrequently while preening, a bird would hold both wings out. This is not done for balance, because at any time during preening the bird may fold its wings.

Interspecific displays: The male Takahe was twice observed chasing Blackbirds from his feed tray by running at them flapping his wings. It was windy on the two occasions and the Takahe almost appeared to be trying to fly after the birds! On numerous other occasions he ignored the same birds around his feed tray. Takahe were often observed apparently trying to fly, especially on very windy days.

Once when the female was out feeding a White-faced Heron appeared high overhead. The Takahe upon seeing it, crept furtively towards the bush, her head tilted skyward the whole time, then quite suddenly, she assumed a more normal posture and commenced grazing again. The heron was still overhead but considerably lower and now had its neck outstretched. At a greater altitude and with its neck withdrawn, the bird's silhouette must have resembled that of a raptor. Takahe of both sexes, the females especially, became very furtive when Harriers or Black-backed Gulls flew overhead.

R. B. MORRIS, *Wildlife Service, Department of Internal Affairs, Wellington.*

——★——

REDPOLL CAUGHT IN HOOK-SEDGE

Previous references to the phenomenon of birds being trapped in hook-sedges (Merilees 1969, *Notornis* 16 (2): 144; Hilton 1969, *Notornis* 16 (4): 236; Daniel 1970, *Notornis* 17 (2): 101) have reminded me of a similar experience in the valley of the Fish River (Makarora, near Haast Pass, Otago).

On 17 February 1974 I rescued a Redpoll *(Carduelis flammea)* firmly entangled by its wing primaries in a clump of relatively short hook-sedge (*Uncinia* sp.) in a beech forect clearing at c. 760 m (2500'). After removal of the attached seeds the bird flew off quite vigorously.

PETER CHILD, *10 Royal Tce, Alexandra*

LETTERS

———★———

The Editor,
Sir,

CHATHAM ISLAND PARAKEETS

As far as I am concerned there is no argument with Mr Geo. A. Smith (*Notornis* 23 (4), 1976) as to whether specific differences occur between various body measurements of the two Chatham Island parakeets. Clearly they do, and I have already pointed out the greater average length of wing of the Chatham Island Red-crowned Parakeet and the greater average width of bill of Forbes' Parakeet (*Notornis* 23 (2): 198-202, 1976). I do not konw which species has the greater " mass," since adequate samples of weights and measurements of sexed birds of both species do not exist. Smith may well be correct in his assertion that the Chatham Island Red-crowned Parakeet is somewhat larger — but this does not affect my original premise.

The point I was trying to make (*Notornis* 22 (2): 119, 1975) was that compared with the very big size difference between Red-crowned and Yellow-crowned Parakeets on the main islands of New Zealand, the size difference between the two species in the Chatham Islands is small. I mentioned this as one factor that could favour hybrid matings at the Chathams. My comment that the two Chatham Island species are " about the same size " was made strictly in this context.

Apparently Smith agrees with me on the main issue that there is a " lesser disparity in size " between the two parakeets at the Chatham Islands (compared with the mainland forms) and that because of this they might hybridize more readily.

R. H. TAYLOR

Ecology Division,
DSIR,
Private Bag,
Nelson
21 December 1976

———★———

The Editor,
Sir,

BIBLIOGRAPHY ON OWLS

We would greatly appreciate it if you would draw your readers' attention to the following request.

" A working bibliography on the Order Strigiformes (Aves) from the world literature " is the title of a biblography currently being compiled by owl biologists R. J. Clark, D. G. Smith and L. H. Kelso.

Authors of articles which contain material on owls (either exclusively or in part and wishing to insure inclusion in the bibliography) are asked to send two reprints of each article to R. J. Clark. Particularly sought are articles appearing in local journals for avian biology, wildlife, animal science (e.g. veterinary medicine, etc.) and sportsmen publications. *Any* article meeting the above criteria, i.e. dealing with owls either in whole or in part, e.g. have reference to owls in the title are suitable. Faunal lists, however, will not be included. The bibliography attempts to cover the world literature and distribution of it will also be worldwide.

To insure inclusion of your work(s) please send two (2) reprints of each article to me at the address given below.

All reprints received prior to 1 July 1977 and dealing with owls will appear in the biblography. No guarantee for reprints received after that date can be made.

RICHARD J. CLARK

York College of Pennsylvania,
Country Club Road,
York, Pennsylvania, USA 17405
11 November 1976

The Editor,
Sir,

STATUS OF GREAT BARRIER ISLAND BIRDS: CORRECTIONS AND ADDITIONS

It is with some consternation that I find the final printing of my paper ' Status of Great Barrier Island Birds ' (*Notornis* 23 (4): 310-319) does not incorporate many of the changes I found necessary to make when correcting the galley-proofs (I did not receive any page-proofs). May I therefore take this opportunity of rather belatedly setting the records straight by listing some of the more obvious corrections that are needed ?

p. 310, Cook's Petrel, line 10: for ' evamined ' read ' examined.'
p. 311, Cook's Petrel, line 2: for ' Whangapouapoua ' read ' Whangaparapara.'
p. 313, Cook's Petrel, line 6: should read '. . . on the summit and *two* were juveniles . . '
p. 313, White-faced Heron, line 11: delete bracket, insert comma.
p. 314, Pukeko, line 6: for ' Oruawhero ' read ' Oruawharo.'
p. 314, Parakeet, line 3: for ' 1975 ' read ' 1976.'
p. 314, Rifleman, line 1: for ' Harataongo ' read ' Harataonga.'
p. 314, Rifleman, lines 4 & 5: should read ' (S. Reed, pers. comm., Reed 1972).'
p. 315, Welcome Swallow, line 1: for ' Oruawhero ' read ' Oruawharo.'
p. 315, Welcome Swallow, line 5: should read ' A. J. Goodwin.'
p. 315, Welcome Swallow, postscript: should read ' A report by A. J. Goodwin (Classified Summarised Notes 1973) of 4 at Whangapoua estuary and 1 at Mabey's Road on 9 January 1972 should read 3 and 1 birds respectively on 9 January 1973.'

p. 315, Pied Tit: full scientific name should read '*Petroica macrocephala toitoi.*'
p. 315, Pied Tit, line 5: for '1973' read '1976.'
p. 315, Silvereye: full scientific name should read '*Zosterops lateralis lateralis.*'
p. 316, Indian Myna, line 5: should read '. . and Bell & Brathwaite believed the species . .'
p.316, Indian Myna, line 11: for 'Oruawhero' read 'Oruawharo.'
p. 316, N.I. Kokako, line 2: for 'came' read 'come.'
p. 316, N.I. Kokako, line 9: for 'Rangiwakaea' read 'Rangiwhakaea.'
p. 316, N.I. Kokako, line 13: after 'northern area' insert 'from goats and pigs.'
p. 317, Discussion, 2nd paragraph, line 4: for 'Australian' read 'Australasian.'
p. 317, Discussion, 3rd paragraph, line 5: for 'Kokao' read 'Kokako.'
p. 318, Literature Cited: Insert the following additional references:

GOODWIN, A. J. 1973. Welcome Swallow *(Hirundo neoxena)*. P. 370 in EDGAR, A. T. (comp.). Classified Summarised Notes. Notornis 20 (4): 346-376.

HUTTON, F. W.; KIRK, T. 1868. Description of Arid Island, Hauraki Gulf. Transactions and Proceedings of the N.Z. Institute 1: 108-112.

OLIVER, W. R. B. 1955. New Zealand Birds. Revised and enlarged edition. 661 pp. Wellington: A. H. & A. W. Reed.

I regret that the tedious task of incorporating these changes has been transferred from author to reader, but the situation that arose was beyond my control.

BEN D. BELL

Department of Zoology,
Victoria University of Wellington,
Private Bag,
Wellington.
14 February 1977

The Editor regrets that he was unable to post the proofs to the author in time to avoid the pre-Christmas mail rush. Although Dr Bell corrected his proofs promptly and returned them forthwith (including additions which he had asked to be allowed to make at galley proof stage), apart from 13 printers' errors picked up by the Editor and corrected, they could not be incorporated into an already greatly delayed December issue.

The Editor offers his unreserved and sincere apologies to Dr Bell and his readers for this incident.

REVIEWS

Fundamentals of Ornithology, by Jocelyn Van Tyne and Andrew J. Berger. 2nd ed. 1976. Pp. xiii + 1-806. New York: John Wiley and Sons. $32.00.

A preface by the second author and a foreword by George Mikesh Sutton, the artist, precede the second edition of this *opus magnum* of ornithology. The first edition of the *Fundamentals of Ornithology* was prepared jointly by the late Jocelyn Van Tyne and Andrew J. Berger and published in 1959. The present second edition was brought up to date and prepared by Professor Berger. The work is lavishly illustrated by George Mikesh Sutton. The other illustrations comprise original photographs of great scientific value, diagrams and maps. The following list of the 13 chapters of the book provides an idea of the authors' approach and the general contents of the book: 1. Paleontology (34 pp.), 2. Structure and function (82 pp.), 3. Plumage and Moult (56 pp.)., 4 Senses and behaviour (56 pp.), 5. Voice and sound production (64 pp.), 6. Bird distribution (42pp.), 7. Migration (54pp.), 8. Flight and flightlessness (48 pp.), 9. Food and feeding habits (18 pp.), 10. Courtship and nest building (28 pp.), 11. Eggs and young (46 pp.), 12. Taxonomy and nomenclature (64 pp.) and 13. Classification of world birds by families (180 pp.).

One may find that the first chapter on paleontology is relatively short. After all our knowledge of the origin of birds has not progressed as much as that of the other branches of ornithology. The next chapter — structure and functions — is admirably condensed, perhaps because one of the authors (A.J.B.) is a well known anatomist. The description of every system is followed up by a detailed outline of their function. Plumage and moult are among the most important characteristics of birds as a group of vertebrates hence this fairly long chapter is devoted to plumage, moult and some allied problems. The latter include descriptions of various kinds of plumages, colours and patterns and their functions.

The chapter devoted to senses and behaviour is, of course, of particular importance to students of bird behaviour. It begins with the description of the anatomy of the six senses found in birds and, before describing briefly some important bird activities, provides an important and interesting discussion on the basis of behaviour. The interpretation by classics like Lorenz, Tinbergen, Thorpe and others is examined in the light of recent literature. A description of various bird activities concludes this stimulating chapter. Logically the next chapter is devoted to voice and sound production by birds. Upon a brief description of the various mechanical sounds found in many birds, various kinds of song are described and problems of the phylogeny, ontogeny of the song, song dialects and song mimicry are outlined. The problem of bird distribution is firstly examined by the " biomes " of the North American continent as first applied by Pitelka

and Kendeigh. This is followed up by a careful consideration of the various factors controlling the distribution of various bird species and the situation on continental and oceanic islands. Problems of bird population studies and a brief mention of introduced and of endangered bird species terminate this interesting chapter.

The world-wide problem of bird migrations is carefully examined by describing the various factors exerting an influence on the various kinds of migrations, such as latitudinal, longitudinal, altitudinal, partial migrations, etc. Finally, a good description of bird navigation and of homing birds is given and discussed in relation to latest findings.

The part on flight and flightlessness begins with a description of the anatomical framework and its mechanics followed up by brief paragraphs on flight speeds and concludes with a description of certain birds such as penguins and some marine birds swimming wing propelled under water. The description of food and feeding of birds begins with a succinct description of the various adaptive specializations of the bill and other parts of the digestive tract. Other aspects, such as the types of food, food finding, including the role of water and salt are, perhaps, too briefly discussed. Courtship and nest building is one of the best documented parts of the book. The description of factors responsible for the initiation of the breeding season is followed by description of other aspects of breeding, such as pair formation, sexual maturity and territory. This chapter concludes with the description of nest building in various groups of birds. The chapter on eggs and young appropriately follows. A brief account is given of the formation of the egg and of its various characteristics, such as colour, size, weight, clutch size, etc. This is followed up by an excellent account of incubation, including a synopsis of incubation patterns. The chapter concludes with a well illustrated description of both atricial and precocial young and a description of ' obligate ' and ' nonobligate ' breeding parasitism.

The penultimate chapter provides comprehensive information on taxonomy and nomenclature, supported by an extensive bibliography, and the last chapter supplies information on the classification of recent world birds by families. The odd 8,600 species of recent birds are placed in 169 families. Physical characteristics, range, habits, food, a brief description of breeding, technical diagnosis, classification, references and a picture of a representative of each family by George Mikesh Sutton. The style is readable and concise. A comprehensive index is found at the end of the book and each of 13 chapters contains an adequate bibliography brought up to date.

Summing up this brief review of the *Fundamentals of Ornithology,* we can say that the second edition of this major contribution to ornithology maintains the high standard of the first edition and the reviewer has only few critical remarks to make. While one appreciates the ecological approach to bird distribution in North America one would like to see examples from other countries. While the reviewer greatly values the morphological approach to food and feeding habits, the inclusion of ecological principles would enhance this chapter. The lack of a mention of birds economically harmful is to be regretted. Admittedly, the explosion of numbers of these bird species and their noxiousness is in many cases the result of unpre-

meditated, man-made changes of the environment. However, the losses sustained by the farmer, orchardist and others occur on all five continents and they are very serious so that research stations have been established to deal with this problem. The part describing the rare and endangered species is very short, confined to two American species and no references are given. Finally, the use of inches and feet instead of metric measures now used by all biologists will cause a small inconvenience to some of them.

The above critical remarks are not intended to diminish the value of this massive contribution to ornithology, our *scientia amabilis.* It will serve as a fundamental text to students of avian biology on both hemispheres. Moreover, owing to its encyclopaedic character and the excellence of its source material, it will be indispensible to university professors of biology, taxonomists and, in fact, to every practising ornithologist.

K. W.

———★———

Birds of Nepal with reference to Kashmir and Sikkim, by Robert L. Fleming Sr & Jr. 350 pp. Published by the authors, P.O. Box 229, Katmandu, Nepal.

This book, the culmination of 25 years study in the Himalayas, contains a tenth of the known birds of the world within its 350 pages, In field guide form it synthesizes the known information, incorporates new data on 38 species previously unknown in Nepal as well as dealing with an additional 16 species recently rediscovered.

Lain S. Bangdal and two Nepalese artists have provided 150 coloured plates and the dust jacket which depicts Crimson Horned and Impeyan Pheasants.

Dealing with birds of a region which has special links with New Zealand since Sir Edmund Hilary's triumph, this book might be welcomed especially by ornithologically-minded New Zealand mountaineers and Sir Edmund's community workers in Nepal.

S. I. A.