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### KERMADEC ISLANDS EXPEDITION REPORTS: THE WEDGE-TAILED SHEARWATER (Puffinus pacificus pacificus) IN THE NORTHERN KERMADECS

By DAVID E. CROCKETT

#### ABSTRACT

From November 1966 to January 1967 I spent eight consecutive weeks on North Meyer Island in the Kermadec Group as a member of the Ornithological Society of N.Z. expedition. Breeding habits of Wedge-tailed Shearwaters were studied through courtship, egg-laying and early incubation. A flood disrupted incubation and destroyed a part of the study area. Nest-associated fauna and ectoparasites were collected.

#### INTRODUCTION

During the Ornithological Society of New Zealand's Twentyfifth Anniversary Expedition to the Kermadec Islands, I spent from 26 November 1966 to 19 January 1967 on North Meyer Island which is one of the Herald Islets of the Kermadec Group. This provided a good opportunity to study the Wedge-tailed Shearwater.

#### NOMENCLATURE

Murphy (1951) classified the birds of the Kermadecs, Kandavu and Norfolk Islands as belonging to the nominate subspecies *Puffinus* p. pacificus — distinguished from other subspecies by larger size and uniformly dark plumage. The smaller subspecies *P. p. chlororhynchus* ranges through 193 degrees of longitude including tropical and subtropical zones of the Indian and Pacific Oceans i.e. from Madagascar and Mascarene Islands east to the Revilla Gigedo Islands off the west coast of Mexico. The predominantly white-breasted race *P. p. cuneatus* occurs only in the North Pacific, where it breeds in the Hawaiian, Bonin and Pescadores Islands.

On the New Zealand mainland three Wedge-tailed Shearwaters have been recorded dead on beaches. The first, at Makara on 26 January 1962, is considered by Falla (1962) to be a representative of

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North Pacific stock. The second specimen was found at Waikawa, near Otaki, in June 1962 (Boeson 1964) and the third near Waikato Heads on 27 November 1966 (H. R. McKenzie *in litt.*). The first two specimens are in the National Museum and the third is in the Auckland Museum.

All the birds I examined on the Kermadecs were of the dark phase, with feet and legs varying from pinkish brown to pinkish violet. Some measurements of Wedge-tailed Shearwaters on the Kermadec Islands are given in Table 1.

TABLE 1 — Summary of measurements (mm) of adult Wedge-tailed Shearwaters collected on Raoul Island and Meyer Island in December 1966 and January 1967.

			Number	Mean	Range
Exposed culm	nen		6	41.7	39 - 43.5
Bill depth			6	14.8	14 - 16
Bill width			6	15.6	14 - 17.5
Mid-toe and	claw	•	7	64.3	61.5 - 68
Tarsus			7	51.2	49 - 54
Wing			7	310	300 - 326
Tail			5	139.4	125 - 149

SUMMARY OF PREVIOUS OBSERVATIONS

Cheeseman (1890) was the first to record the Wedge-tailed Shearwater from the New Zealand region, when he described specimens sent to him by Thomas Bell from the Kermadecs. Detailed observations were provided by W. R. B. Oliver's expedition in 1908, when he spent ten months on Raoul, also visiting outlying islands (1930, 1955). Iredale (1910, 1912) described the vast breeding populations of petrels on Raoul Island. Guthrie-Smith (1936) made no mention of the Wedge-tailed Shearwater but his account of the four burrowing species of petrel on Meyer presumably includes this species.

Sorenson (1964) in his account of the birds seen on Raoul and Meyer Islands during 1944 indicated that it was a common breeding species. Though Murphy (1951) in his account of the populations of this species deals mainly with taxonomy and distribution, Figure 6 of his paper illustrates the sequence of the main events in the breeding cycle, compiled from observations and study specimens. Members of the 1964 OSNZ Expedition made a brief encounter with the species and their observations are summarised by Edgar *et al.* (1965).

Elsewhere, the breeding habits of this species have been studied on Heron Island in the Great Barrier Reef of Australia by Gross, Moulton & Huntington (1963). They studied the same stages of the breeding cycle as I did.

PRESENT STATUS IN THE NORTHERN KERMADECS

This species is an abundant breeder on North and South Meyer. Smaller numbers are found on Napier, Dayrell and North Chanter Islands.

According to Iredale (1910, 1912) it bred "in immense numbers," mainly on the northern and eastern coasts of Raoul in 1908, and it was "probably the most abundant bird breeding on the island." Sorenson (1964) reported it as an abundant breeder in many places there in 1944, but this was definitely not so 22 years later when the 1966 OSNZ Expedition investigated traditional sites. Surveys showed a remarkable decline. Altogether, on the seven ridges leading up from the northern terraces a total of only 6 occupied burrows was found. Of many burrows seen under Pteris fern behind the Hutchison Bluff Sooty Tern breeding area on 4 January 1967, only 20 showed signs of occupation. At D'Arcy Point on 30 November 1966, Merton (1970) found only 20 occupied burrows amongst many hundreds of disused burrows on the seaward slopes. These were mainly in open areas under sedge (Cyperus sp.) but some were under open Pohutukawa (Metrosideros kermadecensis) forest at higher levels. The situation at Rayner Point on 13 December 1966 was similar to that at D'Arcy Point: occupied burrows were found at the top of sheer cliffs in places almost inaccessible to me. Those examined were over 2 m in length and had been used for many years, as their entrances were very enlarged. Among the many derelict burrows at Nash Point, only two with eggs were found on 14 January 1967.

Cats and rats have apparently played the major part in this spectacular decline: evidence of cat predation was found at D'Arcy Point (46 corpses), Rayner Point (7 corpses) and on the northern terraces where cat-eaten remains were found on most ridges. However, the reduction in numbers has been most rapid over the last thirty years and this suggests that Norway Rats (*Rattus norvegicus*), accidentally introduced to Raoul in 1921 (Watson 1961), could have been the major predator. The Black-winged Petrel (*Pterodroma hypoleuca nigripennis*), Black-capped Petrel (*P. externa cervicalis*) and Kermadec Petrel (*P. neglecta*) have been affected similarly (Merton 1970).

WEDGE-TAILED SHEARWATER ON NORTH MEYER ISLAND Status, nesting sites and methods:

On North Meyer the Wedge-tailed Shearwater was found breeding from sea level to the summit. Burrows were concentrated in suitable habitats and these aggregations ranged in size from 6 to over 100 burrows. There were short burrows under boulders, in small caves, beneath rock shelves, in rock-filled cracks, in hard gritty rock, and under *Cyperus* clumps. Longer burrows were found in soft friable soil and in soft clay on the summit.

Following Warham (1960), 15ft square quadrats were marked in various situations to determine burrow density: this varied from 6 per quadrat beneath the tangled roots of a large pohutukawa, to 22 on gentle *Cyperus*-covered clay slopes (Nos 5 and 7, Appendix I). The survey was made after laying, so that a true picture could be gained of the breeding population. The biggest sub-colony was on

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the gently-sloping western shore terrace of North Meyer where burrows numbered 220+ and had a mean density of 14 per quadrat. This terrace, which varied in width from 12 m to 15 m and was 76 m long, had a deep layer of clay loam supporting Ngaio (*Myoporum obscurum*), *Cyperus*, Native Spinach (*Tetragonia tetragonioides*) and several species of grasses. It was particularly favoured for burrowing because of the deep layer of soil accumulating from the cliffs above through erosion by the actions of birds and weather. Similar conditions were reported by Guthrie-Smith (1936) after his short visit in 1929. Over 100 accessible nests were marked in this area for continuous observation.

From a survey of numbers of occupied burrows in quadrats (Appendix I), the total population on North Meyer was estimated to be about 10,000 breeding pairs.

Pre-laying behaviour:

During late November birds arrived singly or in small groups throughout the day. The majority, however, arrived soon after dark (Figure 1). Unlike other shearwaters (Lockley 1947, Serventy 1958, Warham 1960) little sign of rafting on the sea was observed before the birds arrived. Some small groups of 20+ were occasionally seen on the sea in the vicinity of the island late in the day.

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FIGURE 1 — Nightly return of birds visiting burrows in the study area. 35 burrow entrances were covered with a lattice of thin twigs as used by other workers (Lockley 1947, Warham 1966). These were checked at 0900 hrs and 2100 hrs daily between 28 November 1966 and 6 January 1967.

During daytime before incubation up to 30 birds could be seen in flight off the western shore of North Meyer. They spent most of this time gliding along the cliffs. Though generally silent while circling the nesting area, on four occasions birds were heard to "wail."

During late November shearwaters were seen after dusk cleaning out existing burrows and making new ones. When digging a new burrow the bird, with its body tilted forward and the head almost touching the ground, began scraping vigorously with its feet until a depression was formed. Three hours later the beginning of a burrow was evident. Upon reaching firmer soil burrowing ceased but continued the following evening. During this activity vegetation within 2 to  $2\frac{1}{2}$  m of the burrow was showered with soil and dust. By the end of the sixth night the burrow was complete, but a further week elapsed before any vegetation was placed in the chamber.

Cleaning of old well-established burrows, by scratching out debris and soil, was seen from 25 November through to 14 December. Normally 3 to 5 nights were taken to complete cleaning.

Except where the terrain imposed limits, burrows varied in length from 1 to 2<sup>1</sup>/<sub>2</sub> metres. Practically all had a bend which obscured the incubating bird from view. The majority of burrows sloped gently towards the nesting chamber which in some cases was 15 to 23 cm below the level of the entrance. Entrances, often concealed beneath hanging vegetation, were 15 to 20 cm in width and 13 to 20 cm in height. The average measurement of nesting chambers was 30 x 30 x 20 cm deep. Nesting material was obtained close to burrow entrances. Birds had the habit of picking up a piece of vegetation, gently passing it over a shoulder and depositing it behind. This activity continued until a handful of vegetation had accumulated at the entrance. The vegetation was later carried inside. This plucking of vegetation and soil scraping continued intermittently during incubation, especially when nests became blocked (see below), and resulted in the formation of a cleared area radiating from the burrow mouth.

Courtship was similar to that described for other species of shearwater (Warham 1960, Richdale 1963). Two birds would sit opposite one another, almost motionless and utter a wailing or moaning call, which would rise and fall in volume. A pair would carry on in this manner for an hour or two before settling down for the night. This phase of courtship was not observed during daytime. A further stage in the courtship was beak rubbing, followed by head and neck rubbing during which the eyelid would be drawn across the eye and birds would give voice to a deep moan with the throat well puffed out. Courtship began on the surface, but soon progressed to the burrow itself. Copulation was observed on the surface and in burrow entrances on several occasions.

The last week of November saw many hundreds of birds ashore but on the evenings of 5, 6 and 7 December there was a sharp drop in numbers. For the next 2 weeks numbers ashore were very low and calling was practically non-existent; this was considered to have been due to a pre-laying exodus as found in related species (Warham 1960, Richdale 1963, Thoresen 1967). Then from 23 December the intensity of calling increased and this was partly attributed to the influx CROCKETT

of unemployed birds. Activity gradually decreased towards the middle of January and the colony was extremely quiet from that time onwards. *Laying:* 

After their absence in the first half of December, birds returned and laying commenced. The first eggs seen appeared in burrows 16 and 24 of the study area on 12 December, after which the rate of laying increased steadily until 18 December. After this date the number of new eggs discovered each day began to dwindle with the last fresh egg being discovered on 28 December. Laying was thus spread over 16 days with a peak between 15 and 23 December. Gross, Moulton & Huntington (1963) observed that egg-laying was at a peak on or soon after 15 December on Heron Island.

For this species on the Kermadec Islands a laying period from the last week of November to the second week of December (Murphy 1951) and a laying peak in early December (Oliver 1955) have been reported. So the 1966 laying period was about 2 weeks later than these. Sooty Terns breeding at Denham Bay showed a similar trend (Peart in prep.).

The laying of the egg was sometimes immediately preceded by the presence of a bird in the burrow for one or two days. However, the sexes were not distinguished in this study. On most occasions the single egg was laid at night.

On 30 December, two days after the last fresh egg was discovered, 72 (85%) of the 85 marked burrows in the study area contained eggs. No eggs were laid in the remaining 13 occupied burrows which, except for two, were abandoned by mid-January.

#### Nest blocking:

Warham (1960) described blocking of burrows by the Shorttailed Shearwater (*Puffinus tenuirostris*) on Bass Strait islands. A close watch was kept for this type of behaviour.

Several birds had rather short burrows in which they were exposed to direct rays from the sun. On a number of occasions these burrows were found to be blocked with loose vegetation. I was unable to determine whether these piles of vegetation at burrow entrances were part of the nest-making process which had temporarily halted or if the material had been deliberately placed to block the passage of light. Often I noticed that the mouth of a burrow had been partially blocked with soil. Thinking that the burrow had been abandoned, I took a closer look only to discover a bird sitting quietly upon its nest.

#### Nesting failure:

I left Meyer Island before chicks hatched but marked nests allowed a fairly accurate assessment of nesting failure prior to 19 January. Before 7 January there had been nearly 40 rain-free days which had caused most herbaceous plants to wilt and die. During these 40 days the burrowing of many thousands of Black-winged Petrels and Wedge-tailed Shearwaters had scattered much debris and soil over the western slopes of North Meyer. An extremely heavy and prolonged downpour, commencing about 0430 hours on the morning of 7 January, sent torrents streaming down the hillside carrying debris and soil which washed over the cliffs on to the terrace below.

By 0700 hours the downpour had ceased and a scene of destruction greeted us. A great amount of scouring had occurred, while in areas where the rushing water had met a barrier, rubble to a depth of about 45 cm had been deposited. A survey showed that some burrows had been completely demolished. Other burrows along the edges of a temporary stream were swamped while some were completely filled with debris. A large number of burrows had been inundated with water but drained fairly quickly leaving the nesting chamber quite sodden and the egg damp. Entrances of many burrows were blocked with debris which, on removal, liberated scared bedraggled birds that rushed out and headed seawards. However, I noted that very few attempted to dig themselves out. The usual evening round on 7 January showed that the entire study area was practically devoid of birds.

However, on the following evening a large number were on the surface. These were mostly banded and in worn plumage, so were not the unemployed birds which had been present about the colony since the last week of December and which were recognisable by their fresh plumage. For the next two nights much activity was observed with over 120 birds recorded on the surface. Many of the swamped burrows were being cleaned out and a start was made in lengthening partially-destroyed burrows. Some banded birds were searching for (marked) burrows which had been completely obliterated. These birds were seen about the nesting area for at least six nights following but, as far as I could discover, none attempted reburrowing.

This is a summary of the marked burrows damaged or destroyed on 7 January:----

- 72 burrows contained an egg on 30 December 1966.
- 33 birds were still incubating on 18 January 1967.
- 39 burrows were abandoned because of rain 22 of these were totally destroyed.
- So 54% of occupied nests were deserted because of water damage.

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#### LITERATURE CITED

LITERATURE CITED
 BOESON, B. W. 1964. Seabirds found dead in New Zealand in 1962. Notornis 10 (8): 404-411, tables 1-3.
 CHEESEMAN, T. F. 1890. On the birds of the Kermadec Islands. Transactions and Proceedings of the New Zealand Institute XXIII: 216-226.
 EDGAR, A. T.; KINSKY, F. C.; WILLIAMS, G. R. 1965. The Kermadecs Expedition 17 - 25 November 1964. Notornis 12 (1): 3-43, pls 1-1X, 1 map.
 FALLA, R. A. 1962. A Wedge-tailed Shearwater in New Zealand. Notornis 9 (8): 278-279.
 GROSS, A. O.; MOULTON, J. M.; HUNTINGTON, C. E. 1963. Notes on the Wedge-tailed Shearwater at Heron Island, Great Barrier Reef, Australia. Atoll Research Bulletin 99: 1-11, 2 tables, 1 plate.
 GUTHRIE-SMITH, H. 1936. Sorrows and joys of a New Zealand naturalist. Wellington: A. H. & A. W. Reed.
 IREDALE, T. 1910. Bird life on the Kermadec Islands. Emu 10 (1): 2-16, pls II-V. 1912. Concerning the Kermadec Islands' avifauna. Transactions and Proceedings of the New Zealand Institute XLV: 78-92.
 LOCKLEY, R. M. 1942. Shearwaters. London: J. M. Dent & Sons Ltd.
 MERTON, D. V. 1951. The populations of the Wedge-tailed Shearwater (Puffinus pacificus). American Museum Novitates 1512.
 UNRPHY, R. C. 1951. The populations of the Wedge-tailed Shearwater (Puffinus pacificus).

MERTION, D. V. 1970. Rermade: Islands expedition reports: A general account of birdlife. Notornis 17 (3): 147-199.
 MURPHY, R. C. 1951. The populations of the Wedge-tailed Shearwater (Puffinus pacificus). American Museum Novitates 1512.
 OLIVER, W. R. B. 1930. New Zealand birds. Wellington: Fine Arts (N.Z.) Ltd. 1955. New Zealand birds. Second ed. Wellington: A. H. & A. W. Reed.
 RICHDALE, L. E. 1963. Biology of the Sooty Shearwater Puffinus griseus. Proceedings of the Zoological Society of London 141 (1): 1-117, Text-figs 1-4, pls. 1-2, tables 1-45.
 SERVENTY, D. L. 1958. Recent studies on the Tasmanian muttonbird, Puffinus tenuirostris. Australian Museum Magazine 12: 327-332.
 SORENSEN, J. H. 1964. Birds of the Kermadec Islands. Notornis 11 (2): 69-81, figs 1-5.
 THORESEN, A. C. 1967. Ecological observations on Stanley and Green Islands, Mercury Group. Notornis 14 (4): 182-200, pls XXVIII-XXXIX.
 WARHAM, J. 1960. Some aspects of breeding behaviour in the Short-tailed Shearwater. Emu 60 (2): 75-87, text-figs 1-3, pls 6-8.
 WATSON, J. S. 1961. Rats in New Zealand: A problem of inter-specific competition. Proceedings of the Ninth Pacific Science Congress, 1957. 19: 15-17.
 WATT, J. C. 1971. Ectoparasitic insects on birds and mammals of the Kermadec Islands. Notornis 18 (4): 227-244, figs 1-16.

#### APPENDIX I

#### QUADRAT SUMMARY

Status of Wedge-tailed Shearwater burrows in ten 225 sq. ft. quadrats on North Meyer in January 1967.

#### Ouadrat Description

- 1. Large boulders embedded in soft clay soil. Clumps of Cyperus, spinach and Paspalum. Gentle slope.
- 2. Soft soil beneath a clump of Ngaio trees on steep, sloping ground.
- 3. Cyperus-covered soft soil beneath a high canopy of Ngaio. Gentle slope.
- 4. Gentle slope of soft soil with occasional boulders. Cover of spinach.

Densitv

- 16 Occupied 3 Unoccupied
- 12 Occupied
- 11 Occupied
  - 3 Unoccupied (plus 3 Kermadec Petrel nests)
- 14 Occupied

- 5. Soft soil accumulated amongst boulders at the foot of a cliff. Covered with *Cyperus*. Almost flat.
- 6. A steep gully with all soil washed out. Cracks and caves. These have been modified into burrows.
- 7. Beneath root system of a large Pohutukawa. Gentle slope.
- 8. Accumulation of soil on a flat surface retained by a vertical lava dyke. Covered in *Cyperus*.
- 9. A steep face with alternate layers of hard and soft rock. Mainly small caves.
- 10. A steep slope of gritty, disintegrating, volcanic rock. Easily burrowed.

- 22 Occupied
  - 3 Unoccupied (plus 3 Black-winged Petrel burrows)
  - 7 Occupied 1 Unoccupied
  - 6 Occupied (plus 2 Black-winged Petrel burrows)
  - 7 Occupied (plus 1 Kermadec Petrel nest 3 Black-winged Petrel burrows)
  - 9 Occupied (plus 2 Black-winged Petrel burrows)
  - 8 Occupied (plus 1 Black-winged Petrel burrow)

#### APPENDIX II

#### BURROW-ASSOCIATED FAUNA

Two samples of nest cup material were collected and processed by Dr J. C. Watt. His report reads:—

"The first sample comprised soil and leaf litter and contained mainly several species of mites (Acarina), one species of Collembola and two species of Lepidoptera caterpillars. Also present were a few of the following (one species of each) millipede, elaterid beetle larvae, earwig, spider and staphylinid beetle.

The second sample comprised mainly soil and karaka leaves and contained many mites and caterpillars, plus a few earwigs, an ant and an earthworm. All of these, except perhaps some of the mites, normally inhabit soil and/or leaf litter. A detailed analysis will be available at a later date."

#### **ECTOPARASITES**

The following were collected from live Wedge-tailed Shearwaters on North Meyer Island (Watt 1971): the Mallophaga (biting lice) Ancistrona sp., Austromenopon sp., Halipeurus mirabilis, Naubates harrisoni, Saemundssonia puellula and Trabeculus hexacon; and the flea Parapsyllus sp.

David E. Crockett, 21 McMillan Avenue, Kamo, Whangarei

1975

### NOTES ON A FIELD TRIP TO FIJI

By BETH BROWN and PETER CHILD

#### ABSTRACT

A field study of birds was made by some members of the Ornithological Society of New Zealand in two areas of the Fiji Group, the Nausori Highlands of Viti Levu and the isolated island of Vatulele, in August-September 1972. A table shows numbers of each species recorded in a particular piece of cutover forest in the Highlands together with estimated density and habitat utilization. Land birds, seabirds and migratory waders were recorded at Vatulele Island and a list of species recorded, with relevant observations, is given. One species new to Fiji, the Spine-tailed Swift (*Chaetura caudacuta*), is recorded.

#### INTRODUCTION

Following the Ornithological Society's field survey of August 1970 to several places in the Fijian Islands (Blackburn 1971), a group of members formed a party to make a further study of birds in the Nausori Highlands and to visit Vatulele Island. This island, lying 32 km south of Korolevu, a well-known resort on the southern coast of Viti Levu (see map in Morgan & Morgan 1965: 159), is to be developed for tourism shortly.

The organization was undertaken by J. A. Brown\* and Mrs Beth Brown\*. Other participants were H. F. Alloway, Mrs M. Alloway, M. Alloway, Mrs B. A. E. Baker, Mrs G. Bennie, H. M. Brown, W. F. Cash\*, P. Child, P. T. Crombie\*, Mrs G. Eller, D. Hickman, Miss A. Hutson\*, Dr P. V. Jenkins, Mrs P. Jenkins\*, E. Kelly and D. Metherell [\* denotes members of the 1970 party]. Peter Child compiled the field records and chart.

The Nausori Highlands camp was set up on the site occupied by C party in 1970. This lies just off the main road running from Nadi to Bukuyu village at a point 24 km past the Pacific Lumber Company's mill. Forest here was being milled in 1970 and birds appeared to be less plentiful in 1972. In an adjacent area, birds now uncommon in the cut-over section were readily seen from new roads into the as yet unmilled forest. The party was not able to investigate this area in depth owing to lack of transport and the distance from camp.

During the period spent in the Highlands overcast skies with light showers and long fair intervals were experienced. The wind was a moderate south-easterly with calm spells in the early mornings and evenings.

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The party carried out observations from 30 August to 4 September 1972 inclusive, in an area within approximately a  $1\frac{1}{2}$  km radius of camp in the cut-over forest. Findings, which apply to this area only, appear in the following table. Daily tallies were made of numbers actually identified and seen.

It should be noted that:

- 1. Birds were recorded by a limited few competent observers, generally not more than six persons on any one day.
- 2. Numbers of birds recorded tended to increase as observers became more proficient at identification and seeking appropriate habitats.
- 3. Some wide-ranging species could be counted by more than one observer on a particular day, e.g. Peale's Pigeon.
- 4. The estimated abundance recorded for some species is affected by their degree of timidity and wariness, and confinement to dark understorey, e.g. Golden Whistler, which by call appears to be more common than these records suggest. Giant Honeyeaters are easy to hear but difficult to see. Conversely Peale's Pigeon is conspicuous by call, size and ease of sighting. The Fiji Warbler was not seen at all until BB taped the call via a parabolic reflector and played it back, whence the bird emerged from very low dense undergrowth and was keenly and critically examined by all members of the party.

## ADDITIONAL NOTES ON SOME SPECIES – NAUSORI HIGHLANDS

#### SWAMP HARRIER (Circus approximans)

Probably only older birds were recorded for those seen were greyish above and pale creamish below. This bird was more an active hunter and less of a scavenger than the New Zealand bird and was seen on more than one occasion to be hunting through the forest at mid heights.

#### PEREGRINE FALCON (Falco peregrinus)

Seen over a roadway by PVJ and PJ on 3 September at 1000 hours, flying with a rapid wingbeat and identity confirmed by a local Fijian man. Members of the party did not have the opportunity of visiting the tantalizingly attractive volcanic cliffs and outcrops visible in many directions in the distance, and where falcons are said to be more generally found, as indicated by Clunie (1972).

#### FAN-TAILED CUCKOO (Cacomantis pyrrhophanus)

One was seen briefly in excellent light about 6m up on a limb by PC on 3 September.

#### WHITE-RUMPED SWIFTLET (Collocalia spodiopygia)

No tallies were kept, but this was found to be an extremely common bird all over forest, grassy clearings and roadways during the heat of the day, darting in all directions incessently until sunset.

#### BROWN & CHILD

Nausori	Highlands:	Ňu	mbers/D	ensity		Hal Uti	oitat lisati	lon		
Grid, Kei c. 17704 30.8.7 Alt: c.17 S (Order au	:: 572, 6035. :0'E, 17 <sup>0</sup> 47'S. '2 to 4.9.72(inc.) 00' :pecies: s listed in Mayr)	Greatest Daily Tally:	Typical group size	Comparative abundance: Scale $1 \rightarrow 5$ 1 = rare 5 = abundant	Low dense undergrowth	Medium height understorey	Sub-canopy	Canopy	Bush clearings & roadways	Open Country & aboverest
Fiji Gosl	nawk	2	1	2			1 1111/1	UMI	(IIII)	VIIII))
Swamp H	arrier	4		2			TIMIN,			016760
Perearing	Falcon		1	1						TTITA
Many-co	loured Fruit Dove	20	2 - 5	4			mm	mт		1411.111
Goldon F	love	6	1 - 2	2			111111	11.111		
Pealo's J	Piceon	49	1 - 3	5			177	mm		
White-th	roated Pigeon	30	1 - 2	3			Thirty .	mm	im	
Collared	Lory	11	2	3			1000 EU	mn	3 <b>4</b> 2-11	
Yellow-b	reasted M.Parrot	53	1 - 5	4			nnn	אות		
- Fan-taile	d Cuckoo	1	1	1			7000			
White-ru	mped Swiftlet	100+	6 - 12	5					mn	aunik
Kingfishe	r	18	i - 4	3			0.000		mm	
White-br	easted W.Swallow	7	1 - 2	2					111	nnna
Polynesia	an Triller	36	1 - 3	4			ШШ	IIIIA		
Red-vent	ed Bulbul	2.0	1 - 3	3				הודת	771	
Island Ti	rush	9	1	2	mit		TIM	7/77		
Polynesia	n Starling	33	1 - 4	3.			711177	וחות		
Indian M	vna	12	1 - 4	2				mit	m	
Jungle M	vna	7	1 - 3	ż				TTTT		VTTA
Fiji Warb	ler	6+	1	3	m					1123
Spotted 1	antail	31	1 - 2	3		mitt	777			
Slaty Fly	catcher	14	1 - 2	2		11111	TTTT			
Fiji Shrik	cebill	1	1	1		11/1				
Vanikoro	Broadbill	10	1 - 2	2			772			
Blue-cres	sted Broadbill	5	1	1	Ø					
Scarlet R	obin	14	1 - 2	3	mh	771			7777	
Golden W	histler	6	1 - 2	2	27		73			
Orange-b	r. Honeycater	21	1 - 2	3	W	TTIO)	77772			
Wattled 1	Honcyeater	20	1 ÷ 2	4			mmn	1111		
Giant Fo	est Honeyeater	11	1 - 2	4			TUM			
Layard's	White-eye	79	4 - 5	5	Ø.	ЩЩ	7			
Grey-bac	ked White-eye	8+	4 - 5	2	ZŻ	m	72			
Red-head	ed Parrot Finch	13	1 - 5	2						I
Strawberr	y Finch	18	2 - 6	3					TIL	
		(	ļ	1		Í				

Flocks of six to twelve were common in any one area, also seen occasionally quite high above the canopy. The snapping of the bill as insects were taken was tape-recorded with birds about 15m away. WHITE-COLLARED KINGFISHER (Halcyon chloris)

One to four were seen almost every day on the edge of forest clearings or near streams, usually perched high on an exposed limb. RED-VENTED BULBUL (Pycnonotus cafer)

A few were seen nearly every day. This bird has invaded the highland forest.

ISLAND THRUSH (Turdus poliocephalus)

More often heard than seen, but not especially common in the areas near camp.

POLYNESIAN STARLING (Aplonis tabuensis)

One was seen carrying nesting material, and another went in and out of a broken tree-trunk about 4.5m high, opposite camp, as if investigating a nest site. This same site was in use in 1970, when C party members watched starlings carrying food to the nest-hole. A high-pitched two-note whistle is frequently heard.

JUNGLE MYNA (Acridotheres fuscus)

Small numbers were recorded. PJ saw three hunting for food on a horse in a forest clearing. A colour-slide taken at the time shows the horse feeding head down, with one myna on the back while a second clings to the side of the horse's neck with its beak to the ear, apparently pecking. The ear is a common site for ticks to be found on various animals.

#### FIJI WARBLER (Vitia ruficapilla)

Although described by Mercer (1966) as uncommon, this little secretive bird was reasonably common in all directions from the camp. On some occasions at least three or four separate territories could be delineated by calls simply by listening carefully from one spot. Evidently the most shy bird of the forest, its identity could not be definitely established by a sighting until it was enticed from the dark undergrowth by taped calls. In short flights of 12 to 15m between vantage spots, which more than once formed a rough triangle, its course was straight, level and movement so rapid that colour could not be distinguished. This mode of flight is contrary to B party's observations in the Highlands in 1970 but the effect on the bird of hearing its own call must be taken into account. Seen perched at a low level in sunshine the Viti Levu subspecies V. r. badiceps was noted by BB as: crown, a shining rufous cap; upper surfaces, glossy olive, becoming greener towards tail; under surfaces, medium to light grey; superciliary, cream; legs, clear pink; black line through eye; light line on wing (seen folded). Surprisingly the distinctive call of this bird was heard coming from a scrubby gully below the lookout on the road between the Nausori Highlands and Nadi. This position was near a high rocky escarpment in steep dry grassland at least 3km from the forest.

#### SCARLET ROBIN (Petroica multicolor)

On more than one occasion the usually black regions of the typical adult were found to be medium greyish, with black eye-patches. These were considered probably to be immature birds.

WATTLED HONEYEATER (Foulehaio carunculata)

One bird was identified as a young of this species.

LAYARD'S WHITE-EYE (Zosterops explorator) and

GREY-BACKED WHITE-EYE (Zosterops lateralis)

The grey-backed was definitely present in the Highlands but not to the same extent as Layard's, which is one of the commonest birds of the understorey. On one particular count PC recorded 8 grey-backs for certain, and 40 Layard's for certain in the same period of time. Grey-backs are more difficult to identify quickly.

Notable omissions from the Highlands sightings were Long-tailed Cuckoo (*Eudynamis taitensis*), Black-faced Shrikebill (*Clytorynchus nigrogularis*) and Red-throated Lorikeet (*Vini amabilis*). After returning to New Zealand BB found on carefully checking tape-recordings that the mournful voice of the Black-faced Shrikebill was audible on a tape made on 2 September. Comparison was possible with duplicates of recordings made by GPR, assisted by LEH (both of B party) at Kadavu in 1970, with the bird in view. The 1972 recording was made in the same clearing where a pair of Black-faced Shrikebills was observed on 10 September 1970, feeding at the edge of heavy forest in the Highlands by BB, RVC and RBS.

#### VATULELE ISLAND

The party crossed from Korolevu Beach Hotel to the landing jetty at Ekubu on the morning of 6 September. The crossing of 32 km took  $2\frac{1}{2}$  hours in rough seas. Camp was established at the northern end of the island at a sandy flat known as Mataikoro, where a sheltered site was put at our disposal by our Fijian hosts. Saltbushes provided a windbreak and the sandy beach nearby proved to be an asset for birding and bathing. There are no streams on Vatulele and brackish ground water is the only supply other than a limited amount of rain water. Both were brought from Taunovo in drums and rationing became necessary. The party remained here until 11 September.

Continuous strong south-easterly winds of 25 to 30 knots day and night made viewing difficult and birds hard to find. Wind also prevented a trip to offshore islets. Weather remained partly cloudy to overcast and dull with occasional very light showers. Temperatures were warm throughout. It was necessary for members to walk considerable distances daily, often over difficult terrain in order to cover the island as fully as possible.

The island of Vatulele is 13 km long and 5 km across at its widest point near the northern end and lies in approximately a north-south direction. It is low-lying with a cultivated and inhabited coastal strip on the eastern side which occupies about one quarter of the



FIGURE 1 — Map of Vatulele Island, Fiji.

area. The four villages from north to south are Taunovo, Ekubu, Lomanikaya and Bouwaqa, with a total population of close to 1,000 inhabitants. Groves of coconuts, breadfruit, and carefully tended gardens of bananas, pawpaws, cassava, yams, kumaras and taro are situated on the coastal strip. Villages are linked by a narrow roadway running to within one kilometre of the southern end and used by the only motor vehicle, a tractor. The remaining land is undulating with a surface of very sharp rough broken coral and rises gently to the west coast, where four stretches of vertical cliffs stand. Cover consists of varied bush interspersed with some taller trees and isolated groves of coconut palms towards the west coast. In the northern region a combination of jagged coral covered with undergrowth and a thorny vine frequently made progress through the forest difficult to impossible. The encircling coral reef lies about a kilometre offshore except along the south-western side where it reaches to within 100 to 200 metres of the land. A lighthouse stands near the northern end of the island. Two tiny islets off the southern tip covered with wind-blown scrub, Valololevu and Valololailai, showed no evidence of being used as rookeries. Another group of rocky islands called Vatusavu,  $\frac{1}{2}$  km north-east of Mataikoro, was not visited. The largest supported about ten coconut palms and smaller rocks here may be a suitable roosting or breeding site for Common Noddies. Half a kilometre to the east of these rocks is a larger group, Vatulevu, with two sizeable islets. The larger of these was visited briefly during the return crossing to Korolevu and has a small sandy beach and a coconut grove. It was said to be a breeding site for terns but only boobies were found there on 11 September.

A means of increasing the village food supply was brought to our notice when two young boys called at camp on their way to hunt for jungle fowl, with the elder carrying a domestic pair, one under each arm. The method is to place a tamed hen as a decoy in a likely spot, and when a feral cock appears to claim her the tamed cock is released on a long cord. In the ensuing fight both birds become entangled and the wild one is readily captured.

There are no free-ranging domestic mammals on Vatulele. A very few cattle and two or three horses are kept tethered and pigs are penned.

Islanders were seen crushing roots from a shrub as a preliminary to fishing. These are then placed in a bag and hung from a boat. The juice exuded stuns fish. Parham (1964): 73) says that the roots of *Derris trifoliata* were used for this purpose but that their use was now unlawful. He also mentions (p. 43) that the sccds of *Barringtonia asiatica* (Vuturakaraka), a large tree, have a similar effect. No land snakes were encountered, although a thin whistle heard at the base of a tall tree on which Pacific Pigeons roosted was attributed by native boys to a poisonous snake. One ringed sea snake was found ashore where it had possibly come to breed. These are venomous but are not considered dangerous because they have extremely small mouths. The islanders said that large inland caves, formerly a haven for the people in times of unrest, are a roosting place for fruit bats. We found these caves empty but a musty ammoniacal odour lent credence to the information. It was possible to climb up through a large cave to a rock above and gain a vantage point.

#### LAND BIRDS -

#### REEF HERON (Demigretta sacra)

In a total of 21 birds seen no mottled-phase birds were recorded. The ratio of all-grey to all-white birds was a clearcut 2 to 1. The most seen were 6 grey and 3 white in 13km of east coast on 7 September (PC, DH). Smaller numbers seen on other days were in the same ratio and Vatulele birds would seem to be at variance with relative percentages elsewhere in Fiji (Blackburn 1971), though no conclusions are possible with the small total of 21.

GREY DUCK (Anas superciliosa).

Present, but not abundant, with 2 separate pairs seen on the east coast and 4 near Taunovo village.

SWAMP HARRIER (Circus approximans)

Windy conditions kept this bird low over bush and gardens and no more than 2 or 3 were seen daily. These were noticeably grey above and pale below. One was seen over the reef and another, surprisingly, chased pigeons through a coconut grove. FERAL FOWL (Gallus gallus)

One colourful rooster was seen by MA in the western bush and a semi-domesticated rooster was shown to us in Taunovo village. This had brilliant plumage. They are said to be fairly common.

BANDED RAIL (Rallus philippensis)

Single birds were noted on several occasions near villages and gardens and WFC saw 2 together on the eastern beach. None was encountered in marshy areas or heavy bush.

MANY-COLOURED FRUIT DOVE (*Ptilinopus perousii*)

Uncommon on Vatulele; only one was seen, inland on 9 September.

MALAY TURTLE DOVE (Streptopelia chinensis)

Found commonly all over the island, and especially in and around villages, this dove was even seen right down to the tide-line. An easy living was available for it wherever coconuts were being split for copra or other purposes.

#### PACIFIC PIGEON (Ducula pacifica)

This large pigeon was reasonably common, especially inland where it was seen in groups of large spreading trees which were fruiting. 11 were recorded on a track to the caves on 9 September.

#### WHITE-THROATED PIGEON (Columba vitiensis)

Not very common and found mainly in ones and twos in coconut trees, but on one occasion BB surprised 6 feeding on the ground on broken nuts.

#### COLLARED LORY (Phigys solitarius)

Fairly common, especially towards the southern end. They were generally in pairs feeding on the flowers of coconut palms.

#### BARN OWL (Tyto alba)

Villagers told us that this is present in small numbers and hides in hollow trees. Three of the party saw one, which WFC photographed at 1130 hours in bright light on a palm frond. A screech, probably this bird's hunting call, was heard from camp at 2015 hours one evening.

#### WHITE-RUMPED SWIFTLET (Collocalia spodiopygia)

Very commonly seen in open places, these were also observed hawking above the forest and cliffs on the western side. PTC saw them flying in and out of cliff crevices near Vetau beach and considered that they were possibly nesting there. This beach lies on the northern side near the lighthouse.

WHITE-COLLARED KINGFISHER (Halcyon chloris)

Some birds seen showed buffish below. No more than one was seen on any one day.

#### PACIFIC SWALLOW (Hirundo tahitica)

Sightings of 2, 1 and 4 were made on consecutive days at a northern cliff ledge. Nesting was suspected when one was seen carrying straw.

#### POLYNESIAN STARLING (Aplonis tabuensis)

A few were seen in larger forest trees, with 5 in a flock on 10 September. One was seen in a coconut palm on the same day carrying nesting material.

#### INDIAN MYNA (Acridotheres tristis)

A few were noticed in Ekubu on our arrival but were uncommon elsewhere.

#### SLATY FLYCATCHER (Mayrornis lessoni)

On 9 September GE and WFC reported 2 seen in tall forest canopy. There were no further sightings.

#### VANIKORO BROADBILL (Myiagra vanikorensis)

Uncommon, but distributed in varied habitats from scrub at the eastern beach to dense bush in the west and south.

#### WATTLED HONEYEATER (Foulehaio carunculata)

A common bird throughout, with GE noting 27 in 5km of main road on 10 September, it may differ from the Viti Levu subspecies *F. c. procerior.* Vatulele birds seemed noticeably smaller and very pale on the undersurfaces in comparison, especially on the underbelly and tail. The well-formed wattles were a definite yellow. Calls were different with a complete absence of the usual repetitive 'kikau.' Three old nests were found at low levels in exposed situations suspended more or less hammock fashion at 1 to  $2\frac{1}{2}m$  above the ground. These were built of loosely coiled rootlets. Fledglings were calling and being fed. The islanders said that these birds have a clutch of 2 to 3 eggs, white with dark spots at one end.

#### SPINE-TAILED SWIFT (Chaetura caudacuta)

On 8 September PC and PTC were below the lighthouse when two swifts were seen flying about the cliffs. PTC reports: "We were sitting on a rocky ledge watching a pair of tropic birds when two swifts appeared above and rapidly lost height until we were looking down on them. The upper surfaces were dark and the spines showed plainly on their tails. The pair circled into the cliffs and disappeared. They came back again in about five minutes and flew past us and out of sight round a bend. The birds were about 30m away and were watched through binoculars."

As far as can be ascertained the above is a first record for this species in Fiji. It is not listed by Mercer (1966). Mayr (1945: 77-78) says that *C. caudacuta*, which winters in Australia, may migrate through Micronesia and the Bismarck Archipelago but knew of no definite records. Fiji lies east of this possible migration route to breeding areas in eastern Asia and Japan. However, vagrants have appeared in New Zealand on a number of occasions and in 1942-3, November-March, there was a considerable invasion (Falla, Sibson & Turbott 1966: 187). Oliver (1955: 447) says that a few birds have been seen in August and September. Therefore, it is not surprising that these birds should occur in Fiji, lying as it does due north of New Zealand, for at the time that they were seen they could be expected to be on a southward migration.

#### SEABIRDS —

#### WHITE-TAILED TROPIC BIRD (Phaethon lepturus)

Four were seen on 7 September off cliffs near camp. A nest was found at the western end of the camp beach next day. This was in a rather dark pocket of the cliff about 3m above high water. An adult was brooding a small fluffy chick whose egg tooth was still showing. Both were still present the following morning.

#### BROWN BOOBY (Sula leucogaster)

Noted as uncommon with 3 or 4 being seen each day over the reef and beyond. Usually easily distinguished by the clear-cut demarcation between the brown and white on the breast, it was also noticed that the flight of this species is much closer to the water than the other two seen.

#### RED-FOOTED BOOBY (Sula sula)

An adult was identified from the launch on 6 September and others were seen in flight over the reef and beyond. Both adults and immatures were found in fair numbers roosting in trees on Vatulevu islet, visited on 11 September, and were characterised by the pinkish to reddish feet.

#### BLUE-FACED BOOBY (Sula dactylatra)

Small groups were seen fishing at sea during the crossing from Korolevu. The dark tail of this species was noted in birds passing

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along the reef breakers from camp at about 0600 hours. When Vatulevu was visited on 11 September both adults and immatures in various plumages were roosting on the coral heads.

#### LESSER FRIGATE BIRD (Fregetta ariel)

Evidently present in very small numbers with one male flying low over palms near camp on 8 September, and 4 recorded by PJ next day, over cliffs to the north of camp.

#### CRESTED TERN (Sterna bergii)

Regarded as common with some tens inside the reef on any one day, and a few seen further at sea during the voyage across. A tally of 59, all apparently adults, was made in 13km of coast on 7 September. No sign of a nesting colony was seen on Vatulevu islet on 11 September, although one immature carcase was recovered from a low rock. As mentioned, rocks at Vatusavu seemed to offer a suitable site for breeding or roosting for this species.

COMMON NODDY (Anous stolidus)

The only noddy seen and present in small numbers. Usually 1 to 3 birds could be seen in the early morning or evening offshore from the camp. It seemed to be roosting, with a possibility of nesting, on the rocky pinnacles of Vatusavu when we passed nearby on 11 September.

#### WADERS —

PACIFIC GOLDEN PLOVER (Pluvialis dominica)

A total of 22 was recorded in 13km of east coast on 7 September. The largest flock was 13 seen with tattlers on 11 September.

WANDERING TATTLER (Tringa incana)

Found mainly on the eastern side, with the largest count 59 and best flock 14. Only two or three were found on the western beaches, for in general this side, with a lack of exposed tidal flats, was less suitable as a feeding ground for waders.

#### SIBERIAN TATTLER (Tringa brevipes)

Two, and a possible third were seen on 7 September. All were poticeably pale below. The double-syllable call was heard frequently and, less often, the slightly longer trill which is not to be confused with the rippling whistle of T. incana. Both species, with other waders, fed from the beach to the edge of the green growth and sheltered from the strong winds in the rocks above.

TURNSTONE (Arenaria interpres)

The largest daily tally was 32 and the largest flock 18.

#### APPENDIX I

#### The following is a list of probable sightings:

Fiji Goshawk (Accipiter rufitorques) Golden Dove (Ptilinopus luteovirens) Polynesian Triller (Lalage maculosa) Jungle Myna (Acridotheres fuscus) Spotted Fantail (Rhipidura spilodera) Golden Whistler (Pachycephala pectoralis)

#### APPENDIX II

Birds said to be present but not recorded: Crimson-crowned Fruit Dove (*Ptilinopus porphyraceus*) Fan-tailed Cuckoo (*Cacamantis pyrrophanus*) Grey-backed White-eye (*Zosterops lateralis*) Black-naped Tern (*Sterna sumatrana*) White Tern (*Gygis alba*)

#### DISCUSSION

With the exception of the Wattled Honeyeater and Polynesian Starling, the smaller forest passerines typical of the Nausori Highlands are relatively uncommon on Vatulele, and the handsome Pacific Pigeon is a notable addition to the avifauna. Further examination of the more densely vegetated parts of the island is warranted under better viewing conditions, perhaps during a less windy season. The northerm offshore islets need further investigation for breeding seabird species.

Additional species of Arctic waders could be expected periodically on the eastern tidal flats of Vatulele. Also, with a view to gathering more information about migratory patterns of Arctic waders, it seems desirable to have further seasonal counts from various islands as has been done for Suva Point by the Morgans (1965: 161).

In the Highlands of Viti Levu further work is needed in at least three habitat types; high altitude ranges, unmilled forest and among the difficult terrain of volcanic outcrops and cliffs of exposed ridges.

The current position of sub-speciation on separate islands or groups is another field awaiting further documentation, although the joint National Museum of New Zealand and Fiji Museum general study of the Fiji avifauna being undertaken at present includes such studies.

It will be obvious from these comments that the diversity of habitat found in Fiji offers plently of scope for both the amateur and specialist researcher.

#### **ACKNOWLEDGEMENTS**

Sincere thanks are extended to many people who helped make this field trip a success. Among those to whom we owe special thanks are Mr Fergus Clunie of the Fiji Museum, Suva, for helpful advice. In the Nausori Highlands the kind people of the Pacific Lumber Company and, in particular, Mr & Mrs G. Beckham and Mr & Mrs M. Thoms gave invaluable assistance with supplies.

We thank Mr Maurice Clark of Korolevu for help and advice. Mr Ifierimi Rotuira, Headman of Taunovo village, and his family were most hospitable and kind to all members of the party who greatly appreciated their welcome and help. Master Serai, senior teacher of

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Vatulele, gave valued aid and his wide knowledge of Fijian lore was appreciated.

We would like to thank Mr A. Blackburn and Mr H. R. McKenzie who critically read the manuscript. Mrs D. A. Lawrie kindly drew the map of Vatulele Island.

#### LITERATURE CITED

BLACKBURN, A., 1971. Some notes on Fijian Birds. Notornis 18 (3): 147-174.
CLUNIE, F., 1972. Fijian Birds of Prey. Suva: Fiji Times and Herald.
CLUNIE, F., 1972. A contribution to the natural history of the Fiji Peregrine. Notornis 19 (4): 302-321.
FALLA, R. A; SIBSON, R. B.; TURBOTT, E. G., 1966. A Field Guide to the Birds of New Zealand. London: Collins.
MAYR, E., 1945. Birds of the Southwest Pacific. New York: Macmillan.
MERCER, R., 1966. A Field Guide to Fiji Birds. Suva: Government Press.
MORGAN, B.; MORGAN, J., 1965. Some notes on birds of the Fiji Islands. Notornis 12 (3): 158-168.
OLIVER, W. R. B., 1955. New Zealand Birds. Wallington: A H & A W Peed

OLIVER, W. R. B., 1955. New Zealand Birds. Wellington: A. H. & A. W. Reed. PARHAM, J. W., 1964. Plants of the Fiji Islands. Suva: Government Press.

Beth Brown, 39 Red Hill Road, Papakura.

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#### WILDLIFE AT WORK

Once again the very welcome annual summary of the activities of the Wildlife Service of the Department of Internal Affairs is at hand. Wildlife — A Review No. 5 (1974), edited by Peter Morrison, includes the following reports: Wetland conservation; The Mallard/ Grey situation; Conservation of Brown Teal; Paradise Shelduck; Lead poisoning in waterfowl; Albatrosses of the Chatham Islands; The food of oceanic birds; Chatham Island Black Robin; Mangere Island; Raoul Island; the climate of a frog habitat; Are Tuataras dependent on petrels?; *Placostylus*; Forest Survey; Takahe; Mt Bruce Native Bird Reserve, and it concludes with a list of recent scientific publications.

Wildlife Branch is said to have acquitted itself nobly at the International Ornithological Congress at Canberra and a number of overseas participants have commented on the policies of conservation and island protection being carried out. The substance of this work is reported in *Wildlife* — A Review and will be interesting reading for all members of the OSNZ.

#### BEECH FORESTS

The Symposium on "Ecology and Management of South Island Beech Forests" held by the N.Z. Ecological Society in Invercargill during August 1973 has now been published in their *Proceedings*, No. 21, issued December 1974. It will be of considerable interest to all concerned with the scientific background to the Government's The address of the N.Z. Ecological proposals for using these forests. Society is: P.O. Box 1887, Wellington.

# FOREST-DWELLING BIRDS OF THE WAIRAU CATCHMENT, MARLBOROUGH

#### By R. GUEST

#### ABSTRACT

Data from 366 randomly located permanent plots is used to relate the distribution of some bird species to forest type and composition. Whereas the complexity of the forest stand affects the bird population within it, topographical features and the distribution of associated bird species also have an effect.

#### INTRODUCTION

During the period November 1972 to February 1973, the Forest and Range Experiment Station of the NZ Forest Service conducted a survey of the high country of the Wairau Catchment to determine the condition and trend of the vegetation in relation to browsing mammals (Manson & Guest 1974 unpubl.). As part of this survey, 366 randomly located permanent plots were established in the 77 000 ha of indigenous forest. As well as the presence of bird species in the immediate vicinity of the plot, details on the composition and structure of the vegetation and site factors such as altitude and aspect were recorded.

Botanical nomenclature follows that of Allan (1961) and ernithological nomenclature that of the OSNZ Annotated Checklist (1970).

#### RESULTS

The forests of the area are comprised of three main types:— (i) that dominated by mountain beech (Nothofagus solandri var. cliffortioides). In this type the understorey ranged from no vascular species to moderately complex with broadleaf (Griselinia littoralis), Hall's totara (Podocarpus hallii) and Coprosma species. There was an average of 4.5 tree and shrub species per plot. The type was found mostly at higher altitudes, comprising 90% of the plots sampled above 1300 m and 2% of those below 700 m with a corresponding gradient in between.

(ii) that dominated by a variety of beech species. This contained red (N. fusca), silver (N. menziesii) and mountain beech in varying proportions in the canopy; and most often a diverse and complex understorey. There was an average of 11 tree and shrub species per plot. Although it was found throughout the altitudinal range of the forest sampled, it was most predominant between 850 and 1000 m. (iii) that which has beech species, but is mainly dominated by podocarps (*Podocarpus* spp.) and their associated hardwoods, such as

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rata (*Metrosideros* spp.) and kamahi (*Weinmannia racemosa*). There was an average of 16 tree and shrub species per plot. This type was not found above 1000 m, and was most common below 700 m, comprising 55% of the plots found there.

The number of bird species found on each plot was averaged for each forest type. In mountain beech there were  $1.46 \pm 0.09$ species per plot, in mixed beech  $1.87 \pm 0.11$ , and in podocarp/beech  $2.04 \pm 0.22$ . The number of bird species present in mixed beech and podocarp/beech were statistically similar at the 5% level of significance, however both were significantly different from the mountain beech type at the same level.

#### TABLE 1

Species	Mountain beech	Mixed beech	Podocarp/ beech	Signifi (P = 0	.cance .05)
Bellbird ( <u>Anthornis</u> <u>melanura</u> )	52	59	51	not sign	ificant
Tui ( <u>Prosthemadera</u> <u>novaeseelandiae</u> )	1	7	4	not	"
Kea ( <u>Nestor</u> <u>notabilis</u> )	10	10	13	not	11
S.I. Kaka ( <u>Nestor</u> <u>meridionalis</u> )	3	8	2	not	n
Silvereye ( <u>Zosterops</u> <u>lateralis</u> )	3	8	4	not	"
Long tailed cuckoo ( <u>Eudynamis</u> <u>tailensis</u> )	) 4	4	0	not	11
Grey Warbler ( <u>Gerygone</u> <u>igata</u> )	33	27	28	not	tt
S.I. Fantail ( <u>Rhipidura</u> <u>fuliginosa</u> )	4	10	28	highly	11
Yellow breasted Tit ( <u>Petroica</u> <u>macrocephal</u>	<u>.a</u> ) 9	18	17	not	n
S.I. Robin ( <u>Petroica</u> <u>australis</u> )	3	10	21	highly	"

Percentage occurrence of birds in the forest types

The plant species complexity of the different types were significantly different, so this factor alone cannot explain the differences. Recher (1971) and Steele (1972) have suggested that the structure of the forest may be more important than the number of plant species.

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However, the number of bird species found in different forest densities were not significantly different.

Twenty-four species of birds were recorded on the plots. The distribution of the 10 most common species was determined for each forest type (Table 1). Species recorded less frequently are listed in Appendix I.

The S.I. Fantail and S.I. Robin were both strongly attracted to the podocarp/beech forest. The altitudinal distribution of the birds was also determined (Table 2).

#### TABLE 2

The percentage occurrence of birds within altitudinal zones

Species	551- 700	701- 850	Alti 851- 1000	tude (r 1001- 1150	n) 1151- 1300	<b>&gt;</b> 1300	Significance (P = 0.05)
Bellbird	52	48	57	61	59	39	not significant
Tui	14	2	6	5	2	4	significant
Kea	6	7	8	21	10	9	not significant
S.I. Kaka	4	7	10	7	2	0	very "
Silvereye	8	11	0	7	2	9	not "
Long tailed cuckoo	0	2	0	7	4	11	significant
Grey Warbler	19	30	27	29	32	39	not significant
S.I. Fantail	25	11	7	9	2	7	very "
Yellow breasted tit	15	19	15	10	9	7	not "
S.I. Robin	19	11	3	7	12	14	not "

Whereas the Tui and S.I. Fantail were found most frequently in the lower altitudes, the S.I. Kaka preferred the mid-slopes and the Long-tailed Cuckoo the high altitude forest.

The distribution of these bird species was not significantly different in forests of different densities. Other features, however, also have an effect. Decaying wood, openings in the canopy, water, and the dependence on other bird species may influence bird distribution.

That of the Long-tailed Cuckoo, for instance, may well be more dependent on the distribution of Yellowheads (Mohoua ochrocephala) and Brown Creepers (Finschia novaeseelandiae) — its most common hosts — than on any of the habitat factors.

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Little work has been done on the distribution of birds in the indigenous forests of New Zealand. Kikkawa (1966) described the avifauna of different forest types of the South Island, but his types were very general. The dependence of the birds on their environment is little understood and requires investigation.

#### ACKNOWLEDGEMENTS

I am grateful to the Forest Service personnel who collected the field data, and to C. N. Challies, J. Coleman, and Mrs J. Orwin for their comments on earlier drafts of this paper.

#### LITERATURE CITED

ALLAN, H. H. 1961. Flora of New Zealand. Vol. 1. 1085 pp. Wellington, Government Printer. KIKKAWA, J. 1966. Population distribution of land birds in temperate rainforest of Southern New Zealand. Transactions of the Royal Society of New Zealand, Zoology 7 (17):

New Zealand. Transactions of the Royal Society of New Zealand, Zoology 7 (17): 215-77, 14 figs, 4 pls.
MANSON, B. R.; GUEST, R. 1974. The Forests of the Wairau Catchment. N.Z. Forest Research Institute, Protection Forestry Report No. 127 (unpublished).
OSNZ 970. Annotated checklist of the birds of New Zealand. . . The Checklist Committee (F. C. Kinsky, Conv.), Ornithological Society of N.Z. Inc. 99 pp., 4 maps. Wellington: A. H. & A. W. Reed.
RECHER, H. F. 1971. Bird species diversity: a review of the relation between species number and environment. in "Quantifying Ecology." Proceedings of the Ecological Society of Australia 64: 135-52

Australia 6: 135-52. STEELE, R. C. 1972. Wildlife conservation in woodlands. Forestry Commission Booklet No. 29. 68 pp., 30 figs, 11 pls. London: HMSO.

#### APPENDIX I

Bird species recorded on the plots, but not in sufficient numbers to be treated in detail.

Australasian Harrier (Circus approximans gouldi), N.Z. Falcon novaeseelandiae), Western Weka (Falco (Gallirallus australis), Southern Black-backed Gull (Larus dominicanus), N.Z. Pigeon (Hemiphaga novaeseelandiae), Shining Cuckoo (Chalcites lucidus), Morepork (Ninox novaeseelandiae), S.I. Rifleman (Acanthisitta chloris), Brown Creeper (Finschia novaeseelandiae), Yellowhead (Mohoua ochrocephala), Song Thrush (Turdus philomelos), Blackbird (Turdus merula). Chaffinch (Fringilla coelebs gengleri), and Redpoll (Acanthis flammea).

R. Guest,

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#### BIRDS OF THE GAMBIA

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We have been asked by the authors, Jens Kirkeby and Jorn Vestergaard Jensen, of a proposed checklist of the birds of the Gambia to solicit any unpublished records for this area. In the relatively unlikely event that any of our readers have had experiences in the Gambia, contributions should be sent to: Mr Jorn Vestergaard Jensen, Holtevej 13, DK-8000, Aarhus C, Denmark.

### SOME FOODS OF THE WANDERING ALBATROSS (Diomedea exulans)

#### By M. J. IMBER and R. RUSS

#### ABSTRACT

Regurgitations or stomach contents of 7 Wandering Albatrosses (Diomedea exulans) from the New Zealand region (5 from the Auckland Islands, 50°S, where there is the largest known breeding colony of the species) show that Cephalopoda and fish, in that order, are the main foods. No others were detected. Nearly all the prey are partly or wholly mesopelagic but some are known to migrate towards the surface at night. Hence, this albatross feeds at night. Over 80% of the Cephalopoda were bioluminescent. Though squids of the family Onychoteuthidae, because of their large size, seem most important in the diet, those of the Histioteuthidae were by far the commonest prey.

#### INTRODUCTION

In 1881 the Danish scientist Japetus Steenstrup reported to a meeting and subsequently published (1882) the following: "... First Mate Asm. Corneliussen . . . collected during the last voyage [in the southern seas] remains of cephalopods which he had cut out of the stomachs of albatrosses, Diomedea exulans L. These large birds belong, as is well known, to the most voracious cephalopod hunters, and their food consists mainly of the oceanic forms living far from the coasts. As a matter of course the content of their stomachs is of the greatest importance to the scientists whose knowledge of the cephalopod forms from the open sea has hitherto been very scarce. The contents of both the glasses came from the sea a little south of the Cape" (translation from the Danish by Volsoe, Knudsen & Rees 1962; see reference under "Steenstrup 1882"). Among these remains Steenstrup identified some squids to be of the genus Gonatus. But little further progress in elucidating the food of this great albatross had been made 90 years later.

Murphy (1936), citing other workers' findings in addition to his own, reported the food of the albatross to be cephalopods supplemented by fish, with other items obtained by scavenging, but rarely crustaceans. Oliver (1955), possibly heeding Murphy, mentioned pelagic cephalopods, other molluscs, crustaceans and medusae, and commented upon its scavenging habit. McLachlan & Liversidge (1957) stated: "Feeds mainly at night taking small fish and squid which come to the surface." Off eastern Australia the large "cuttlefish" *Amplisepia verreauxi*, (Cephalopoda, Sepiidae), is an important item (Gibson & Sefton 1955, Serventy *et al.* 1971).

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An opportunity to investigate, in greater detail, the feeding habits of this albatross was provided by the 1972/73 Auckland Islands expedition. Among its objectives was a survey of the avifauna of these islands which lie about 500 km south of New Zealand (50-51°S, 166°E). A report on the three species of albatross breeding there — Wandering Albatross *Diomedea exulans exulans*, Southern Royal Albatross *D. epomophora epomophora* and White-capped Mollymawk *D. cauta cauta* — is to be published by C. J. R. Robertson. The main colony of *D. exulans* is on Adams I. but a few nest on Disappointment I. and Auckland I. (the main island). Censuses by Russ and Robertson revealed that the total local breeding population of this species represents about 40% of the world's breeding population (Robertson 1975).

During field work on Adams I. in the first week of January 1973, Russ collected two regurgitations from beside the nests of fledglings; both regurgitations seemed fresh, for they were still oily. During banding, adults seldom regurgitated and, though chicks sometimes ejected oil, no useful samples of food were obtained while banding. Between 3 and 5 January 1973 Russ collected a pair of adults at an empty nest and a fully-grown fledgling: these were prepared as study skins at the National Museum, Wellington, and we obtained the stomachs for examination. In addition, Mr F. C. Kinsky, Ornithologist at the Museum, kindly made available from the collection of preserved stomachs, those of Wandering Albatrosses obtained in Wellington Harbour (15 August 1969) and at Opoutama, Hawkes Bay (2 August 1963).

#### METHODS

Of the seven samples only one (from Wellington Harbour) contained a significant amount of flesh (squid), so no analysis of undigested food was possible. Accordingly, we noted the occurrence of remains of each class of food, then proceeded to identify the beaks of cephalopods and otoliths of fish.

The identification of cephalopod beaks is based on the lower beaks. We followed Clarke (1962) and made extensive use of the collection of beaks from Grey-faced Petrels (*Pterodroma macroptera gouldi*) (Imber 1973). Additional illustrations and descriptions of beaks were found in Berry (1918), Robson (1924), Akimushkin (1963), Clarke (1965), Filippova (1968, 1972), Young & Roper (1968, 1969) and Voss (1969). Several other references were consulted for species not encountered in this study. Finally, a few rare beaks were sent to Dr J. A. Filippova (All-Union Research Institute of Marine Fisheries and Oceanography, Moscow) and to Dr M. R. Clarke (Marine Biological Association of the U.K., Plymouth).

Otoliths were examined by Mr J. M. Moreland, Ichthyologist at the National Museum. Those he was unable to identify were compared with those illustrated by Fitch & Brownell (1968), Schmidt (1968) and Fitch & Barker (1972).

#### RESULTS

The digestion-resisting remains comprised beaks of cephalopods and bones and otoliths of fish. There was no indication of other animals, such as Crustacea. The stomach oil of this albatross is nearly colourless (personal observations, Lewis 1969), whereas petrels that feed on crustaceans have reddish stomach oil which is almost certainly coloured by the carotenoid pigments from this food (Lewis 1969). In the 7 samples, remains of Cephalopoda occurred seven times (100%) and the remains of fish four times (57%), but fish remains are probably less resistant to digestion than are cephalopod beaks.

The Cephalopoda among the prev of this albatross are listed in Table 1. Samples were few but no differences were found in the species taken by birds from different localities, so data have been nooled. The Histioteuthidae were commonest, then Cranchiidae, Gonatidae, Chiroteuthidae, Onvchoteuthidae and 8 other families of rarer occurrence, in that order. Because of the relatively large size of some species, squids of the Onychoteuthidae seem most important in the diet (on a weight basis). The beaks of Moroteuthis ingens and M. robsoni are particularly robust, however, and are relatively common among the regurgitated beaks that are often found beside albatross (Diomedea spp.) nests (personal observations of material supplied by C. J. R. Robertson). As previously suggested for Greyfaced Petrels (Imber 1973), the accumulation of beaks in albatross stomachs is usually associated with at least one particularly large pair of beaks (usually Moroteuthis, occasionally Taningia) which are presumed to hinder the fragmentation and onward passage of smaller beaks. In the five stomachs we examined, two contained only two or fewer pairs of beaks which belonged to species of Histioteuthis. The other three stomachs (with accumulations of 3, 7 and 19 pairs of beaks) each contained beaks of one or two Moroteuthis ingens or M. robsoni. Hence, it seems likely that the frequency of occurrence and importance of these two *Moroteuthis* species in the diet is exaggerated in Table 1. but by how much is uncertain.

The four samples containing fish remains comprised one with a pair of otoliths, two with otoliths and bones, and one with only a vertebra. Four pairs of otoliths (representing 4 fish) were found. Two from the specimen collected in Wellington Harbour were identified as belonging to *Macruronus novae-zelandiae* (Hector) of the family Merlucciidae. This mesopelagic fish is also taken by at least two other species of albatross in the New Zealand region (Imber, unpublished). Another pair of otoliths was identified, by reference to Fitch & Brownell (1968), Schmidt (1968) and Fitch & Barker (1972), as belonging to *Halargyreus johnsonii* Gunther of the family Moridae. The fourth pair could not be identified. These fish probably ranged in length from about 25 cm to nearly 1 m.

Order Femiler 1	Lowe	r beaks	Beak mea	surement <sup>2</sup>	Estima	ated weight 3	Importance
Species	No.	Percent	Mean(mm)	Range	Mean(g)	Range	Of family 4 (Percent)
Octopoda (= Octobrachiata)							
Argonautidae	4	1	40.0				<1
Argonauta nodosa Solander	3		13.0	11.0-15.9	160	90- 300	
Argonauta ?argo L.	1		(17.0)	-	(350)	-	
Teuthoidea			-	2			
Architeuthidae <u>Architeuthis</u> sp. (juvenile)	1 1	<1	8.0	-	3,000	-	3
Ommastrephidae unidentified sp.	1 1	<1	9.3	•_	1,400	tur	1
Onychoteuthidae <u>Onychoteuthis banksi</u> (Leach)	19 1	7	3,1	-	54		37
Morotouthis ingens (Smith)	10		11,4	10.4-12.3	2,500	1,900-3,100	
<u>Moroteuthis</u> <u>robsoni</u> Adam	3		9.0	7.1-10.1	1,250	620-1,800	
<u>Moroteuthis</u> <u>knipovitchi</u> Filippova	3		6.5	6.2- 6.7	470	400- 520	
? <u>Kondakovia longimana</u> Filippova	2		15.5	15.2-15.8	6,300	6,000-6,600	
Gonatidae <u>Conatus antarcticus</u> Lönnberg	29 3	10	7.7	6.6- 8.9	200	145- 260	3
<u>Gonatus</u> sp. (cf. <u>separata</u> Akimushkin)	6		5.6	5.3- 5.9	105	94- 115	
Gonatus sp.C	1		6.1	_	125	-	
Conatus sp.D	4		6.7	4.8- 8.4	150	78- 240	
?Berryteuthis anonychus (Pearcy & Voss)	15		· 4.9	3.8- 5.7	80	48- 110	
?Psychroteuthidae ? <u>Psychroteuthis</u> sp.	1 1	<1	8.5	• -	(600)	_	<1
Enoploteuthidae ?Enoploteuthis sp.	3 3	1	4.4	:4.3- 4.4	55	50- 60	<1

#### TABLE 1. Cephalopoda, identified and counted by their beaks, among food of Wandering Albatrosses (<u>Diomedea exulans</u>) from Auckland Islands(5 samples) and the east coast of New Zealand (2 specimens)

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TABLE 1 (continued)

Octopotenthidae <u>Octopotenthis ?lonciptera</u> Akimushkin <u>Taulneia ?danqe</u> Joubin	9 2 2	n	10.5 18.5	6.5-12.7 15.9-21.1	350 1,425	100- 5 950-1,9	00 20	L <sub>1</sub>
Histloteuthidae <u>Histloteuthis</u> ? <u>cltaninae</u> N. Voss <u>Histloteuthis</u> ? <u>atlantica</u> (Hoyle) <u>Histloteuthis</u> ? <u>miranda</u> (Borry)	149 83 33 17	5	7 U U 1 0 2 0	2.4- 6.6 3.6- 6.3 6.5- 7.9	155 180 330	35- 2 28- 2 260- 3	00 50	23
<u>Ilistictenthis</u> ? <u>macrohista</u> N. Voss <u>Ilistictenthis</u> ? <u>dofleini</u> (Pfeffer) <u>Histictenthis</u> sp.C	13		4.0 4.7 3.0	3.0- 4.5 2.2- 7.2 -	98 135 54	30- 3 30- 3	25 20	
Chiroteuthidae Chiroteuthis sp.A Chiroteuthis sp.A	28 20	10	2.6	6.9-8.3	430	320- 50	20	6
<u>Mastiroteutins</u> sp.D <u>Mastiroteuthis</u> sp.B <u>Mastiroteuthis</u> sp.D	04 0		7.9 4.2	7.8- 8.0 5.1- 9.1 4.0- 4.5	475 250 85	450- 50 140- 72 70- 10	0 0 0	
Cycloteuthidae <u>Cycloteuthis</u> ? <u>akimushkini</u> Filippova	4 4	<del></del>	12.0	11.0-12.9	(1,500)	I		۶Ĵ
Cranchiidae <u>Taonius ?pavo</u> (Lesueur) <u>Merglocranchia richardsoni</u> Dell	32 29 2	11	9.7 5.1	8.9-10.8 4.8- 5.4	500	350- 64 100- 13	<u>o</u> c	£1 .
unidentified sp.	1		5.1	t	110		ò	
Unidentified TOTALS	1 281	<b>1</b> 00	I		-			<b>₽</b> 8
1 Designated species (e.g. <u>Histioteuthis</u> therein is, here, M. robsoni.	sp.G) corr	espond to	those in	Imber (1973)	except that	t Moroteut	his sp.	A

brackets is an estimate for an incomplete beak. Based on the graphs of Clarke (1962). Figures in brackets are rough estimates based on an incomplete beak, or for Under any mercy in arrowing. Usually length of rostrum, except in Argonautidae where crest length is used (see Clarke 1962). Figure in 2

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31 families not available to Clarke. Calculated as the sum of the products of No. of lower beaks x estimated mean weight of all species within each family, expressed as a percentage of the total sum of all these products (as in Imber 1973).

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#### FOODS OF WANDERING ALBATROSS

#### IMBER & RUSS

#### DISCUSSION

There have been few critical studies of the foods of any albatross. The most thorough and most recent is that by Harris (1973) on the Waved Albatross (D. irrorata). The similarity of the diet of the Waved and Wandering Albatrosses, especially insofar as cephalopods are concerned, is very marked: the differences seem mainly caused by dissimilarities in the cephalopod faunas of the two regions. Reports in the literature of identified Cephalopoda eaten by albatrosses (Table 2) are more frequent than reports of other classes of prey, thus indicating their general importance to the Diomedeidae. Tickell (1964) found that Black-browed (D. melanophris) and Grev-headed (D. chrysostoma) Albatrosses feed extensively on cephalopods. Fish are next in importance as food of albatrosses generally and have been reported in most studies (Tickell 1964, Harris 1973, this paper). However, Crustacea seem important only in the food of the smaller species (Tickell 1964, Harris 1973, C. J. R. Robertson pers comm.).

The prey of Wandering Albatrosses are mostly typical mesopelagic animals, some of which are known to undertake diurnal vertical migrations, upwards at dusk and downwards at dawn (cf. Table 8 in Imber 1973). Others no doubt do so, at least to some extent, for albatrosses feed at the surface whilst some prey have been recorded only from deep water. The typical daytime depth of most of these prey is between 50 and 500 m, though many individuals of some species occur deeper still — frequently to 1000 m but some to 5000 m (Clarke 1966). Hence, apart from daytime scavenging, the Wandering Albatross is a nocturnal feeder as McLachlan & Liversidge (1957) stated. This conclusion is mainly derived from what is known about the cephalopods but is also supported by our knowledge of the fish prey.

Lewis (1969) made a biochemical analysis of the stomach oils of four procellariiform birds, including one Wandering Albatross collected in Cook Strait. He found that wax esters constituted 77% of the latter's oil. As discussed by Lewis, wax esters are rare or absent in zooplankton and other epipelagic animals, and their discovery in the stomach oils of Sooty Shearwater (Puffinus griseus) and Fulmar (Fulmarus glacialis) (see also Cheah & Hansen 1970) led to the hypothesis, never proven, of a secretory origin. However, within the last decade wax esters have been discovered as prominent lipids in numerous mesopelagic and bathypelagic fish, crustaceans and squids (Lewis 1967, 1969, Lee & Hirota 1973). Lee & Hirota state: "In general, of the pelagic fauna, only the deep-living temperate and polar zooplankton and nekton store wax esters." These include many animals that undertake diurnal vertical migrations. Here is further strong evidence linking oceanic birds and mesopelagic prey, and of nocturnal feeding by Wandering Albatrosses. Conversely, results presented in this paper support Lewis' contention (1969) that stomach oil is of dietary origin.
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Species	Locality	Cephalopoda (family, species) identified	Reference
Light-mantled Sooty Albatross ( <u>Phoebetria palpebrata</u> )	South Indian Ocean	Cranchiidae – Taonius pavo	Chun 1910
Laysan Albatross ( <u>Diomedea</u> <u>immutabilis</u> )	North Pacific Ocean	Onychoteuthidae - Onychoteuthis banksi	Clarke 1966 citing S.S. Berry
Black-footed Albatross ( <u>D</u> . <u>nigripes</u> )	North-west Pacific Ocean	Amphitretidae - <u>Amphitretus ?pelagicus;</u> Histioteuthidae - 2 species; Gonatidae - 2 species; Chiroteuthidae - <u>Chiroteuthis veranyi;</u> Cranchiidae - <u>Taonius pavo;</u> Octopoteuthidae - 1 species	Akimushkin 1954 a, b, 1963
Albatrosses (unidentified)	South Georgia	Gonatidae - <u>Gonatus</u> <u>antarcticus</u>	Clarke 1966
Waved Albatross ( <u>D</u> . <u>irrorata</u> )	Galapagos Islands	Ommastrephidae, Histioteuthidae, Octopoteuthidae, Chiroteuthidae, Enoploteuthidae, Onychoteuthidae, Pholidoteuthidae	Harris 1973

# TABLE 2 --- Cephalopoda in the food of albatrosses other than Wandering Albatrosses (Diomedea exulans)

As with Grey-faced Petrels (Imber 1973), detection of prey seems to be mainly through their bioluminescence. This applies to the cephalopods eaten by the Wandering Albatross though apparently not to the fish. Over 80% of the cephalopods enumerated in Table 1 are bioluminescent. Most of the species listed in Table 2 are bioluminescent, as are at least 96% of the squids taken by Waved Albatrosses (Harris 1973). In particular, the importance of the highly bioluminescent squids of the family Histioteuthidae in the food of oceanic vertebrates — Procellariiformes (Akimushkin 1963, Harris 1973, Imber 1973, this paper, Imber unpublished) and Cetacea (Akimushkin 1963, Clarke 1966, Gaskin & Cawthorn 1967) — is becoming increasingly evident. However, bioluminescence is prevalent among mesopelagic animals so this factor might merely be a coincidence.

Research in the Southern Ocean indicates that three species of squid are relatively common (Roper 1969). Two of these are smaller than any represented by beaks in our albatross samples, and one of these is apparently restricted to a vertical range well below the surface. The third commonest "species" he found was Gonatus antarcticus (but we suspect this was more than one species) which is much larger than the other two, attaining a mantle length of at least 17 cm (Clarke 1966). It was common in the upper layers, 55% being taken in the upper 250 m (Roper 1969). Whereas 141 specimens of this "species" were captured, Roper recorded that: "Deeper dwelling forms, e.g., species of Mastigoteuthis, Chiroteuthis, and Histioteuthis, are represented by fewer than two dozen specimens each" in this collection from the Southern Ocean. We, therefore, have the apparent anomaly that Wandering Albatrosses select rarer, deeper-living animals in preference to a common "species" living nearer the surface. But, unlike the Chiroteuthidae and Histioteuthidae, Gonatus antarcticus and most other species of this family do not possess light organs. This seems to us the strongest evidence that albatrosses detect many of their prey by its bioluminescence. Apparently some non-bioluminescent prey can be detected at night, since most of these are also mesopelagic. However. unlike most of the bioluminescent squids, these may be detectable because they are relatively large and/or active species (especially the Onychoteuthidae and the fish). Some shallower-living forms may be available during twilight (e.g. Argonautidae and Gonatidae).

In Table 3 the preferred sizes of cephalopods taken by some marine vertebrates of differing body weight are compared. Comparison of Tables 1 and 3 reveals that the range of sizes of cephalopods taken by Wandering Albatrosses overlaps that of all the other species. Sperm Whales captured in Cook Strait had been feeding mainly on onychoteuthid squids (especially *Moroteuthis*), the Histioteuthidae coming second in frequency of occurrence (Gaskin & Cawthorn 1967). Hence, the diet of this albatross comes close to that of Sperm Whales. The largest cephalopods are the *Architeuthis* species, of which the beaks of a juvenile were found in one of the regurgitations of a fledgling on Auckland Is. These squids may attain 1,000 kg and are regularly taken by Sperm Whales (Clarke 1966). However, they are probably relatively uncommon so that these whales mainly take more abundant squids, few of which exceed 10 kg (Clarke 1962). Hence, these whales, considering their size, take disproportionately small squid when compared with petrels and albatrosses.

- Species	Weight (kg)	Mean weight of cephalopod caten (g)	Reference
Prey-faced Petrel Pterodroma macroptera <u>could</u>	<u>1</u> ) 0.55	<b>&lt;</b> 75	Imber 1973
laved Albatross <u>Diomedca irrorata</u> )	3.29	< 260	Harris 1973
Vandering Albatross Diomedea <u>exulans</u> )	8.70	<b>&lt;</b> 400	this paper
Sperm Whale ( <u>Physeter catodon</u> )	15,000± <sup>`</sup>	500-3,000	Gaskin & Cawthorn 19

TABLE 7. Comparison of the preferred sizes of Cephalopoda

# ACKNOWLEDGEMENTS

We wish to thank Mr F. C. Kinsky, National Museum, Wellington, for his foresight in preserving seabird stomachs and donating relevant ones to us, and Mr J. M. Moreland, National Museum, for his assistance in identifying specimens. Dr G. R. Williams and Messrs E. W. Dawson, C. J. R. Robertson and B. E. Reid kindly commented on the text.

#### LITERATURE CITED

JSHKIN, I. I. 1954 a. Novye dannye o rasprostranenii golovonogikh mollyuskov v dal'nevostochnykh moryakh SSSR. Doklady Akademii Nauk SSSR 94: 1181-1184. JSHKIN, I. I. 1954 b. Golovonogie mollyuski v pitanii kashalota. Doklady Akademii AKIMUSHKIN, I. I. AKIMUSHKIN, I. I. 1954 b. Nauk SSSR 96: 665-667.

AKIMUSHKIN, 1. 1. 1954 b. Golovonogie mollyuski v pitanii kashalota. Doklady Akademii Nauk SSSR 96: 665-667.
AKIMUSHKIN, 1. 1. 1963. Golovonogie mollyuski morei SSSR. Moskva: Akademiya Nauk SSSR. (Translation by A. Mercado. 1965. Cephalopods of the seas of the U.S.S.R. Pp. 1-223, figs 1-60, tables 1-17. Jerusalem: Israel Program for Scientific Translations.)
BERRY, S. S. 1918. Report on the Cephalopoda obtained by the F.I.S. "Endeavour" in the Great Australian Bight and other southern Australian localities. Biological Results of the Fishing Experiments by the F.I.S. "Endeavour," 1909-14 4: 203-298, figs 1-67, tables 1-XXX, pls LIX-LXXXVIII.
CHEAH, C. C.; HANSEN, I. A. 1970. Wax esters in the stomach oil of petrels. International Journal of Biochemistry 1: 198-202, tables 1-4.
CHUN, C. 1910. Die Cephalopoden, I: Oegopsida. Wissenshaftliche Ergebnisse der Deutschen Tiefsee-Expedition, Valdivia 18 (1): 1-401, atlas of 61 plates.
CLARKE, M. R. 1962. The identification of cephalopod" "beaks" and the relationship between beak size and total body weight. Bulletin of the British Museum (Natural History), Zoology 8: 419-480, figs 1-25, tables 1-5, pls 13-22.
CLARKE, M. R. 1965. "Growth rings" in the beaks of the squid Moroteuthis ingens. (Oegopsida: Onychoteuthidae). Malacologia 3: 287-307, figs 1-13, tables 1-6.
CLARKE, M. R. 1966. A review of the systematics and ecology of oceanic squids. Advances in Marine Biology 4: 91-330, figs 1-59, tables 1-7.
FILIPPOVA, J. A. 1968. A new species of the genus Cycloteuthis (Cepholopoda: Oegopsida). Malacologia 11: 391-406, figs 1-7, tables 1-4.
FICHPOVA, J. A. 1972. New data on the squids (Cephalopoda: Cegopsida) from the Scotia Sea (Antarctic). Malacologia 11: 391-406, figs 1-7, tables 1-4.
FITCH, J. E.; BROWNELL, R. L. Jr. 1968. Fish otoliths in cetacean stomachs and their importance in interpreting feeding habits. Journal of the Fisheries Research Board of Canada 25: 2561-2574, fi

GASKIN, D. E.; CAWTHORN, M., W. 1967. Diet and feeding habits of the sperm whale (Physeter catodon L.) in the Cook Strait region of New Zealand. New Zealand Journal of Marine and Freshwater Research 1: 156-179, fig. 1, tables 1-8, appendix.
GIBSON, J. D.; SEFTON, A. R. 1955. Notes on some albatrosses of coastal New South Wales. Emu 55: 44-48, pls 3-4.
HARRIS, M. P. 1973. The biology of the Waved Albatross Diomedea irrorata of Hood Island, Galapagos. Ibis 115: 483-510, figs 1-4, tables 1-17, pls 11-12.
IMBER, M. J. 1973. The food of grey-faced petrels (Pterodroma macroptera gouldi (Hutton)), with special reference to diurnal vertical v

with special reference to diurnal vertical migration of their prey. Journal of Animal

with special reference to diurnal vertical migration of their prey. Journal of Animal Ecology 42: 645-642; tables 1-8.
 LEE, R. F.; HIROTA, J. 1973. Wax esters in tropical zooplankton and nekton and the geographical distribution of wax esters in marine copepods. Limnology and Oceanography 18: 227-239, tables 1-7.
 LEWIS, R. W. 1967. Fatty acid composition of some marine animals from various depths. Journal of the Fisheries Research Board of Canada 24: 1101-1115, figs 1-4, tables 1-4.
 LEWIS, R. W. 1969. Studies on the stomach oils of marine animals — II. Oils of some procellaritiform birds. Comparative Biochemistry and Physiology 31: 725-731, fig 1, table 1.

table 1.

table 1.
McLACHLAN, G. R.; LIVERSIDGE, R. 1957. Roberts: Birds of South Africa. (Revised edn.) Pp 1-504, text-figs, pls. 1-LVI and 1-8. Trustees of the South African Bird Book Fund.
MURPHY, R. C. 1936. Oceanic birds of South America. Vol. 1. Pp 1-640, figs 1-61, pls 1-38. New York: American Museum of Natural History.
OLIVER, W. R. B. 1955. New Zealand birds. 2nd ed., rev. and enlarged. Pp 1-661, text illus., 12 unnumb. col. pls. Wellington: A. H. & A. W. Reed.
ROBERTSON, C. J. R. 1975. Distribution and status of the Diomedea species. In: YALDWYN, J. C. (ed.). Report on the Auckland Islands Expedition 1972/73. Wellington: Dept. of Lands & Survey — in press.
ROBSON, G. C. 1924. On the Cephalopoda obtained in South African waters by Dr J. D. F. Gilchrist in 1920-21. Proceedings of the Zoological Society of London 39: 589-685, figs 1-51, pls 1-2.

Gilchrist in 1920-21. Proceedings of the Zoological Society of London Sr. 209-009, figs 1-51, pls 1-2. R, C. F. E. 1969. Systematics and zoogeography of the worldwide bathypelagic squid genus **Bathyteuthis** (Cephalopoda: Oegopsida). United States National Museum Bulletin 291: 1-207, figs 1-74, tables I-XX, pls 1-12, appendix. IDT, W. 1968. Vergleichend morphologische Studie uber die Otolithen mariner Knochenfische. Archiv für Fischereiwissenschaft 19 (Beiheft 1): 1-96, text-figs 1-185, pla 14.26 ROPER, C. F

SCHMIDT,

Knochenfische. Archiv fur Fischereiwissenschaft 19 (Beiheft 1): 1-96, text-figs 1-185, ols 14-25.
SERVENTY, D. L.; SERVENTY, V. N.; WARHAM, J. 1971. The handbook of Australian sea-birds. Pp. 1-254, text illus., 15 col. pls. Sydney: A. H. & A. W. Reed.
STEENSTRUP, J. 1882. Notae Teuthologicae, 1. Pp 145-150 In "The cephalopod papers of Japetus Steenstrup." Translation by Volsoe, A.: Knudsen, J.; Rees, W. 1962. Pp 1-330, text illus. N. 1964. Feeding preferences of the albatrosses Diomedea melanophris and D. chrysostoma at South Georgia. Pp 383-387, table 1, In: Biologie Antarctique (eds Carrick, R.; Holdgate, M.; Prevost, J.). Paris: Hermann.
VOSS, N. A. 1969. Biological investigations of the deep sea. 47. A monograph of the Cephalopoda of the North Atlantic. The family Histioteuthidae. Bulletin of Marine Science 19: 713-867, figs 1-37. tables 1-17.
YOUNG, R. E.; ROPER, C. F. E. 1968. The Batoteuthidae, a new family of squid (Cephalopoda: Oegopsida) from Antarctic waters. Antarctic Research Series 11: 185-202, tables 1-4, ols I-VI. .IV-l ala

YOUNG, R. E.; ROPER, C. F. E. 1969. A monograph of the Cephalopoda of the North Atlantic. The family Cvcloteuthidae (suborder Oegopsida). Smithsonian Contributions to Zoology 5: 1-24, figs 1-3, tables 1-3. pfs 1-9.

Postscript: In Table 1 the 3 squids tentatively identified as Enoploteuthis (family Enoploteuthidae) should be placed in the family Cranchildae, probably as another Megalocranchia sp. Cohen (1973, Journal of the Roval Society of New Zealand 3: 629-634) considers that the name of the fish family Moridae should be Eretmophoridae.

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# ·----- **\*** -----**RESIGNATION OF PRESIDENT**

At its November meeting, Council regretfully accepted the President's resignation which became inevitable due to increased pressure of work and more overseas trips for him in the near future. Mr Kinsky will remain on Council, however, and the positions of President and Vice-President will be handled by Mr B. D. Bell and Mrs G. Hamel, respectively, until May.

# OBSERVATIONS ON THE ECOLOGICAL SEPARATION OF TWO INTRODUCED CONGENERIC MYNAHS (Acridotheres) IN FIJI

By DICK WATLING

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## ABSTRACT

This paper reports observations made over 4 months on two species of introduced congeneric mynahs in W. Viti Levu, Fiji. Habitat preferences of the two species were investigated and the relative use of foraging sites in one habitat — agricultural land — was observed. Differences in foraging behaviour, feeding associates and gregariousness are pointed out. It is concluded that the two species have a wide ecological overlap but do, in general, occupy different niches in man-modified habitats

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- Gregariousness

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#### INTRODUCTION

#### General

The continued coexistence of two closely related birds on a small island depends both on the maintenance of reproductive isolation and on the absence of ecological competition (Dobzhansky 1941, Mayr 1942, Lack 1969, Crook 1961). The majority of ecologists believe that interspecific competition will result either in the displacement of one of the species or in the evolution of ecological compatibility between the two species.

The majority of work on the ecological separation of sympatric species has been confined to situations of long coexistence of the birds or where formerly allopatric populations have become sympatric, either due to deliberate introduction such as the Madagascar Fody (Foudia

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*madagascariensis*) in the Seychelles (Crook 1961) or natural range expansion as in the Red-eyed Towhee (*Pipilo erythrophthalmus*) and the Mexican Collared Towhee (*P. ocai*) in North America (Sibley 1950, 1954, Sibley & Sibley 1964).

In the Fiji Islands, a slightly different situation exists, due to the nearly simultaneous introduction of two congeneric mynahs at the beginning of the century. Acridotheres tristis and A. fuscus are now well established on the main islands of the group. They are both natives of the Indo-Malaysian subregion, where they are sympatric in some areas. A. tristis has spread from India down through Burma into the Malay Peninsula over the last century (Oates 1833, Gibson-Hill 1949, 1951). A. fuscus was abundant in Burma in 1833 (Oates 1833) and is common in the Malay peninsula (Gibson-Hill 1949, Glenister 1951). It is also present in India, but has a very patchy distribution (Ali 1949).

The ability of the two species to establish themselves successfully is perhaps not surprising. Fiji, with only 59 species of land birds, has a relatively small terrestrial avifauna with few species readily colonising man-modified habitats (Gorman 1972). With the large increase in human population this century, both species of mynah have been able to increase and colonise new areas in association with man. As Lack (1971) pointed out, nearly all recent bird colonists on remote islands are in man-modified habitats, and the two mynahs are no exception. In addition A. tristis has proven to be an adept coloniser with successful introductions into many other parts of the world. A. fuscus, on the other hand, has not been introduced into any countries other than Fiji, although a race (A. f. javaniscus) has established itself on Singapore from escaped cage birds (Gibson-Hill 1951).

Most ecologists believe that avian populations are limited by food. Consequently, attention is usually drawn to differences in morphological and behavioural adaptations associated with foraging. The general appearance of the two species of mynah is remarkably similar. They are both conspicuously marked especially in flight when the prominent white wing patches and white tail tips of both species are very striking. In general, A. tristis is a vinaceous black-brown, whereas A. fuscus is a dark greyish-black. They are both active birds with an upright stance, and both species have a wide variety of calls, which can generally be distinguished but not always. A. fuscus appears to lack the clear whistling notes of A. tristis.

A. fuscus is a slightly smaller bird, and weighs considerably less but this is not obvious in the field.

#### Habitats

This paper presents comparative observations on the habitat preferences and foraging ecology of the two species. The field data was obtained during a  $3\frac{1}{2}$  month stay in Fiji from June - October 1972. Field work was carried out in West Viti Levu only.

TABLE 1.

The measurements of four birds of each species. Means for each sex given. (From specimens taken during the course of the study.)

	<u>Λ.</u>	tristi	s			<u>A. f</u>	iscus	
	3	o <sup>71</sup>	1	ę	2	ď	2	ç
Length	252	mm	249	mm	231	mm	231	mm
Wing length	144	mm	139	mm	121	mm	121	mm
Bill length (to base of skull)	24	mm	24	mm	22	mm	22	mm
Tail length	88	mm	89	mm	75	mm	<b>7</b> 5	mm
Weight	130	grms	127	grms	. 80	grms	83	grms

A detailed description of the habitats of Fiji has been given by Twyford *et al.* (1965). In the present investigation the habitats were divided so as to be broad enough to provide useful data, yet, necessarily, were fairly general due to the relatively short time available for the study.

The following habitats were distinguished (with the areas where work was carried out):—

- (1) Urban-suburban: Lautoka, the second largest town in Fiji, principally a port. It has relatively few suburbs. Nadi, a small town with only one main street and very restricted suburbs.
- (2) Agricultural land: Work was carried out in two areas, with two study plots in each — Nadi area (sugar cane monoculture): Votualevu and Sabeto; Sigatoka valley (cash crops, market gardening): Nalebaleba and Mavua.
- (3) Grassland-reedland: The areas surrounding the villages of Nasivikoso and Nasaucoko, at the head of the Sigatoka R. Altitude 100 m.
- (4) Lowland forest: In the Nausori Highlands. Altitude 600 m 700 m.
- (5) Highland forest: At Nadarivatu and Nawai. Altitude 825 m-1,300 m.
- (6) Mangrove: In the Nadi Bay, around Denerau where a newly constructed road made access possible.

In Fiji the prevailing S.E. Trades cause an unequal rainfall distribution over the main islands, the windward-eastern sides being far wetter than the western sides. Hence west Viti Levu has a dry country vegetation markedly different from that of the eastern side.

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Habitat preferences were studied by running non-standardised transects through the study areas and recording total numbers of both species observed. Inaccuracies due to differences in conspicuousness of the two species were not thought to be important, for the birds are so similar morphologically and behaviourally that identification of individuals is difficult for those not familiar with the birds.

# Foraging sites in agricultural land

It was found that the greatest overlap of A. tristis and A. fuscus populations occurred in agricultural areas. In consequence the relative use of foraging sites by the two species in agricultural land was investigated.

The following foraging sites were distinguished:-

- (1) Human habitation: All areas in or in close proximity to human or farm dwelling.
- (2) Open land: All pasture land and areas of open grassland, with little or no herb or scrub layer.
- (3) Scrub: Untended arable land soon reverts to a scrub habitat dominated by Hibiscus Burr (Urena lobata), Noogurah Burr (Xanthium pungens) and Solanum torvum in W. Viti Levu. This is generally followed by stands of Guava (Psidium guajava) or Castor (Ricinus communis). It is usually kept fairly open by cattle and horse grazing.
- (4) Cultivated land: All arable land with a cultivated crop planted.
- (5) Plough: Recently ploughed or harrowed lands. Usually a reflection of the disturbance rather than the physical nature of the foraging site itself.
- (6) Vegetables and Fruit: Observations of birds actually feeding on fruit or vegetables.
- (7) Cane: Observations during cane harvesting, when large flocks would congregate during harvesting operations.
- (8) Sundry: including drinking, probing bark, nectar drinking, hawking.

In the agricultural areas, the relative use of foraging sites was determined by running two transects a week in each of the four study areas over  $2\frac{1}{2}$  months. The transects usually followed a roughly circular route, but care was taken not to count the same birds twice. The technique used by Hartley (1953) was adopted, repeated standard observations being made for each species observed. The following parameters were recorded for each observation:—

()1 Species, (2) Number, (3) Flock composition, (4) Activity, (5) Foraging station, (6) Feeding technique, (7) Food taken is observed, and (8) Associates — domestic animals, other birds, human activity.

# RESULTS

Habitat preferences

Urban —

A. tristis is found on the major and many of the smaller islands of Fiji only in close association with man, and the largest concentrations of A. tristis are to be found in urban and suburban areas. Associating mainly in loose aggregations or pairs they are found in all parts of the built up areas including the town centres. They are particularly attracted to market places, open drains, refuse dumps and storage yards.

A. fuscus, on the other hand, is rarely found in the town centres of Nadi or Lautoka but is more frequently seen in the suburbs and parks. It was noticeable that in Suva, with its more lush vegetation, A. fuscus is common in the town centre as well as suburban areas. Even in the town centres of Nadi and Lautoka, it will be attracted in by the nectar producing plowers of Erythrina variegata and Spathodea campanulata trees.

Agricultural land —

The greatest habitat overlap between the two species occurs in agricultural land. Although in this habitat the largest concentrations of *A. fuscus* were found, *A. tristis* was nearly as common. Even in agricultural land, however, *A. tristis* was generally associated with human habitation being most commonly seen in or near the farm compounds. *A. fuscus*, on the other hand, was usually seen ranging over the whole agricultural area in loose flocks.

The two agricultural study areas carried slightly different densities of mynahs but similar ratios. Although this might be significant and could possibly be explained as being due to the different farming practices, it could only be speculation considering the data collection method.

TABLE II.

Relative densities of the two species in the two study

areas in agricultural land. (Data collected from 57 hours of transects and nearly 4,000 observations).

	<u>Λ.</u>	tristis	Α.	fuscus
	Nadi	Sigatoka	Nadi	Sigatoka
Nean No. of birds seen per hour	32.6	40.7	54.4	73.8
S.D.	8.2	8.8	15.1	34.1
Transect hours	38.0	20.25	38.0	20.25
Ratio of		Nadi	1.67	
A. fuscus/A. tristis		Sigatoka	1.82	

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Grassland-Reed country (Talasiga) -

Both species of mynahs are essentially birds of disturbed habitats. As a result they are not found commonly in any of the primaeval habitats. This is more true for *A. tristis* than for *A. fuscus* which was regularly seen on transects through this habitat, but never in large numbers. *A. tristis* was only seen on two occasions, one of which was a flock of 20 birds associated with 75 *A. fuscus* feeding with cattle. This was also the largest flock of *A. tristis* seen outside of roosting flocks.

In general, the only sightings of *A. fuscus* would be when they were feeding with the cattle and horses which roam over large areas of unfenced talasiga, or when visiting the nectar producing trees *Spathodea* (rare in talasiga) and *Erythrina*.

The visibility in this habitat is poor due to the very thick nature of the vegetation; as a result birds feeding on or near the ground can easily be missed. However, the thickness of the vegetation would normally prevent foraging by ground feeding birds. Only where it had been replaced by grassland would one expect to find *A. fuscus*, and it was in these areas that it was most commonly met.

The villages in this habitat, such as Nasaucoko, Nasivikoso and Wawosi, have a resident population of A. tristis and the two species would often be seen foraging together in the villages or in the small agricultural areas around them. The transects avoided the neighbourhood of these villages.

#### Highland and lowland forest -

As with the grassland-reed habitat, the forests are not utilised to any extent by either species. Around those villages within the forest, one would regularly see both species, but only *A. fuscus* occurred well away from habitation, usually in the tree tops and in small but often noisy parties. More *A. fuscus* were seen per hour in the highland forest around Nadarivatu and Nawai than in the lowland forest around Nausori. It is possible that the larger human population and the presence of a small area of agriculture in the Nadarivatu-Nawai region, is the reason for this.

#### Mangrove ---

Two visits were made to the mangroves at Denerau; on neither occasion were mynahs seen. Being predominantly ground feeders, it is unlikely that either species uses the habitat for foraging to a large degree. However, in southern Viti Levu, mangroves are used for night roosts by *A. fuscus* and possibly by *A. tristis* (F. Clunie, pers. comm.).

The habitat preferences of the two species in Western Viti Levu is summarised in Fig. 1.

FIGURE I.

Habitat preferences of <u>A. tristis</u> and <u>A. fuscus</u> in Western Viti Levu. (N.B. Mangrove excluded, Lowland and Highland forest pooled. Data from 134 hrs. of observations).



## Feeding behaviour

During the study both species of mynah were found to be ground feeders. They are inquisitive, and *A. tristis* especially will readily enter buildings or outhouses, searching through many situations to find food, turning over dead vegetation, scattering dung, hovering briefly to remove insects from walls or tree trunks or energetically chasing flying insects both on the ground and in the air.

The proportion of fruit and insect in the diet of either species could not be estimated reliably. In New Zealand A. *tristis* takes 50-60% fruit, the rest being animal matter (P. Wilson, pers. comm.).

A. fuscus was seen feeding in trees or bushes more often than A. tristis and was observed taking nectar from 3 species of tree — E. variegata, S. campanulata, (1 unidentified). It is probable that it takes nectar from other suitable flowers when they are in bloom. Its efforts whilst doing so are generally clumsy and it needs firm and easily accessible florets. This might represent a newly exploited niche and it is somewhat surprising that A. tristis does not appear to have moved into this niche since there appears to be no morphological difference to preclude it, except perhaps its greater weight.

The greatest differences in their feeding behaviour relate to the gregariousness of the two species and their relative use of feeding associates.

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# Use of foraging sites in agricultural land

The object of this part of the study was to determine whether the mynahs foraged independently and in different foraging sites. The results of nearly 4,000 observations (1 foraging bird = 1 observation) shows that there are substantial differences in the use of foraging sites and in the feeding behaviour of the two species. (See Figs 2 and 3 for details).

A. tristis was most commonly found foraging in or around human habitation, whereas A. *fuscus* only rarely used this foraging site. The positions were reversed in scrub land where A. *fuscus* was commonly seen, usually in association with cattle or horses.

The two species come into contact most often in areas of open land, where mixed flocks were often seen.

FICURE II.

The proportion of observations in each foraging site of <u>A. tristis</u>, <u>A. fuscus</u> and mixed flocks in the Nadi agricultural area. (Data from 2,221 observations).



FORAGING SITES

FIGURE III.

The proportion of observations in each foraging site of <u>A. tristis</u>, <u>A. fuscus</u> and mixed flocks in the Sigatoka agricultural area. (Data from 1,583 observations. Key as in FIG.II. N.B. Mo sugar cane is grown in the Sigatoka valley). 40 40 40 40 40 10 10 Human Open Scrub Cultiv.Cane Plough Veg. Nectar Sundry Hab.

#### FORAGING SITES

The presence of any human disturbance, such as ploughing or sugar-cane harvesting, is a great attraction to both species and large mixed flocks will congregate, following the plough or foraging amongst newly cut cane tops, which are left lying on the ground.

The occurrence of crop damage was rare, but there is no doubt both species could be serious pests on occasions. One case of serious damage was observed, where a crop of groundnuts was attacked when the plumules were emerging from the ground (R. Viner pers. comm.). A 30-40% loss was estimated. Other cases included damage to maize (Zea sp.) and to pawpaws. Both species were involved.

Only one foraging site appeared to be exclusive to one of the mynahs. Only *A. fuscus* was observed taking nectar from three species of trees, *Erythrina variegata, Spathodea campanulata* (an exotic tree) and one unidentified species.

One of the shortcomings of this study was that the relative acreages of each foraging site in the study areas could not be measured.

#### WATLING

This would have been a nearly impossible task, since the study areas were a mosaic of small areas of different foraging stations. It would have enabled one, however, to determine to what degree each species selects foraging sites or whether they are determined by the relative acreages. In the Nadi area, sugar cane fields covered nearly the entire study areas except those parts subjected to annual or periodic flooding. In these areas scrub, open and cultivated (domestic crops) foraging sites predominate. Since cane fields cannot be used as foraging sites after they are 3'-4' tall, the actual acreage of foraging sites available to the mynahs is a small portion of the total. This is in contrast with the Sigatoka area where no cane is grown, and most of the cultivated crops are not thick enough to prevent the mynahs foraging between the plants. Hence, the relative area for foraging is much greater in the Sigatoka valley. However, the results indicate that, despite this, the relative use of cultivated land by both species does not vary greatly between the two study areas. This would seem to indicate that cultivated areas cannot be an important foraging site for either species.

#### Feeding associates

Both species will regularly associate with domestic animals and feed in close attendance to them. The association between *A. fuscus* and the buffalo in its native Malaya has given rise to its common name — Buffalo Myna (Gibson-Hill 1950). It is commonly seen perched on the back of cattle and horses and less frequently on goats. These are merely landing stages or resting places for they do not search

#### FIGURE IV.

The domestic feeding associates used by A. tristis and

<u>A. fuscus</u>. (Key: Diagonal lines - cattle; Horizontal lines - horses; Crosses - chickens, pigs and goats).



% of observations

	A. tristis	Mixed flocks	A. fuscus
Total No. of birds observed foraging	902	1,323	1,567
<pre>% foraging with domestic associates</pre>	5.2%	23.9%	41.6%

for parasites on the animal (Ali 1949, and pers. obs). Usually they quickly fly down and feed close to the mouth or hooves of the animal, darting back and forth as they chase disturbed insects. Quite large flocks will congregate around a single animal, but rarely causing annoyance.

The total observations of A. tristis with associates are far fewer than those of A. fuscus, but the feeding behaviour is the same in each case. Any agricultural activity will attract both species.

### Diurnal rhythms

The activities of both species and mixed flocks when first observed are shown in Figs 5 to 7. Since the observations covered the whole day, they reflect the proportion of the day spent in each activity. The presence of feeding mynahs appears to be highly attractive to both species and a much higher proportion of mixed flocks were first seen feeding than single species flocks.

A. tristis spends less time foraging than A. fuscus, possibly due to its reliance on household scraps and waste for it was often seen either waiting or feeding near farmstead kitchens, refuse areas or chicken runs. This reflects its specialised niche as a commensal with man.

FIGURES V, VI & VII.

The proportion of observations of separate species and mixed flocks in each of three activities. - Foraging (heavy stippled), Flying (lined), Inactive (honeycombed).



WATLING



The activity patterns of the two birds over 3 hr periods through the day are given in Figs 8 and 9. Despite the low number of transect hours in the 1200-1500 period, they indicate a feeding peak in the morning, but with only a slight reduction in feeding intensity during the rest of the day.

FIGURE VIII.

The activity pattern of A. tristis during the day. (Key: Foraging - heavy stippled; Flying - stippled; Inactive - crosses). 100 80 60 % time spent in each activity 40 20 0900 -1200 1200 -1500 1500 - 1800 0600 . ŏ900 11.5 33.25 3.5 8.7 No. of Transect hours

FIGURE IX.

The activity pattern of  $\underline{\Lambda}$ . fuscus during the day. (Key as for FIG. VIII).



## Gregariousness

In Fiji, A. tristis is noticeably less gregarious than A. fuscus. The present study took place well outside of the breeding season, when the greatest gregariousness for both species should be expected (Sengupta 1968, Gibson-Hill 1950). In agricultural land A. tristis is usually found in pairs or small parties. In urban areas larger aggregations occur, these being generally scattered with little or no cohesion. Only in the evenings, when flying out to roosting sites would large cohesive flocks of A. tristis be seen. The roosting site of A. tristis from Nadi was a cane field about  $1\frac{1}{2}$  km from the centre of the town. The birds always congregated on open land adjacent to the roosting site before entering it just before dusk. I estimated the roost to contain between 500-700 birds. No A. fuscus were ever seen to roost with A. tristis and no large roost (over 30 birds) of A. fuscus was found.

A. fuscus was seen in larger and more cohesive flocks in both agricultural land and when it entered urban areas. The flocks were generally noisy and usually extremely conspicuous. Mixed flocks always contained more A. fuscus than A. tristis. In these flocks A. tristis members were not fully integrated, usually flying together and feeding apart from the main A. fuscus concentrations. All flocks whether

WATLING

mixed or of single species were characterised by their loose organisation with a constant exchange of individuals, pairs or small groups.

The large number of times two A. tristis only were seen provides good evidence for the maintenance of a pair bond in the non-breeding season. Although the evidence (Fig. 6) is not as good for A. fuscus, it seems reasonable to suggest that the pair bond is also maintained in this species.

FIGURES X, XI & XII.

The relative frequency of flock sizes of <u>A. tristic</u>, A. fuscus and mixed flocks, in agricultural land.



#### DISCUSSION

In Fiji the niches occupied by the two species appears to be similar to those they occupy in their natural, sympatric range. Gibson-Hill (1950) recorded *A. fuscus* as an inhabitant of open country in Malaya, with a strong preference for grazing grounds and grass covered waste land. In Singapore it is a shy species which sometimes visits gardens in the suburbs, and is only occasionally seen in the city (Ward 1968). In contrast, A. tristis is abundant in cities and towns throughout its range and follows man into remoter districts (Oates 1833, Gibson-Hill 1951, Ward 1968, Sengupta 1968). In Fiji the position is essentially similar, A. tristis being a bird of town and city whereas A. fuscus is more a country bird. The commonness of A. tristis in agricultural land is possibly due to the high density of the human population, all the farmers being smallholders, rarely farming more than 2-4 acres. A. fuscus, however, could not be described as a shy, retiring species. It is both aggressive and inquisitive. I believe it could occupy many of the niches of A. tristis in the latter's absence, especially in agricultural land.

Despite the dominating and aggressive manner of the two species, very little interspecific aggression was observed — only 4 observations, in all instances the aggressor was the eventual victor (3 times A. tristis, 1 A. fuscus). It is of interest that the spread of A. tristis into the Malay peninsula has been held responsible for an apparent decrease in the numbers of A. fuscus (Tweedie 1955). Intra-specific aggression was more common, even though it was outside of the breeding season. The ability of the two species to establish themselves concurrently in an alien environment would suggest that they do occupy different ecological niches.

The mynahs have been held responsible for displacing the native birds and driving them deeper into the bush (Derrick 1965, Mercer 1967). As Gorman (1972) pointed out, this is very difficult to substantiate and there is no quantitative data to support it. Only 8 observations of interspecific aggression were noted with native birds; Wattled Honeyeater (Foulehaio carunculata) - 5, Polynesian Triller (Lalage maculosa) — 2, Grey-backed Whiteye (Zosterops lateralis) — 1. There is no doubt that automatic displacement occurs on some occasions due to their larger size. However, the mynahs appear to be well adapted to exploiting man-modified habitats and have probably increased in numbers concurrently with the large increase in population and agriculture since they were introduced. It is possible that their presence has prevented some of the native birds moving into man-modified habitats. However, the small number of native birds in this niche is probably reflective of the small terrestrial avifauna (Gorman 1972). The small number is, in fact, deceptive, for a fairly large proportion of native birds, 14 (24%) of 58 terrestrial birds, utilise urban or suburban habitats to some degree (Gorman 1972). In contrast, Singapore has 32 (6%) of 550 species of land birds which regularly enter urban habitats (Ward 1968).

Neither species has penetrated the primeval habitats to any degree. A. fuscus will be seen more frequently than A. tristis in these habitats and it will be seen rather more commonly in secondary forest or grassland. Another introduction from the Indo-Malaysian subregion, the Red-vented Bulbul (Pycrorotus cater), has been able to

penetrate all the habitats on the main islands. It is common in secondary forest and will often be encountered in true forest.

In a survey of European Fringillids, Lack (1971) showed that in natural habitats most congeneric species were isolated primarily by the types of food which they take, though some also differed in habitat. However, in farmland, a man-modified habitat, there was a considerable ecological overlap, especially in diet. The mynahs, birds of manmodified habitats, are essentially omnivorous (Wilson pers. comm., Gibson-Hill 1951) and, with their extensive habitat overlap in agricultural land, one would expect them to take the same food to a large degree. This is in part avoided by differences in their favoured foraging sites. A. tristis, reflecting its position as a commensal with man, forages mainly in two sites usually closely associated with man. A. fuscus, on the other hand, has a more catholic use of foraging sites, usually away from human habitation.

The occurrence of feeding flocks of A. fuscus as opposed to A. tristis is of interest in considering the function of feeding flocks in relation to the distribution and utilisation of foraging sites. Hinde (1959) pointed out the adaptive value of feeding by "local enhance-ment" whereby individuals fly to and join feeding flocks. However, it can only be of real value if food sources are localised over fairly large areas, for then fruitless searching time will be reduced. In the main, A. tristis forages in restricted areas and is probably reasonably sedentary, thus having a greater knowledge of its foraging terrain. A. fuscus, on the other hand, forages over a wide area and in a greater number of different foraging sites; in these circumstances feeding by local enhancement would be of great adaptive value, whereas for A. tristis it would not. However, the noisy and conspicuous feeding flocks of A. fuscus almost certainly attract small numbers of A. tristis. for mixed flocks are often encountered, but always with a heavy preponderance of A. *fuscus*. The conspicuous visual characteristics (the white tips to the tail feathers and the white patch on the open wing) are identical for both species and must serve as interspecific as well as intraspecific signals, to some extent, for the location of feeding flocks.

This report has probably emphasised the differences between the two mynahs whereas the very many similarities in morphology, behaviour and ecology have not been stressed. The two species appear to have a wide ecological overlap but, in general, occupy different niches in man-modified habitats. However, further observations should encompass at least the whole of Viti Levu and, more importantly, should be made during the breeding season.

## ACKNOWLEDGEMENTS

This study was undertaken as part of my B.Sc. Hons degree at Bristol University. My thanks are due to Dr R. Avery and Dr M. Gorman for help in planning the research. I am also grateful to R. Viner and Dr Peter Wilson for providing unpublished information and to P. Lack for criticising the manuscript, and finally, to the Bristol University Exploration Society for providing generous financial support and to M. F. Charters for making everything possible whilst in Fiji.

#### LITERATURE CITED

ALI, S. 1949. Indian Hill Birds. London: Oxford University Press. CROOK, J. H. 1961. The Fodies (Ploceinae) of the Seychelles. Ibis 103a (3): 517-548. DERRICK, R. 1965. The Fiji Islands. Suva: Government Press. DOBZHANSKY, Th. 1941. Genetics and the Origin of Species. 2nd ed. New York: Columbia

DOBZHANSKY, Th. 1941. Genetics and the Origin of Species. 2nd ed. New York: Columbia University Press.
OIBSON-HILL, C. A. 1949. An annotated checklist of the birds of Malaya. Bulletin of the Raffles Museum 20: 1-299.
GIBSON-HILL, C. A. 1950. Myna matters. Malayan Nature Journal 5: 58-75.
GLENISTER, A. G. 1951. The Birds of the Malay Peninsula, Singapore and Penang. London: Oxford University Press.
GORMAN, M. 1972. Origin of the avifauna of urban and suburban Suva, Fiji. Fiji Agricultural Journal 34: 35-38.
HINDE, R. A. 1959. Behaviour and specialisation in birds and lower vertebrates. Biological Reviews 34: 35-128.
LACK, D. 1969. The numbers of bird species on islands. Bird Study 16 (4): 193-209.
LACK, D. 1971. Ecological Isolation in Birds. Oxford: Blackwells.
MAYR, E. 1945. Birds of the Southwest Pacific. New York: Macmillan.
MERCER, R. 1967. Field Guide to Fiji Birds. (Fiji Museum Spec. Publ. Ser. No. 1). Suva: Government Press.

MERCÉR, R. 1967. Field Guide to Fiji Birds. (Fiji Museum Spec. Publ. Ser. No. 1). Suva: Government Press.
OATES, E. W. 1883. A Handbook of the Birds of British Burmah. 2 vols. London: R. H. Porter Ltd.
SENGUPTA, S. 1963. Studies on the life of the Common Myna Acridotheres tristis — I. Proceedings of the Zoological Society of Calcutta. 21: 1-27.
SIBLEY, C. G. 1950. Species formation in the red-eyed Towhees of Mexico. University of California publications in Zoology 50: 109-194.
SIBLEY, C. G., SIBLEY, F. C. 1964. Hybridization in the Red-eyed Towhees of Mexico. Evolution 8: 252-290.
SIBLEY, C. G., SIBLEY, F. C. 1964. Hybridization in the Red-eyed Towhees of Mexico: the population of the southeastern plateau region. Auk 81 (4): 479-504.
TWEEDIE, W. 1955. Common Malayan Birds. London: Longmans.
TWYFORD, I.; WRIGHT, A. C. S.; PARHAM, J. W. 1965. Plant Cover and Soil Resources of the Fiji Islands. Suva: Government Press.

Fiji Islands. Suva: Government Press. D. P. 1968. Origin of the avifauna of urban and suburban Singapore. Ibis 110 (3):

WARD, P. (,, 239-255.

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#### A NATURALISTS' TOUR IN ICELAND

In July 1974 I was able to visit the extreme north-west cape of Iceland (Hornvik), just south of the Arctic Circle. The enormous precipices teem with many million seabirds — in fact, all but one of the cliff-nesting arctic seabird species breed there. Phalaropes, Golden Plover and Curlew nest nearby, and White-tailed Eagles and a Gyrfalcon were seen in the district.

A specially conducted Naturalists' Camping Tour will be held in this remote area between 13 and 27 July 1975. The tour provides a rare opportunity for ornithologists to visit an arctic region at reasonable cost — the all-inclusive charge is  $\pounds$ 140 from London by air. For details write to me, Sandy Bartle, Ecology Div., DSIR, P.O. Box 30466, Lower Hutt, or to the organiser, Dick Phillips, Whitehall House, Nenthead, Alston, Cumbria CA9 3PS, U.K.

# POST-INCUBATION ACTIVITY OF ADELIE PENGUINS

By RICHARD D. CRAWFORD

## ABSTRACT

From 30 December 1972 to 24 January 1973 records were kept of Adelie Penguin activity at Hallet Station, Antarctica. A total of 312 hours of observation time was spent observing 13 penguins of various ages. Quantitative evidence is presented on the amount of time spent by members of each age group at their respective activities.

# INTRODUCTION

Several recent studies (Muller-Schwarze 1968, Yeates 1971, and Derksen 1974) have investigated diurnal activity in the Adelie Penguin (*Pygoscelis adeliae*). However, since most of these studies were conducted on adult birds during the incubation period, very little information is available on the activity budgets of non-breeding birds or adult birds after their eggs have hatched. The purpose of this paper is to examine the activity budgets of non-breeding two- and three-year-old birds and breeding adults during the latter part of the nesting season and to relate these observations to data at present available on breeding adult Adelie Penguins.

#### Methods and Materials:

All observations were taken during the period 30 December 1972 to 24 January 1973 at Hallett Station, Antarctica  $(72^{\circ}19'S, 170^{\circ}13'E)$ . The duration of various activities was determined by stopwatch while I was sitting in a small shelter near the study colonies. Oftentimes a non-breeding bird would move from one colony to another at which time I would move from the shelter and follow it at as great a distance as possible. A pair of 7 x 35 binoculars proved useful in observing these non-breeding birds.

Activity budgets were computed for the following birds: Five two-year-old birds, five three-year-old birds, and three breeding adults each with two chicks. The observations on the breeding birds were made while the chicks were still being cared for by the adults and before creches were formed. All penguins studied were of unknown sex.

Daily observation periods varied, but each penguin was observed for one complete 24-hour period (for example, one day I would observe from 1300-1600 and from 1900-2200 and the next day from 1600-1900, etc., until observations for a complete 24-hour period were obtained). This gave me a total of 312 hours of observation time on the 13 penguins studied.

#### NOTORNIS 22: 54-57 (1975)

All activity observed was placed into one of the following classifications:

- (1) Resting Sleeping in any of the various positions used by Adelie Penguins and all postures with open eyes in which the birds were not visibly alert.
- (2) Alert Postures characterized by the head being elevated from the resting positions, often with the crest feathers erected.
- (3) Nest building The time spent gathering new stones for the nest or rearranging those already in the nest.
- (4) Territory defence Threat displays directed at other individuals and actual pecking or fighting.
- (5) Wandering Time used by young penguins in wandering from one colony to another.
- (6) Courtship Includes mutual pair-forming displays (Sladen 1958) and copulation.
- (7) Chick care Time spent feeding and caring for chicks.
- (8) Body maintenance Includes preening, body shaking, stretching, yawning, and excretion.

#### RESULTS

Activity budgets for the 13 Adelie Penguins studied are contained in Table 1. The time spent resting and alert by the breeding birds compares favourably with the data presented by Derksen (1974) for incubating birds. However, as can be seen, the two- and three-year-old penguins spent significantly less time resting and more time alert. As would be expected, they also spent more time nest building than the breeding birds due primarily to their stone-gathering activity whereas the breeding penguins had only to maintain a nest built earlier in the season. The percent time spent resting, alert, and nest building was tested using as analysis of variance and found to be highly significant ((P < .01).

The three-year-old birds spent significantly more time in territory defence than either the two-year-olds or the breeding adults. This is probably related to the fact that two-year-old Adelie Penguins spend more time wandering from colony to colony than the three-year-old birds. The two-year-old birds tended to not defend a nest as long as the three-year-olds. The breeding birds showed low activities in both of these categories because they remained on a territory established earlier in the season.

Courtship was also more prevalent among the three-year-old birds. Again, this is probably due to them showing a stronger nest-site attachment than did the two-year-olds. Courtship was non-existent in the breeding birds because their mates were not present while they were being observed.

The amount of time spent on body maintenance was about equal for all three groups, and since the non-breeding birds had no chicks they spent no time on chick care. CRAWFORD

Breeding Ader			
		Age	
Activity	$Two(5)^{1}$	Three(5)	Breeding(3)
Resting	41.97 <sup>2</sup>	45.16	84.01
Alert	43.71	41.20	14.12
Nest building	2.19	3.81	0.11
Territory defense	1.00	2.97	0.38
Wandering	0.81	0.79	1.16
Courtship	2.11	5.06	0.00
Chick care	0.00	0.00	0.22
Body maintenance	8.19	1.01	0.00
Unknown	0.02	0.00	0.00
Total	100.00	100.00	100.00

Table 1. Activity budgets for two-year-old, three-year-old, and breeding Adelie Pencuins.

<sup>1</sup> Number in parentheses is sample size.

<sup>2</sup> Refers to percent of total time.

#### DISCUSSION

LeResche & Sladen (1970) state that females first breed when 3-4 years of age and males at ages of 4-6. They also state that older "wanderers" show a stronger nest-site tenacity than one- and two-yearold birds. This study has provided quantitative substantiation of these observations as well as presenting data on other activities of these non-breeding penguins.

Derksen (1974) has admirably performed a quantitative analysis of Adelie Penguin behaviour during the incubation period using timelapse photography, and has hypothesized on how this behaviour might enable the Adelie to survive the harsh Antarctic environment. My observations presented here for the breeding adults compare favourably with his. Apparently little behavioural change is exhibited between the incubation stage and guard stage, except that increasingly more time is spent on chick care as the season advances.

# ACKNOWLEDGEMENTS

I wish to thank Drs Dirk V. Derksen and Milton W. Weller of Iowa State University for helpful discussions and use of reference material. Field work was sponsored by NSF Antarctic Research Program Grant No. GA 23744 to John R. Baker of Iowa State University.

#### LITERATURE CITED

DERKSEN, D. V. 1974. A quantitative analysis of the incubation behavior of the Adelie Penguin (**Pygoscelis adeliae**). Unpublished Ph.D. thesis, Iowa State University, Armes. LeRESCHE, R. E.; SLADEN, W. J. L. 1970. Establishment of pair and breeding site bonds by young known-age Adelie Penguins (**Pygoscelis adeliae**). Animal Behaviour 18 (3): 517-526.

MULLER-SCHWARZE, D. 1968. Circadian rhythms of activity in the Adelie Penguin (Pygoscelis adeliae) during the austral summer. Pp. 133-149 in: O. L. AUSTIN, Jr., (ed.) Antarctic Bird Studies, Antarctic Research Series, Vol. 12. Washington, D.C.: American

Geophysical Union. SLADEN, W. J. L. 1958. The Pygoscelid penguins. Falkland Island Dependency Survey Scientific Report 17: 1-97. YEATES, G. W. 1971. Diurnal activity in the Adelie Penguin (Pygoscelis adeliae) at Cape Royds, Antarctica. Journal of Natural History 5: 103-112.

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# SHORT NOTE

# THE BANDED DOTTEREL IN NEW CALEDONIA

The winter distribution of the Banded Dotterel (Charadrius bicincta) to the north of New Zealand is not well defined. The species has been recorded at Norfolk Island (Wakelin 1968), the Fiji Islands (Morgan & Morgan 1965, Smart 1971) and the New Hebrides (OSNZ 1970: 45). However, in his authoritative monograph on the birds of New Caledonia and the Loyalty Islands, Delacour (1966: 76) did not include the Banded Dotterel but commented that it is very likely that waders other than the nine he listed may occur there from time to time.

On 24 August 1974 at 1600h we observed a party of six Banded Dotterels in breeding plumage at Magenta, Noumea. They were feeding at low tide on a small sandbank 40 metres from the shore near the end of a light aircraft aerodrome runway. The Dotterels were accompanied by one Turnstone (Arenaria interpres) in breeding plumage, three Eastern Bar-tailed Godwits (Limosa lapponica) and seven Pacific Golden Plovers (Pluvialis dominica) one of which was in breeding plumage. The birds were disturbed from time to time by light aircraft taking off over the sandbank on which they were feeding. No waders were seen on visits to the area on 22 August and 1 September.

LITERATURE CITED

 DELACOUR, J. 1966. Guide des oiseaux de la Nouvelle-Caledonie et de ses dependances. Neuchatel: Delachaux & Niestle.
 MORGAN, B.; MORGAN, J. 1965. Some notes on the birds of the Fiji Islands. Notornis 12 (3): 158-168. 158-168.
 OSNZ 1970. Annotated Checklist of the Birds of New Zealand. Ornithological Society of New Zealand, Inc. Wellington: A. H. & A. W. Reed.
 SMART, J. B. 1971. Notes on the occurrence of waders in Fiji. Notornis 18 (4): 267-279.
 WAKELIN, H. 1968: Some notes on the birds of Norfolk Island. Notornis 15 (3): 156-176. WILLIAM GARRETT NANCY GARRETT

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# PRELIMINARY REPORT ON BIRD BANDING IN NEW ZEALAND 1973 - 74

By C. J. R. ROBERTSON

Wildlife Service, Department of Internal Affairs, Wellington

During the year ended 31 March 1974, a total of 29,466 birds were banded while 4,814 recoveries and 3,465 repeats received during the year were added to the records of the New Zealand Banding Scheme. Five new species have been recorded for the first time. The early banding records of Dr L. E. Richdale for the Northern Royal Albatross which go back to 1937 have been included to show a complete record for this species not recorded in previous reports.

Details of the numbers per species banded and recovered are shown in Table 1 while a selection of interesting age and distance recoveries is shown in Table 2.

This year marked an important milestone in the history of the scheme with recoveries how exceeding the 100,000 mark. During the preparation of this report an item in the BTO News 1974 No. 67 recorded some remarks concerning the oldest authenticated age for a wild banded bird. This was reported to be a German Oystercatcher which reached the age of 34 years.

Included in Table 2 below are records of two Northern Royal Albatrosses, one banded as an adult in 1937 and recovered in 1973 at nearly 36 years old, and another banded as a chick in 1941 which in 1973 was just over 32 years old. Both birds were recovered again on 1 December 1974 during the preparation of this report. R-15113 had then reached a banded age of 37y-0m-17d, and as it was banded as a breeding adult would have been at least 46+ years old. R-15148 was banded as a chick which had hatched on 29 January 1941, and would thus have reached an actual age of 33y-10m-2d. Both of these birds form part of a breeding study continued since the start of the project by Dr Richdale in 1937.

I continue to be indebted to banding operators for their cooperation and to my assistants Mrs J. Llewellyn, G. Hatzakortzian and his replacements Mrs J. Braddick, Mrs S. Mathers and Mrs E. Perks for their painstaking work; the Government Engineering Computer Centre for the use of their facilities, and my other colleagues in the Wildlife Service for their assistance.

NOTORNIS 22: 58-65 (1975)

TABLE ONE BANDING AND RECOVERY TOTALS	Number B Recoverie Repeat	anded : Ne es : Bi : Ex	w Birds Or rds Recove tra Recove Recovered	ily Fred At Lea Fries For B Once	st Once irds	( ) + =	Provision New Speci	al Total ( es 1973-19	0nly 974
Page 1	NUM	BER BANDED			RECOVERIES	5	REPEA	T RECOVER	IES
SPECIES NAME	PREVIOUS	1973-74	TOTAL	PREVIOUS	1973-74	TOTAL	PREVIOUS	1973-74	TOTAL
North Island Kiwi	30	11	41	12	7	19	-	-	-
Little Spotted Kiwi	+ 0	4	4	-	2	2	-	-	- 1
Yellow-eyed Penguin	17	145	162	1	3	4	-	-	-
North Blue Penguin	1,300	32	1,332	631	25	656	2,480	62	2,542
South Blue Penguin	270	106	376	23	35	58	3	5	8
White-Flippered Penguin	1,581	472	2,053	135	62	197	26	53	79
Rock Hopper Penguin	1	0	1	- 1	1	1	-	-	-
Fiordland (NZ) Crested Penguin	306	6	312	18	2	20	1	-	1
Wandering Albatross	1,734	1	1,735	70	19	89	88	7	95
North Royal Albatross	+ 0	1,232	1,232	- 1	87	87	-	853	853
South Royal Albatross	19,161	21	19,182	2,218	43	2,261	1,558	17	1,575
Black-Browed Mollymawk	10,042	1,452	11,494	593	6	599	42	-	42
Grey-Headed Mollymawk	3,089	643	3,732	510	1	511	141	-	141
Bullers Mollymawk	1,486	273	1,759	271	-	271	102	- 1	102
Giant Petrel	959	24	983	183	-	183	91	- 1	91
Cape Pigeon	6,788	1	6,789	520	1	521	36	-	36
Grey-faced Petrel	13,241	0	13,241	279	1	280	52	- )	52
Pycroft's Petrel	215	1	216	21	-	21	42	-	42
Cooks Petrel	54	0	54	-	1	1	-	-	-
Blue Petrel	+ 0	1	1	-	-	-	-	-	-
Broad-billed Prion	551	102	653	- 1	-	-	-	-	-
Fairy Prion	33,076	1,478	34,554	1,230	69	1,299	105	6	111
Black Petrel	79	23	102	7	20	27	-	-	-
Westland Black Petrel	414	63	477	9	10	19	-	- 1	-
Wedge-tailed Shearwater	1 <sub>308</sub>	2	310	I _ J	_	_	1 – I	-	1

1975

**BIRD BANDING 1973-74** 

Page 2	UN	MBER BANDE		н	RECOVERLES	10	REPEAT	RECOVERI	SB
SPECLES NAME	FREVIOUS	1973-74	TOTAL	PRÉVIOUS	1973-74	TOTAL	PREVIOUS	1973-74	TOTAL
Bullers Shearwater	627	182	609	۲	ά	10			
Sooty Shearwater	3,725	16	5,741	281	27	308	ו ל	יי ו	I C
Huttons Shearwater	350	296	646	20	1	)   	- i 1		ç
Norfolk Island Little Shearwater +	0	٣.	~	, 1	I	```		1	I
Nth Island Little Shearwater	284	24	287	~	~	<u>م</u>	1 1	1 1	1
. = White-faced Storm Petrel	4,523	116	4,639		- +9	465 -	101	- 33-	- 1,242
Diving Petrel	6,460	ſſ	6,465	688	'.	688	573	) I	575
White-tailed Tropic Bird	6	~	10	ı	ı	ı	- 1	ı	)   
Australian Gannet	12,405	10	12,413	2,030	19	2,049	3.430	47	3.471
Pied Shag	129	0	129	35	ı	35	6	~	. «
Spotted Shag	555	ю	116	9	1		- 1	. ,	)
Reef (Blue) Heron	4 ح	Q	17	20	ı		I	1	
Black Swan	(26,915)	1,090	(28,005)	(6,064)	153	(6,217)	(2)	4	(9)
Canada Goose	(23,143)	1,291	(24,434)	(12,958)	180	(13,138)	(8.687)	638	(9,325)
Paradise Duck	(18,856)	2,905	(21,761)	(15,331)	768	(660,4)	(261)	\$	(355)
Mallard	(56,594)	5,921	(60,515)	(11,811)	1,287	(13,098)	(1,943)	323	(2.266)
Hybrid Mallard (Cross)	(1,520)	44	(1,564)	(+01)	25	(426)	(30)	. 10	(33)
Grey Duck	(31,152)	112	(31,863)	(9,612)	214	(9,826)	(266)	2	(273)
Grey Teal	( 656 )	195	(7,7圣)	(168)	80	(176)	(12)	~ ~	(28)
Brown Teal	75	15	06	9	4	. 01	: 1	. n	` ^
N.Z. Shoveler	(122)	231	( 602)	(77)	33	(22)	(3)	ı	(2)
N.Z. Scaup	5	4	6	ĸ	I	ĸ	1	ı	
Australasian Harrier	1,371	96	1,467	355	64	395	158	6	165
Chukor	362	79	64717	-	1	۲		. 1	
Fartridge	(12,760)	613	(13,373)	(1,038)	67	(1,135)	(2)	6	(16)
-	-	-	_		_			-	_

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Page <u>3</u>	NUME	ER BANDED			RECOVERIE	3	REPE	AT RECOVER	IES
SPECIES NAME	PREVIOUS	1973-74	TOTAL	PREVIOUS	1973-74	TOTAL	PREVIOUS	1973 <b>-</b> 74	TOTAL
Jalifornian Quail	12,138	0	12,138	3,295	7	3,302	1,999	1	2,000
Paeasant	(45,595)	2,288	(47,883)	(3,992)	222	(4,214)	(8)	_	(8)
North Island Weka	2,672	68	2,740	116	1	117	53	-	53
Western Weka	144	4	148	9	- 1	9	- 1	-	-
Stewart Island Weka +	0	21	21	- 1	-	-	- 1	-	-
Pukeko	954	51	1,005	90	20	110	5	6	11
Notornis	108	65	173	56	13	69	165	-	165
Sth Island Pied Oystercatcher	737	1	738	175	15	190	112	24	136
Variable Oystercatcher	125	4	129	63	3	66	93	6	99
Black Oystercatcher	101	0	101	8	5	13	· 10	-	10
Spur-winged Plover	524	0	524	169	} _	169	437	1	438
N.Z. Dotterel	49	7	56	13	4	17	38	5	43
Banded Dotterel	423	3	426	4	-	4	4	-	4
Pied Stilt	268	1	289	9	-	9		-	-
Southern Skua	533	5	538	65	1 1	66	22	-	22
Antarctic Skua	2,044	86	2,130	835	4	839	732	21	753
Sthn Black-backed Gull	55,550	746	56,296	3,899	235	4,134	134	2	136
Red-billed Gull	41,242	1,758	43,000	12,052	66	12,118	12,463	207	12,670
Elack-billed Gull	27,967	86	28,053	2,001	48	2,049	1,355	3	1,358
Bluck-fronted Tern	697	9	706	48	] – '	48	30	~	30
Caspian Tern	2,327	389	2,716	104	6	110	-		-
Fairy Tern	3	2	5	-	ŧ –	-	-	~	-
White-fronted Tern	15,878	814	16,692	515	2	517	10	~	10
Sooty Tern	14,584	2	14,586	144	-	144		~	-
Kea	1,036	0	1,036	641	1	642	3,140	~	3,140
N.Z. Red-crowned Parakeet	15	1	16	-	-	-	-	-	-

BIRD BANDING 1973-74

Pase 4	MUM	BER BANDED			RECOVERIES		REPEAD	RECOVERI	ES
SPECIES NAME	PREVIOUS	1975-74	TOTAL	PREVI OUS	1973-74	TOTAL	FREVIOUS	1973-74	ΨOm∆T
Shining Cuckoo	27	۲	80	4		-			
Morepork	. yc	Ċ		+ (	ı	+	1	I	I
and the second sec	C C	>	<b>م</b> رً	5	1	5	59	4	2,2
worta islana Kifleman	55	0	33	16	I	16	- 22 - 23	0	
South Island Rifleman	223	56	277	33	66	វ	2 7	1 =	5 (
New Zealand Pipit	39	~	41	, r		\ U \	-	t	<u>0</u>
Hedge Sparrow	1,377	17	1,394	555	0	х л л		1	1
· Browh Creeper	23	0	25		1 1 1 1		676	<del></del>	580
Grey Warbler	278	a	08C	I C	1	U I	1	ı	I
North Island Fantail	160	, c	0.04	2 i		±	5	1	57
South Island Fantail	0 C	5 (		<del>,</del>	Ś	37	68	ı	68
	5 . t :	V	171	<del></del>	1	~	I	1	ł
	104	0	104	53	~	30	57	ഗ	62
South Island Robin	242	381	723	6/1	- - 2	218	1	734	720
BLACK KONIN	13	ω	21	1	14	14	1	- 7 - 7	+
Stewart Island Robin	~	9	2		I			-	_
Song Thrush	2,166	12	2,178	266	к	240	1 K K	1	1 1
Blackbird	4,362	27	4. 339	1.001	νç	7 () 7 () 7 ()	001	- (	124
Silvereye	31.797	1 775	XX 570	722	- H		00+ <b>1</b>	20	1,422
Bellbirå		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		4,000	454	4,775	6,878	646	7,524
:	100	5	. , 0.14	5	- 6 -	110	87	14	101
Zellen II.	070	~	327	37	ю	40	10	ø	16
TELLOW DARRET	485	66	551	102	~	103	66	1	20
	1,266	48	1,314	230	9	236	404	ſ	0017
Greenîinch	5,264	162	3,426	531	œ	0 KK	. a	\ (	
Goldfinch	1,661	17	1.678	62	)		2 1	V	2440
Redpoll	4 88.1	- <		1 L 7 C	1	V Q	¢۲	1	ر م
House Snarnow		- (	+ ,004	201,11	1	1,103	3,002	ı	3,002
1 ( 2 ( 0 ( 1 ( 1 ( 1 ( 1 ( 1 ( 1 ( 1 ( 1 ( 1	14,144	489	19,631	1,884	13	1,902	212	0	219
	4,729	1,953	6,632	311	2	402	56	39	75
-	-	-	-		-				

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Faxe 5	2	UMBER BANI	ED (E)	14	ECOVERIES		REPE	AL RECOVE	IES
SPECIES NAME	PREVIOUS	1973-74	TUDT	PKEVIOUS	1975-74	TOTAL	PREVIOUS	1973-74	TOTAL
Indian Myna	1.328	-59	1,392	297	6	207	125	ъ	128
North Island Saddleback	246	29	275	50	I	50	17	1	17
South Island Saddleback	158	0	153	ر ار	~	74	I	i	1
White-backed Magpie	51	2	53	27	~	44	23	~	55
Rook	957	0	657	260	~	261	102	1	102
83 species not banded or	10,162	1	10,162	538	ı	538	107	ι	107
recovered in 1973/74									
			-						
PROVISIONAL TOTALS:	613,985	29,466	643,451	96,040	4,814	100,854	55,783	3,465	59,248
		E.	ABLE ONE PU	OVI SI ONAL	SUMMARY				
Species Banded 1973-74		107			Total Spec	cies Banded	rt		190
Species Recovered 1973-74		76			Total Spec	cies Recove	bered		139
Species with more than 10,000 t	oanded	20			Species wi	ith more th	an 1,000 F	lecovered	18
			PERCENTA	GE RECOVER	031				

1975

# BIRD BANDING 1973-74

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23.67 11.23 15.67

Game Species Non-Game Species All Species

TABLE TWO	SELECTION OF	INTERESTING RECOVERIES	5 RECEIVED 1973.	-74			
	AGE AT BA	NDING P=CHICK A=ADU	JLT J=JUVENILI	E U=UNKNOWN			
PAGE 1	HOW RECOV	ERED X=DEAD V=RELI	SASED ALIVE ≠	BREEDING S=SIGHT U=	UNKNOWN		
SPECIES	BAND	EANDED LOCALITY, AGE ANI	) DATE	RECOVER LOCALITY, HOW AND	Y DATE	AGE	DISTANCE
Southern Blue Penguin	P- 4072	Taiaroa Head	A. 6.11.73	Tairoa Head	V. 20. 1.74	Y.M.D. 2- 2-14	
White-Flippered Penguin	P- 5167	Motunau Is.	P. 7. 1.74	Lawyers Head	X. 9. 2.74		120 CC
Wandering Albatross	R-29234	Adams Is.	A. 22. 1.64	Adams Is.	₹. 23. 1.72	9	ACC 163
Southern Royal Albatross	R5934	-Campbell Is.	==E•16•10•65	Off Concepcion (Chile)	V. 27. 4. 73		5220, CF
=. =	R- 8630	Campbell Is.	P. 17. 5.66	E of Bicheno (Tasmania)	V 9.73	7- 3- 2	22/25 UNW
= =	R-25250	Campbell Is.	P. 27.10.72	off Concepcion (Chile)	X. 21.12.72	0- 1-24	5308 SE
Northern Royal Albatross	R-15113	Taiaroa Head	A. 15 11 37	Taiaroa Head	¥ 20. 9.73	35-10- 6	
	R-15127	Taiaroa Head	A. 20. 2.70	Sisters Is., Chathams	V. 20.11.73	3- 8-27	642 E
	R-15148	Taiaroa Head	P 8.41	Taiaroa Head	¥ 5.10.73	32-1-3	
Black-browed Mollymawk	M-24793	Campbell Is.	P. 21. 3.70	New Hebrides	X73	2- 2- 2	2413 N
-	M-26777	Campbell Is.	P. 31. 3.72	At sea (S. of West Australia)	X. 6.11.73	1- 7- 6	2695 W
Giant Petrel	Ø-12373	Campbell Is.	P. 5. 1.72	Quequen (Argentina)	V. 18. 2.73	1- 1-14	5535 SE
Cape Pigeon	27504	off Castlepoint	U. 9.8.54	Mernoo Bank	X. 10. 8.70	14- 0- 8	192 SSW
Fairy Frion	D-110556	Motunau Is.	A. 23.10.63	Motunau Is.	V. 28.10.73	10- 0- 5	
Bullers Shearwater	Z- 563	Poor Knights Is.	A. 3.12.64	Poor Knights Is.	V. 5. 1.73	8-1-2	
North Is. Little Shearwater	Х-' 972	Penguin Is.	A. 4.11.67	Penguin Is.	V. 21. 8.73	5- 9-16	
White-faced Storm Petrel .	C- 4043	Motunau Is.	A. 20.10.63	Motunae Is.	V. 29.10.73	11-0-9	
Australian Gannet	M-22375	Cape Kidnappers	P. 3. 1.69 F	furneux Grp, Bass Strt.	X. 15. 7.73	4- 6-10	1550 ₩
							~

ROBERTSON

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Page 2	1	BANDED		BANDED			
SPECIES	BAND	LOCALITY, AGE AND	DATE	LOCALITY, HOW AND	DATE	AGE	DISTANCE
Black Swan	80698	L. Ellesmere	J. 22. 1.56	L. Ellesmere	X. 15. 7.72	16- 5-22	
11 11	19-12274	L. Ellesmere	J. 15. 1.65	L. Rerewhakaitu	X. 23. 5.73	8-4-6	433 NNE
Paradise Duck	13-10269	Blackmount, Southland	P. 19.12.72	Berwick	X. 5. 5.73	0- 4-15	<u>113 E</u>
17 11	13-13868	Tarndale, Nelson	A. 16. 1.73	Lewis Pass	X. 8. 5.73	0- 3-23	<u>232 E</u>
Grey Teal	2- 4324	L. Wahi	J. 5. 2.71	Manawatu R.	X. 20. 5.73	2- 3-13	<u>207 S</u>
11 11	17-41571	L. Wahi	J. 14. 2.68	Te Kauwhata	X. 14. 3.72	4- 0-29	<u>11 N</u>
Grey Duck	17-13959	L. Whangape	A. 27. 2.62	Tirau	X. 5. 5.73	11- 2- 6	<u>50 SE</u>
N.Z. Shoveler	<b>Z-1346</b> 2	Oreti Beach Lo <b>c</b> .	J. 18.12.72	Hoods Landing, Waikato	X. 6. 5.73	0- 4-17	705 NNE
S. Is Fied Oystercatcher	K- 3206	Christchurch	J. 9.5.67	Hutt R.	<b>X.</b> 30. 5.73	6- 0-21	<u>195 NE</u>
N.Z. Dotterel	24269	Karaka	P. 7.12.61	Karaka	S. 12. 1.74	12- 1- 5	
Black Stilt	E-55657	Ohau River	P. 26.11.67	Ahuriri R.	S. 25.10.72	4-10-29	<u>20 SW</u>
Southern Skua	M-31633	Enderby Is.	A. 17. 1.63	Enderby Is.	V. 5. 1.73	9-11-18	
Antarctic Skua	L- 6291	C. Royds	P. 22. 1.65	Pointe Geologie	S. 22.11.73	8- 9-29	<u>803 N</u>
Black-backed Gull	s- 6046	Baring Head	P. 27.12.60	Petone	X. 23. 1.74	13- 0-26	<u>11 N</u>
Red-billed Gull	E-71179	Kaikoura	P. 22.11.59	Redcliffs	s. 26. 3.74	14- 4- 2	<u>95 SSW</u>
Caspian Tern	н_18234	S. Mangawhai Hd.	P. 24.11.69	Waihou R.	X. 10. 5.73	3- 5-14	72 NW
Morepork	н-17506	Orongorongo	A. 28.11.68	Orongorongo	S. 11.12.73	3- 9-26	
S. Is Rifleman	A-19960	Ross Crk, Dunedin	P. 24.11.68	Ross Crk	V. 19. 1.74	5- 1 <b>-</b> 25	
Grey Warbler	A-35197	Orongorongo	U. 3. 3.70	Orongorongo	V. 12. 7.72	2-4-9	
Song Thrush	C-12141	Whataroa N.	J. 14.12.66	Whataroa W.	X. 3. 4.73	6- 3-19	14 SW
Tui	D-63144	Orongorongo	A. 31. 1.69	Orongorongo	V. 3.11.24	3-11-24	
House Sparrow	B-14957	Milford	U. 19. 1.66	Milford Loc	X. 16.10.73	7- 4-20	
Starling	D-57832	Nilford	A. 10.12.67	Milford	X12.73	6- 0?	
Myna	<b>E-</b> 39862	Havelock North	A. 27.4 .66	Havelock North	X. 22.11.73	7- 6-26	

**BIRD BANDING 1973-74** 

# SHORT NOTES

# SOME THOUGHTS ON THE DIET OF THE SOUTH ISLAND PIED OYSTERCATCHER

While Baker (5) has made a significant contribution to our understanding of the prey upon which the different forms of New Zealand oystercatchers feed in tidal estuaries and along the seashore and has drawn attention to the need for further study, he makes no mention of the fact that for five or more months of the year, August-December, most adult pairs of the South Island Pied Oystercatcher Haematopus finschi are on inland breeding grounds in a variety of habitats, e.g. riverbeds, cultivated farmlands (2), mountain bogs (4), where they enjoy a change of diet which must surely lack the salty tang of crabs, cockles, mud-snails, pipis, tuatuas, etc. Here they form part of the association so characteristic of the riverbeds east of the Southern Alps; and their competitors for food are likely to include Paradise Shelduck, Pied Stilt, Black Stilt, Banded Dotterel, Wrybill, Black-billed Gull, Black-fronted Tern; possibly some passerines and more recently Spur-winged Plover and Black-backed Gull. Moreover it is on this diet that new generations of finschi have to be fed and reared; and if they make the same demands as their close relatives, the British oystercatchers studied by Tinbergen and his associates, their parents have to help them with offerings of meaty tit-bits. At this stage we can only guess what *finschi* eat when inland on their breeding grounds; but the diet almost certainly includes worms, slugs, snails, insects, grubs, possibly tadpoles, frog spawn and larval fish. At all events, finschi oystercatchers are ecologically isolated from unicolor and reischeki at highly significant times in their lives, both in the nursery and on the home territory.

At other seasons, too, flocks of South Island Pied Oystercatchers will desert the seashore — marine littoral zone, if you so wish — to forage inland (1). This type of behaviour is now known to be quite normal in some of their northern wintering grounds; and I believe the same applies in the Oreti estuary at Invercargill airport. Perhaps I may quote some examples from my note books.

TAMAKI ESTUARY: 13/2/71. c.130 on grass in Glendowie Reserve. While some were dozing or preening, others were quite definitely searching for food, walking purposefully, probing and prodding at tufts of grass.

27/8/71. c.120 scattered among many Red-billed Gulls on muddy football pitches, perhaps gobbling up drowned earth-worms.

FIRTH OF THAMES: 10/9/71. 500+ feeding inland on lush green pastures. 3 Variable (2 black and 1 smudgy) had accompanied them. KAIPARA HARBOUR: 16/9/73. Iordan's Farm. Hundreds of S.I.P.O. and Bar-tailed Godwits probing busily — one might almost say 'feeding ravenously' — in waterlogged pastures among cattle. Many Pied Stilts present, but not apparently so hungry.

In wet winters in northern New Zealand, finschi ovstercatchers pass many hours in well grassed coastal paddocks, not just loafing but often seeking food on ground where the water is fresh rather than saline.

#### REFERENCES

- 1. 1958 SIBSON, R. B. S.I.P.O. away from shore in N.1. Nortornis 7, 206-207.
   2. 1963 SOPER, M. F. N.Z. Bird Portraits. 59-61.
   3. 1966 SIBSON, R.B. Increasing numbers of S.I.P.O. in northern N.Z. Notornis 13, 94-97.
   4. 1969 CHILD, P. S.I.P.O. nesting high in Central Otago. Notornis 16, 186.
   5. 1974 BAKER, A. J. Prey-specific Feeding Methods of N.Z. Oystercatchers. Notornis 2 219-233. Notornis 21.

#### R. B. SIBSON

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# THE CENTRAL OTAGO WOOD-SWALLOWS

Further to my previous note (Child 1974), I have now to report that, unfortunately, the two species of Australian Wood-swallows which lived at Naseby Forest for several months during the 1971-72 and 1972-73 summers did not return during the 1973-74 season. Of the original 4 male White-browed and the pair of Masked with their two offspring, the last sightings were as follows:

- 29 April 1972: Last sighting of one of the male White-browed. Three remained.
- 6 May 1972: A male White-browed picked up dead under trees near the house: now a museum specimen in the Otago Museum.
- 1 June 1973: Last sighting of the two juvenile Masked. Weather pleasant with very light frosts (1-2°C.). Both birds had the appearance of females; still faintly spotted on the dorsal wing surfaces.
- 15 June 1973: Last sighting of one of the two remaining White-browed. (Hard frosts.)
- 30 July 1973: Last sighting of the other male White-browed and the male Masked. First of a series of hard frosts (to  $-10^{\circ}$ C).
- 4 August 1973: Last sighting of the female Masked. Next day snow fell to a depth of 20 cm. Over the previous week she was moulting and looked very bedraggled and became quite dark in colour.

(In 1972 it was 27 July that the parent Masked birds were last seen, until they returned with their offspring on 9 March 1973.)

From 23 April 1973 the birds were given a dish of honey-water as well as the usual bread and kitchen scraps; the honey-water was an immediate success with all six wood-swallows, and they consumed a SHORT NOTES

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cupful per day. Immelmann (1966) mentioned wood-swallows searching eucalypt flowers but added 'we do not know whether, in addition to the insects in the flowers, they also took nectar.' It would now seem likely that they do include nectar in the diet.

Although there were plenty of examples of close-contact roosting, both on branches and wires, especially during colder spells, we did not witness any of the mutual preening (allopreening) sessions which are characteristic of the genus, and which I have seen in the Whitebreasted Wood-swallow (*Artamus leucorhynchus*) in Fiji.

Incidentally, because of their flight patterns and general mode of life, Immelmann has suggested that a more appropriate name for the group is given by their German name, which means 'swallowstarlings.'

REFERENCES

CHILD, P. 1974. First breeding of Wood-swallows in New Zealand. Notornis 21 (1): 85-87, figs 1-2. IMMELMANN, K. 1966. Beobachtungen an Schwalbenstaren. Journal fur Ornithologie 107 (1): 37-69, figs.

PETER CHILD

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# BANDING OF WELCOME SWALLOWS IN TASMANIA

\_\_\_\_\_ \* \_\_\_\_\_

Mrs Priscilla Park, writer of the Letter to the Editor in the June 1974 issue of *Notornis* informing members of the OSNZ of the Welcome Swallow Banding Group now set up in Tasmania, has sent me information on banding of Welcome Swallows there. The record of birds banded is as follows:—

1953-70	÷	198
1970-71		88
1971-72		242
1972-73	i i	285
1973-74		478

From 813 bandings in 1953-73 not one has so far been recovered in mainland Australia.

Mrs Park's banding project, started in 1971, is gaining momentum and will continue, with the aim of finding out where swallows go when they leave their Tasmanian breeding grounds in winter. The purpose of this note is to support Mrs Park's letter and especially to alert OSNZ members, particularly in Southland and Otago, to the possibility that swallows banded in Tasmania may turn up in winter flocks in New Zealand.

REFERENCE PARK, P. 1974. Welcome Swallow Banding Group. [Letter to Editor]. Notornis 21 (2): 190.

A. T. EDGAR

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# A CRESTED TERN IN THE FIRTH OF THAMES

The Piako River flows into the upper Firth of Thames and here on 30 March 1974 with F. V. Thompson, Acclimatisation Society Field Officer, I saw what was to me an unknown tern.

The weather was fine with a light north-easterly wind. The tide had been dropping for an hour and a half. At 1430 hours the bird appeared from the direction of Thames, flying with the wind about 6m above the water, with head held at a downward angle and moved from side to side as if looking for fish. The bird looked "different" and when it passed above and circled I saw that the bill was a definite yellow. No diving or catching of fish took place. The bird continued out of sight towards Miranda.

The upper surfaces of the body and the forehead were not seen well, but the crown and nape were black; underparts white with wings medium grey; feet dark brown to black; tail forked and longer than that of a Caspian Tern (*Hydroprogne caspia*); estimated total length 45-50cm. An immature Black-backed Gull (*Larus dominicanus*) flying with the tern provided a useful size comparison. The bird seemed in good condition. No calls were heard.

On consulting the *Field Guide* (pp.159-160) I concluded that the bird could only be a Crested Tern (*Sterna bergii*). It is stated that this tern habitually fishes in estuaries and will penetrate rivers. It is a rare straggler to New Zealand with three previous records: Raoul Island (April 1910); one ashore dead in Spirits Bay (March 1951) and Farewell Spit, with White-fronted Terns (January 1960).

LITERATURE CITED

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

A. M. HABRAKEN

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# NORTHERN LITTLE BLUE PENGUIN MORTALITY IN NORTHLAND

\_\_\_\_\_ **\*** \_\_\_\_\_

Two periods of high mortality of the Northern Little Blue Penguin (*Eudyptula minor*) have been recorded in Northland during the past year.

Members of the Whangarei branch of the OSNZ have made repeated and extensive patrols of both east and west coast Northland beaches. The table shows results from selected beach patrols, and penguins per mile indicate significant trends in penguin mortality. Normal levels of penguin mortality seen at most times of the year are taken as below 3 per mile. One peak was seen during July and August 1973 and was most prominent in Ninety Mile Beach. The second peak was more widespread, was more prominent on the east

Location Marsden Pt-Waipu river Mangawhai-Pakiri Ocean Beach Pataua Mimiwhangata Pataua Waipua river-Tikanui Waipakauri-Scotts Pt Marsden Pt-Uretiti Maunaganui Bluff-Tikanui	Date 21/7/73 22/7/73 26/7/73 24/7/73 28/7/73 17/8/73 18/8/73 28/8/73 30/8/73 9/12/73	Miles 12 14 4 1 4 42 54 8 34	L.B. Penguins 16 34 8 2 13 17 171 171 1344 31 12	Penguins per Mile 1.37 2.4 2.0 0.5 13.0 4.25 4.07 24.8 3.8 0.55
Mangawhai-Pakiri Ninety Mile Beach Marsden Pt-Waipu Cove Marsden Pt-Waipu Cove Mangawhai-Pakiri Marsden Pt-Waipu Cove Matauri Bay Mangawhai-Pakiri Ocean Beach Pataua Marsden Pt-Waipu Mangawhai-Pakiri Tokerau Beach Rangaunu Bay Gt. Exhibition Bay Henderson Bay Mangawhai-Pakiri Omamari-Baylys Beach Pataua Marsden Pt-Waipu Cove Ocean Beach Mangawhai-Pakiri N. Kaipara Head-Omamari Ocean Beach Marsden Pt-Waipu River Ninety Mile Beach	5/1/74 24/1/74 9/2/74 9/2/74 17/3/74 21/3/74 24/3/74 6/4/74 6/4/74 7/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/4/74 13/6/74 3/6/74 8/6/74 7/7/74	$     \begin{array}{r}       15 \\       44 \\       12 \\       14 \\       12 \\       14 \\       12 \\       14 \\       15 \\       4 \\       3 \\       12 \\       14 \\       11 \\       10 \\       14 \\       3 \\       14 \\       40 \\       4 \\       12 \\       4 \\       14 \\       47 \\       3 \\       9 \\       54 \\     \end{array} $	$\begin{array}{c} 13\\ 45\\ 18\\ 26\\ 39\\ 166\\ 7\\ 125\\ 54\\ 23\\ 321\\ 323\\ 135\\ 98\\ 317\\ 53\\ 423\\ 512\\ 50\\ 206\\ 96\\ 366\\ 86\\ 22\\ 33\\ 92\end{array}$	$\begin{array}{c} 0.86\\ 1.0\\ 1.5\\ 2.16\\ 2.78\\ 13.8\\ 7.0\\ 8.33\\ 13.5\\ 7.66\\ 26.75\\ 23.07\\ 12.2\\ 9.8\\ 22.64\\ 18.3\\ 30.2\\ 12.5\\ 12.5\\ 12.5\\ 12.5\\ 12.5\\ 12.5\\ 17.6\\ 24.0\\ 26.14\\ 1.82\\ 7.3\\ 3.66\\ 1.7\end{array}$

coast, and was seen during April and May 1974. The two mortality peaks were high both in the number of dead penguins found, and in the relation of these numbers to other species found.

Most dead penguins found were in fresh condition, and often on beaches previously patrolled and cleared of dead birds a few days before. There were signs that dead birds are quickly covered by sand during rough weather and that the number of birds found may only be a fraction of those actually washed up. Live penguins were often observed on beaches in a weak and/or sick condition.

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From time to time penguins have been submitted to the Whangarei Animal Health Laboratory for examination. We are most grateful for the interest and valuable help with investigations.

All birds examined were found to be young, immature, and in the main, females. Their musculature was wasted, fat reserves deplenished, and gastro-intestinal tracts empty or showing scanty reddish brown tarry contents. All birds showed a moderate to severe parasitic infestation. External parasites were mites and biting lice. Internal parasites were intestinal coccidia, intestinal flukes of the family Echinostomatidae and possible genus Echinostoma or Hydrodermia, intestinal tapeworms, and renal flukes. The most interesting and severe parasitic condition was the renal flukes. Many birds carried 250 to 300 flukes which are 2mm in length and could be of the family Eucotylidae or Troglotrematodae. The presence of such high numbers of flukes in the kidneys did not show the expected inflammatory-host reactions, but the migratory tracts were marked by degenerative and necrotic changes and must have a damaging effect on renal function. A similar parasitic picture was seen in penguins from the 1973 and 1974 wrecks.

On 18 September 1973 two apparently healthy penguins were found shot on the Dargaville beach. These were examined and were found to be well fleshed and in good condition, and were identified as a male and a female showing early ovarian activity — probably a nesting pair. Both birds showed small to moderate renal fluke infestation. This seems to indicate that healthy penguins carry renal flukes.

Examinations for the presence of lead, cadmium, mercury, organochlorines and polychlorinated biphenols showed insignificant levels.

The cause of penguin deaths seems to be exhaustion and starvation accentuated by parasitism and rough weather. It is considered unusual to see a similar parasite picture in wild life and is more likely to be seen in conditions of overcrowding and poor hygiene in domestic poultry. It could be postulated that the situation could be brought about by a high peak in population and crowded nesting conditions.

Reference to a previous period of high mortality of Northern Little Blue Penguins is found in N.Z. Birds by Oliver (1955) where a large wreck during 1943 at Mt. Maunganui is described. He also mentioned that from time to time large numbers are stranded on sandy beaches during December and January.

It is not known if penguin wrecks of the size recently seen have occurred in Northland in previous years. We do not know the present population but surveys are planned. More information is needed on parasites found in healthy penguins. It is almost certain that the coccidia, tapeworms and renal flukes have intermediate hosts in their lifecycle, but, as yet, we do not know what these are. The situation

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is interesting but is filled with unanswered and challenging questions. Much remains to be done.

The Whangarei branch is deeply indebted to the Whangarei Animal Health Laboratory for their interest and help in this problem. Samples have often become available at times when other pathological material is at a high peak. Time has been found to examine our samples and to research information on parasites and likely diseases.

## LITERATURE CITED

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

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## M. P. KEARNS

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# THE BILLS OF STARLINGS

In *Notornis* 20: 325 we read "Eye colour in adult Starlings was dimorphic" and a few lines later "Bill colour was also dimorphic but varied seasonally."

In ornithology the word 'dimorphic' has two normal meanings (a) 'having two shapes' derived from the primary meaning of the Greek 'morphe,' (b) 'having two colour phases' based on its secondary meaning, 'appearance.' In the first sense the heads of Huia Heteralocha acutirostris and Bar-tailed Godwit Limosa lapponica are said to be sexually dimorphic — note the addition of the adverb 'sexually.' In the second and more common sense, species which have two colour phases, irrespective of sex or age, are described as dimorphic. Typical examples in New Zealand are:— Southern Nelly Macronectes giganteus, Stewart Island Shag Leucocarbo chalconotus, Arctic Skua Stercorarius parasiticus, Fantail Rhipidura fuliginosa, Variable Oystercatcher Haematopus unicolor and Little Shag Phalacrocorax melanoleucos are better described as polymorphic. In Fiji, but not in New Zealand, the Reef Heron Egretta sacra is conspicuously dimorphic.

The term 'sexual dimorphism' is also, of course, applied to many species in which males and females differ both in shape (size) and colour (appearance). Obvious examples are not far to seek, especially among the pheasants and the ducks.

Since the matter of shape does not here arise, we are left with the thought that the eye colour and bill colour of adult Starlings have two colour phases: This is both tautologous and obscure. What the writer is simply saying is that adult male and female Starlings can usually be distinguished by the colours of their bills and eyes. One puzzled reader even suggested to me that 'dimorphic' is a misprint for diagnostic. Incidentally among the 'Literature Cited' there is no mention of the *Handbook of British Birds* 1938, Witherby, Jourdain, Ticehurst and Tucker; where (Vol. 1. p. 44) under Soft Parts much the same information is supplied; viz. "Bill in summer lemon-yellow; male with french gray base, female with base flesh pink or clouded with grey . . . . Iris, male dark-brown; female brown with narrow inner or outer ring of lighter colour, white, cream or pale yellow, but certainly sometimes uniform brown." The deep orange edging in the iris of some female Canterbury Starlings is worth noting. Is it a seasonal or a local character?

It is unfortunate that a laborious piece of research has been marred in places by an inept use of words.

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# BROWN TEAL ON KAWAU ISLAND

\_\_\_\_\_ **\*** \_\_\_\_\_

At Hokimai Bay, Kawau Island, on the property of Mr F. R. Cometti, a tidal inlet was dammed in 1964 to produce an artificial lake of about an acre in area. A high tide comes to within one foot of the top of the dam on the seaward side. The far end of the lake drifts into clumps of rushes which become very dense, and a small stream flows down the entire valley about a quarter of a mile long, through a bog area now thick with cabbage trees and arum lilies. The lake through which the stream finally flows, is heavily stocked with golden carp and water lilies which cover about one quarter of the surface area.

On 10 July 1973, a drake Brown Teal (Anas chlorotis), with two smaller ducks, arrived on the lake. The drake was easily distinguished because he was part albino. His entire head and neck were white. Otherwise he was as described by Oliver (N.Z. Birds, page 413).

By 24 July there was much activity from the drake and one duck. The other duck by this time had disappeared. This activity was obviously mating display. The drake appeared to hold the duck's head completely under the water, with great splashings and a flurry of wings. During this nuptual display the birds swam swiftly in tight circles. skimmed along the surface for short distances, and independently swam completely submerged for distances estimated at twenty feet.

On 29 August the duck was seen at night feeding on the large lawn bordering the house side of the lake. Both birds arrived early in the morning through the rushes at the head of the lake, and fed at the lawn's edge and amongst the water lilies. They did not seem to be bothered by the many carp which inhabited that area of the lake, nor were they interested in the many young fish which swam about. Throughout September the drake was sighted alone each morning feeding at the lake edge, or sunning himself on the lawn where he would invariably tuck his head under his wing, lift one leg, and go to sleep. He seemed quite tame, unafraid of both dogs and people, and one could easily approach to within three feet.



On 8 October the drake appeared proudly from the rushes, followed by the duck and five ducklings. The ducklings were dark brown to black and none showed obvious signs of albinism. Two had slightly lighter patches of down around the neck and head, but neither of these two ducklings survived. All could be approached quite closely.

Both drake and duck kept the ducklings under close surveillance. They checked constantly with soft whistles and chortling. Although these birds have a wide repertoire of sounds and calls, they make no sound resembling a 'quack.' The commonest sound between the adult birds is a soft 'wort, wort.' I pitched these two sounds on a piano, and found the first 'wort' pitched at F sharp above middle C, and the second 'wort' a semitone below, two sounds in quick succession.

By 9 November, three ducklings had disappeared. On Kawau Island there are wild cats, rats, stoats and weasels.

As the ducklings grew, a fawn to yellow ochre colour appeared on the breast, face and in front and behind each wing. This appeared to leave a dark diagonal area from either side of the bill, slanting upwards to blend into the dark sepia behind the neck and head. The eye was thus set in the middle of this dark ellipse.

By January the two young birds were immature adults and appeared more and more on the lake with the drake. By early February he appeared to attack the young birds in turn in order to make them take off from the water to land several feet away. These 'training flights' increased in distance day by day. The drake, although at all times protective and solicitous, seemed quite vicious in his determination that the young birds would keep up the training schedule he had set them. At this time it was almost impossible to distinguish the young birds from the female parent, so similar were the markings. Often they would appear in pairs, and by the end of February it was realised that the two young birds had departed.

In April the drake also departed, and by the end of June, his mate likewise.

On 30 July 1974, two further Brown Teal arrived on the lake. However, we strongly suspected they were the two young birds from the previous season. The drake had the chestnut 'blush' on his breast, but did not appear to have the whitish marking on his throat as described by Oliver.

No mating or mating display was observed in the weeks after arrival, but the duck disappeared leaving the drake to make the lake and surrounding lawn his very own territory. This he did with a vengeance. About this time, Pukekos appeared in the valley, and when one tried to enter the lake the drake flew at it whistling quite noisily and chased it away. If an unsuspecting Red-billed Gull landed for a quick wash the drake chased it away also, often following it in flight across the dam to land in the sea water, rest for a while and fly back again. The Australian Welcome Swallow, now common in the area, the Magpie which stalked the lawn each morning, the WhiteSHORT NOTES

faced Heron and the Tui were all pursued in this manner by the game little drake.

On 20 October, sad to say, the duck reappeared without any ducklings. At no time have we been able to locate the nesting sites.

On all adult birds the metallic green band on the speculum is bright and pronounced. The tail feathers are long, and when viewed directly behind whilst the bird is on the ground, the tail is quite a magnificent fan shape spread wide and evenly. The birds have often been seen on the lawn at night, but rarely have they been seen in the afternoon.

At the time of writing (November 1974), this pair of Teal is living contentedly on the lake.

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# A PIGEON AMONG THE SHAGS

\_\_\_\_\_ **\*** \_\_\_\_\_

On 8 April 1974 we watched a Kereru (Hemiphaga novaeseelandiae) behaving in an unusual way at Mangere Airport. Blank shots had been fired to scare away scores of White-faced Herons (Ardea novaehollandiae) which a very big tide had driven off their normal feeding grounds so that they were resting in flocks around the fringes of the airfield. The shots startled c. 30 Little Shags (Phalacrocorax brevirostris) which had been fishing a large pool of impounded seawater. As the Little Shags flew in the direction of Ihumatao Point, they were joined by a Native Pigeon which, also startled by the shots, flew out from one of the many tall shelterbelts. Pigeon and Shags flew on a wide circuit and when after a mile or two the Shags headed back for the pond, the Pigeon stayed with them, came down to surface level, hovered and appeared to settle on the water, riding high like a skua. Fortunately the water was calm. The Pigeon rose, circled and briefly settled again, clearly puzzled and slow to realise that water was not its element nor were shags its proper company. Ĭt appeared to have been mesmerized by the Shags, and its reasoning may have been "if these fellow-fliers can settle here, why can't I?"

Just then some passing S.I. Pied Oystercatchers (H. o. finschi) caught its attention and perhaps saved its life. For a short distance it flew with them before breaking away and making its way back to the trees.

During this curious episode of which we had an unimpeded view, we were standing on a stop-bank beside the impounded sea-water. The attempted landings on the water took place at a distance of about 100 metres. Since the Native Pigeon is a very rare bird on the isthmus just south of Auckland we were careful to make sure that the pigeon which was lured into trying to behave as a shag was indeed *Hemiphaga* and not a Carrier or Feral Pigeon (*Columba livia*).

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> UNREPORTED METHOD OF STONE-COLLECTING BY THE ADELIE PENGUIN

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The use of stones for nest construction by the Adelie Penguin (*Pygoscelis adeliae*) is well known. Sladen (1958) determined that both sexes are active in the collection of nest material. Two methods of collection have been reported. Most commonly, birds procure nesting stones from neutral areas away from the territories of breeding birds, or from vacant or abandoned nests (personal observation). A second method described by Levick (1915) is that of stealing from occupied nests. Collecting birds may steal from neighbouring nests or travel considerable distances to adjacent colonies.

In 1971, while studying the incubation behaviour of the Adelie Penguin at Cape Hallett, Antarctica (72° 19' S, 170° 13' E), I observed an unusual method of the collection of nest material. At 1420 local time on 8 November while observing a small colony that contained several banded birds, I noted the approach of a mated female (509-73535) to the perimeter of the colony under observation. A banded unmated male (519-35803) with a nest near the periphery of the colony exhibited an oblique stare bow (Sladen 1958) at the female's approach. The ritualized sequence of events that followed is typical of pair formation in the Adelie Penguin (Pennev 1968). The unmated male (519-35803) assumed a prone position on the nest and proceeded to scrape the bowl with his feet. The female remained in close proximity to the nest, but did not initiate a mutual display (Sladen 1958) when the male returned to an upright posture in the nest. Following an abbreviated scraping bout, the male relinquished the nest to the mated female. The female stepped into the nest-bowl and, instead of taking a prone position, picked up a stone from the nest and retreated to her own colony and deposited the stone in the nest occupied by her mate (509-73469). Interestingly, the unmated male (519-35803) discontinued the ritualized sequence of (1) oblique start bow (2) scraping the nest-bowl and (3) relinquishing the nest to the female, after she had made several trips to his nest for stones. Each time she retrieved a stone from the unmated male's nest she deposited it in her own. At no time did the unmated male show aggression toward the stone-stealing

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female. The mated female continued to steal stones in this manner from the nest of the unmated male for 40 minutes, when I discontinued the observation.

I observed the same colony on 9 November and recorded a second banded female (519-35834) and another unbanded bird stealing stones from the nest of the same unmated male (519-35803) at 1120-1130 in the manner described above. At 1340 I again observed two birds (female 519-35834 and an unbanded bird) using the same technique. Although I had observed this previously unreported method of stone-collecting in other areas of the Hallett rookery. I had never been able to substantiate the sexes of the birds involved.

Sladen (1958) suggested that stone stealing allowed a higher reproductive success among birds with larger, better formed nests, and Tenaza (1971) demonstrated that Adelie Penguins nesting in the central part of a colony were more successful than peripheral nesting The first mated female (509-73535) I observed stealing stones birds. was a central nesting bird and the second (519-35834) occupied a peripheral nest. The unmated male (519-35803), as stated, had a peripheral nest of poor quality. Tenaza (1971) suggested that the poorer quality of peripheral nests is due to loss of stones to other Adelie Penguins. Whether unmated male Adelie Penguins that allow the theft of nest stones by females during pair formation are always peripheral nesters is not known, nor is the frequency of such activity. It is possible that such birds are younger, inexperienced breeding individuals. Unfortunately, I had to leave Cape Hallet on 12 November, so I was not able to follow the progress of the unmated male. Analysis of continuous time-lapse photographs of one of the mated females (509-73535) during the incubation period revealed successful hatching of two chicks.

# ACKNOWLEDGEMENTS

This study was supported by National Science Foundation Antarctic Research Program Grants (numbers GA13827 and GA23744) awarded to Dr John R. Baker of Iowa State University. I thank Richard D. Crawford and Thomas C. Rothe for critically reviewing various drafts of this paper.

#### LITERATURE CITED

LEVICK, G. M. 1915. Natural history of the Adelie Penguin. British Antarctic ("Terra Nova") Expedition, 1910. Natural History Report, Zoology I (2): 55-84, pls I-XXI, tables A-B.
 PENNEY, R. L. 1968. Territorial and social behaviour in the Adelie Penguin. p. 83-131.
 In: O. L. AUSTIN, Jr. (ed.) Antarctic bird studies. Washington, D.C.: American Geographical Union.
 SLADEN, W. J. L. 1958. The pygoscelid penguins. I. Methods of study. II. The Adelie Penguin Pygoscelis adeliae (Hombron & Jacquinot). Falkland Islands Dependencies Survey. Scientific Reports 17: 1-97, text-figs 1-19, pls I-XII, tables I-XX.
 TENAZA, R. 1971. Behaviour and nesting success relative to nest location in Adelie Penguins (Pygoscelis adeliae). Condor 73 (1): 81-92.

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# SHORT NOTES

# GANNET DIVING ON CAR

On 16 September 1974 at 5.40 p.m., a Gannet (Sula serrator) dived on to a car travelling north on the Auckland Harbour Bridge. The bird severed one wing and died immediately. It bore a band number M 36803 and had been banded as a chick at Horuhoru (Hauraki Gulf) on the nest, 9 October 1968.

Strangely enough, the bird's head and neck appeared uninjured. The windscreen of the car was shattered but no one was hurt.

# SYLVIA REED

Auckland Institute & Museum

# SOME DATA FROM POACHED GODWITS

\_\_\_\_\_**\***\_\_\_\_

In mid-February 1973, Gavin Stilwell stumbled upon a cache of heads of shore-birds in a hollow on the large sandy island out from Tapora in mid-Kaipara. The heads had been buried in two shallow 'graves' a few feet apart; but wind had blown away some of the sand, thus exposing some feathers. Most of the bony parts were still beneath the surface and had to be excavated. The remains did not appear to have been scattered by predators. Altogether the heads of 41 birds were retrieved. One came from an oystercatcher, probably Haematopus finschi, large flocks of which frequent mid-Kaipara and roost at the island. Eleven were Knots (Calidris canutus). The remaining twenty-nine (29) were Bar-tailed Godwits (Limosa lapponica). They had been shot by some hunter or hunters, evidently 'firing into the brown': and the heads had been wrenched off, presumably in a feeble attempt to conceal the identity of the birds, should the shooter be accosted by some prowling naturalist or challenged by a ranger. A reddening of the feathers in some of the birds showed that they had been shot when they were starting to assume breeding dress.

Gavin Stilwell handed over the collection to me. Since the females of Bar-tailed Godwits are so much bigger than the males, this quantity of material presented an opportunity to examine their sexual dimorphism, at least in respect of the head; and to measure the basic differences. Tim Lovegrove and Simon Towle spent an evening with me to help with the measuring which was carefully checked. I am also especially grateful to Tim Lovegrove for making the drawing which so clearly illustrates the difference in size between the crania of average birds of either sex from our sample.

Oliver's (1955) measurements for the eastern race *baueri* give the length of the culmen i.e. from tip of bill to start of feathering as follows: 3 77-86mm; 9 87-114. Corresponding measurements from the slightly smaller western race *lapponica* are taken from the British Handbook (Witherby *et al.*, 1940): 3 72-83mm; 9 95-106. However, since the longer and heavier bill of the female must demand a robuster bone structure to support it, we decided to measure from the tip of the bill to the back of the skull.

The larger females and smaller males were easily separated; but as was expected, we found a few skulls which made us hesitate. The 29 measurements ranged from 155-110 mm.; but near the middle there was a distinct gap of a whole centimetre into which no specimens fell. Accordingly, we felt we could reasonably class as small females five birds with measurements between 135 and 133 mm., which at first glance we had thought might be extra large males.

If, therefore, our diagnosis is correct, the sample provides the following figures:

- Biggest 155 mm. Smallest 133. Average of 18 142.4. Difference in range 22.
- 8 Biggest 123 mm. Smallest 110. Average of 11 115.7. Difference in range 13.



Of the 18 females, 4 measured more than 150 mm.; 6 came between 140 and 150 and 8 between 133 and 140. Of the 11 males only three measured more than 120 mm. and 8 were between 110 and 120. The largest female was 45 mm. longer in the head than the smallest male. Although so much longer, the heads of the females, measured over the braincase, averaged only about 1 millimetre wider.

Culmen measurements of the largest females came within the range of those given by Oliver; but the culmina of our smallest males, 71-72 mm., were 5 or 6 mm. shorter than Oliver's smallest birds; and of virtually the same size as the smallest typical *lapponica*, as given by Witherby.

The contents of this note are a modest attempt to salvage some data from the relics of a flagrant instance of illegal hunting. We may be tempted to exclaim 'Alas, poor Yorick.' Perhaps the Godwits I have recorded did not die entirely in vain.

#### LITERATURE CITED

OLIVER, W. R. B. 1955. New Zealand Birds. 2nd ed. Wellington: A. H. & A. W. Reed. WITHERBY, H. F. et al. 1940. The Handbook of British Birds, Vol. IV. London: H. F. & G. Witherby.

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# WHITE-WINGED BLACK TERN IN BAY OF PLENTY

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On 6 October 1974 I was contacted by Mr W. Broun who reported seeing a White-winged Black Tern (*Chlidonias leucopterus*) at the lagoon adjacent to the Kaituna River mouth near Maketu in the Bay of Plenty. He was accompanied by his wife and Mr and Mrs G. Goodman; they all had excellent views of the bird. At one stage they watched it as it quartered a small area over the sand flying almost like a Fantail as it chased insects. This was their second siting of the bird as they had also seen it on 15 September 1974.

On 12 October I went to the area with my family. Like the other party, we arrived at noon. We walked along the side of the lagoon and almost immediately saw the tern flying amongst some agitated Pied Stilts, which had young. Even though it was dull, I was struck with the colour; the bird was in full breeding plumage. It made several low passes over us and the water before departing.

The bird has not been seen there since.

## R. W. JACKSON

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# BLACK-FRONTED DOTTERELS AT ROTORUA

About mid-day on 1 September 1974, I paid a visit to Sulphur Flats by the Travelodge Motel, Rotorua. Feeding on the lake shore I spotted a Black-fronted Dotterel (*Charadrius menops*) feeding with two Banded Dotterels (*C. bicinctus*). Its bright red bill with the black tip and its striking plumage immediately drew my attention to it. I then spotted two more Black-fronted Dotterels behind. All the dotterels were feeding on small insects on the gravel. I believe this is the first record for this species in this area.

#### TONY PALLISER

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#### SHORT NOTES

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# ANOTHER GENTOO PENGUIN

On 16 October 1974, while working in the Papatowai Scenic Reserve in south-east Otago, Mr Bob Sproull and I went for a walk after our lunch along the beach. Near a spot called the Moki Hale we saw a large penguin who was certainly a stranger in these parts. It appeared quite healthy and we were able to photograph it without difficulty. Without any doubt we were able to confirm its identity later as a Gentoo Penguin.

TIM JACKSON

C/o Dept. of Lands & Survey, P.O. Box 890, Dunedin

# BLUE PETREL ASHORE, SAWYERS BAY, OTAGO HARBOUR

On the morning of 6 August 1973 a bird in an exhausted condition was found in the street at Sawyers Bay, Otago Harbur, by Mrs Baker of Sawyers Bay.

Later in the day, I collected this bird which was in a dazed state but uninjured. It was obviously not a prion because of the distinctive white bar across the tail, the dark head and the petrel-like bill.

Following discussions with Mrs Jill Hamel, the bird was identified as a Blue Petrel (Halobaena caerulea).

Description: Upper surface soft blue-grey, secondaries and scapulars edged with white, outer primaries darker on the outer webs, white band across squarish tail. Bill black, mottled forehead with crown, patch around eye, nape darker than back, a faint "M" pattern on upper surface, a small number of filoplumes on the head and neck, underparts, including underwing white; feet pale blue with pinkish webs.

Measurements: Bill 25.8 mm, width at base 9.9 mm. Depth at base 10.4 mm. Wing 214 mm. Tail 91.1 mm. Tarsus 32 mm. Midtoe and claw 44.5 mm. Weight 131 grams.

The bird was kept overnight and found to be quite healthy and active in the morning: it was given drinks of salt water, banded D-38274 and released from Taiaroa Head and was last seen heading out to sea with a strong wing beat.

A. WRIGHT

Wildlife Service, P.O. Box 30, Portobello

# AVIAN ANATOMY

\_\_\_\_\_ **\*** \_\_\_\_\_

Those interested in the vexed problem of the correct and agreed names of the anatomical parts of birds might care to know that an International Committee on Avian Anatomical Nomenclature (or ICAAN) has been set up. For more information contact Dr Julian J. Baumel, its Chairman, Creighton University, School of Medicine, Omaha, Nebraska, USA 68178.

# LETTERS

The Editor, Sir,

# BIOGRAPHIES IN NOTORNIS

What Mr. J. M. Cunningham writes is always interesting if not always right. The validity of some of his reasoning in a letter (*Notornis* 21: 89) is open to question on a number of points.

It has been customary to commemorate with Obituaries members who during their lives gave long or distinguished service. Under the present dispensation a number of transient 'bird-spotters' whose contributions to the ornithology of New Zealand are dubious or minimal, have been rated worthy of overlong 'write-ups' in Notornis.

A rising generation of would-be scientists is nourished on the principle of 'Publish or perish' — another manifestation perhaps of the 'rat-race' — and publish they do, regardless of the quality or value of their findings. Only too often, it seems, well known facts or obvious platitudes are dressed up in jargon in the hope that they will be hailed as scientific discoveries.

Thus among the conclusions in a paper (*Notornis* 20: 1-4) we are told that "It is our view that Yellow-eyed Penguin egg and chick survival on the Otago Peninsula is clearly being adversely affected by farm animal and human interference," etc., which is just a clumsy way of saying that people out for a walk and farm animals are likely to cause the loss of eggs and chicks — or, if you so wish, upset the breeding of Yellow-eyed Penguins. Hardly an original thought ! Moreover how worthwhile are the proffered statistics? The Otago Peninsula is long and rugged and it is a fair guess that the 19 nests found, on which the statistics were based, were in accessible places not far off the beaten track.

The accompanying biography (p. 93) is a fine example of periphrastic verbiage. But when the author writes "I got started" etc., that was the last straw and it broke at least one camel's back.

Traditionally the Editor of *Notornis* is held on a very loose rein and has wide freedom of action. He is nevertheless responsible to the Council and he would be an unwise editor who disregarded its wishes. It is not the Editor but the Council which controls the finances and has to foot the bill. The Council might jib at having to pay for tedious trifles. Surely the criteria for acceptance of material for publication in *Notornis* should be:— Is it about birds? Is it new? Is it true? Is it readable? Twenty pages of red meat are more nourishing than eighty pages of skilly.

R. B. SIBSON

26 Entrican Avenue, Remuera, Auckland, 5 12 July 1974

[I had to look up the OED to see what "skilly" is. Now that I know, I believe I can appreciate that Mr Sibson's 15 years

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LETTERS

as Editor of Notornis have qualified him admirably to suggest what "the criteria for acceptance of material for publication in Notornis should be." I am bound to suggest, however, in a way that he, at least, will understand — "Tempora mutantur, nos et mutamur in illis." — Ed.]

The Editor, Sir,

## SOME SEABIRD RECORDS IN NOTORNIS

In the course of scanning the world's seabird literature I have just taken a three-volume dose of *Notornis*. It seemed wholesome, indeed impressive, if a bit solid (a little more sugar on the pill would do no harm), were it not for one or two small points that made it stick a little. Since I observe that a third of the way through it acquired a new Editor who wrote ([Dawson] 1972) "I would welcome, indeed encourage, controversy and discussion in the pages of *Notornis*. Too often a paper is printed and becomes accepted fact even if its readers hold contrary views, reticent though they may be in expressing them. Too many myths have already appeared in New Zealand ornithology about matters that are said to be 'well known' or are spoken of but never published. Letters to the Editor and critical reviews will always be welcome . . . ." I also notice a provocative review of volume 22 of *Sea Swallow* last year (E.W.D. 1973) which appears attributable to the same source. As Confucius remarked, those who are afraid of lightning should not fly kites, so let us also take up a few points in *Notornis* !

If we start with a bird I have actually seen, long ago at a great distance in a bad light (normally I try to avoid this, because as Oscar Wilde remarked in another context, it does prejudice a man so), your reviewer remarked on "a profound need for better guides and critical studies, such as we have had in *Notornis* on . . . the Soft Plumaged Petrel, by people who really know their seabirds, which might stress in particular, the pitfalls awaiting the beginner or those, experienced elsewhere, who move into a new geographical area . . ." If we refer back to this generally admirable study (Harper 1973) I observe on p. 200 the statement "another belief to be disposed of is that *Pterodroma mollis* has a dark phase. Authentic specimens to support this are so few and of doubtful origins that it would appear at most to be a rare aberration."

I do not disagree with this, but I wonder whether this study and the previous one by Harper, Watson & Angle (1972) of the Kerguelen Petrel (*Pterodroma brevirostris*) could not be considered more thorough if they had noticed that I once took the trouble to investigate this dark morph (Bourne 1957)? About a tenth of the available specimens of Soft-plumaged Petrel (which may well have been selected) have the back suffused with sepia pigment which extends anteriorly as a breast band and ventrally as streaking of the belly. Two extreme examples, one from Gough Island and one taken at 36°S. 88°55′E. by John Gould, are almost uniformly dark and very like a Kerguelen Petrel, from which they may be distinguished by their broader bills, wider primaries with dark centres and shafts where these are pale in the Kerguelen Petrel, pale bases to the feathers of the underparts and pale fringes to those of the chin. I subsequently concluded that some other dark birds with broad bills might be hybrids between the two species (Bourne 1966). I had no skulls of the Kerguelen Petrel available, and Mr Harper's account of their distinctive character might now be thought to indicate that the two preceding species and the Mottled Petrel (*Pterodroma inexpectata*) which I interpreted as their migratory Pacific representative, are not so closely related, but on the other hand some other undoubtedly closely related seabirds such as the Murres or Guillemots of the genus Uria also show adaptive structural differences (Spring 1971) so this may not be so significant.

It may also be noted that some other gadfly petrels, and especially the members of the *Pterodroma neglecta- arminjoniana- alba* complex, also appear to hybridise freely where they breed at the same site despite equally marked differences in structure, voice and appearance. The numerous intermediate individuals in the American Museum of Natural History incidentally include the type of *Aestralata oliveri* from Sunday Island in the Kermadecs on 7 March 1913 (Mathews & Iredale 1914) which appears to me intermediate though with a strong strain of Phoenix Petrel (*Pterodroma alba*). Another bird of this type in the National Museum, Wellington, was taken on Raoul Island on 20 August 1944. It should also perhaps be pointed out that records of the Providence Petrel (*Pterodroma solandri*) from the Tuamotu and Austral groups result from misidentifications of Murphy's Petrel (*Pterodroma ultima*) before it was identified as a distinct species.

It is perhaps also worth pointing out that the northern forms of the Manx Shearwater (Puffinus puffinus) complex also vary greatly in appearance, the extreme individuals being entirely dark (Loomis 1918, Davis & Packer 1972). While I agree that the dimensions and appearance of the New Zealand specimen recently reported by Kinsky & Fowler (1973) do agree with the nominate race from the Atlantic, the difference from the Hawaiian race P. p. newelli is really very small, the only certain character being the length of the tail (Murphy 1952, King & Gould 1967). The possibility that such birds come from the North Pacific should always be considered before it is assumed that they come from the Atlantic, where, incidentally, they no longer breed on Bermuda and have never been proved to do so on the Salvages though they are now known to winter off south-west Africa (Lambert 1971). Since Vooren (1973) also quotes past speculations that breeding birds have a vast feeding range, it should perhaps also be pointed out that more recent workers doubt if it greatly exceeds 200 miles (Harris 1966).

It is not particularly surprising, as your Reviewer remarks, that people should occasionally get into trouble with birds with which they are not normally acquainted. It is only because some people are prepared to risk making asses of themselves in this way that the rest of us become enlightened. The fact which is somewhat surprising to an external observer is that people in New Zealand sometimes show so little awareness of events elsewhere. This not only involves rare petrels and shearwaters, but also such conspicuous examples of native avifauna as Giant Petrels (*Macronecles* sp.). I note with mild interest that eight years after we suggested that there are two species (Bourne & Warham 1966), and six after this was confirmed by the French on

the Crozets (Voisin 1968) I have only come across one note of this observation in Notornis, which gets it wrong (Hicks 1973)\*. One would at least expect someone to make haste to point out that our (perhaps here I should say "my") conclusions about the distribution of the white morph and the migratory tendencies of the Northern Giant Petrel (Macronectes halli) were wrong, but no, nobody has even This really suggests an extraordinary atrophy of the critical Johnstone (1971) has listed the characters by which the noticed ! faculties. two forms, which since they have a widely overlapping breeding distribution should surely be regarded as distinct species, may be distinguished; current evidence suggests that all the young birds migrate, though all the older ones may be more sedentary.

This wayward tendency is most conspicuous to external observers in local classification and nomenclature. The object of this otherwise tedious study is to enable people to arrive at agreement over what entities they are dealing with and what they should be called. Unfortunately, it appears to have evolved in an entirely different direction in New Zealand to the rest of the world, where people apparently still indulge in racial discrimination in the field a quarter of a century after they began to abandon it elsewhere (see Tucker 1949). The rest of us are now confronted by a set of systematic Moas, talking a language we cannot understand. I share your Reviewer's friend's doubts about everybody's observations, with the reservation that I particularly doubt my own because I know more about them, but if the world at large is to make further progress not only with qualitative but also quantitative ornithology we need to agree not only on an international nomenclature but also recording techniques as well, as already pointed out by Mr Heinekamp (1973). I quite agree that at present we are not really ready for computors (our Consultant ended up drawing interesting symmetrical outlines with his); much as I admire the luxuriant variety of treatment adopted in the numerous excellent seabird papers you have published recently, the mind boggles at what would happen if anyone tried to process the data uniformly in a computor !

Actually, I think Notornis is a splendid journal, combining a monumental original contribution in an area where it is much needed with a fine ripe local flavour too rare in the modern world. Congratulations on your coming of age (if that is what Volume 21 means).

#### LITERATURE CITED

BOURNE, W. R. P. 1957. Additional notes on the birds of the Cape Verde Islands, with particular reference to Bulweria mollis and Fregata magnificens. Ibis 99: 182-190. BOURNE, W. R. P. 1966. Further notes on the birds of the Cape Verde Islands. Ibis 108: 425-429. BOURNE, W. R. P.; WARHAM, J. 1966. Geographical variation in the genus Macronectes. Ardea 54 (1-2): 45-67. DAVIS, J. W. F.; PACKER, I. 1972. Melanistic Manx Shearwater. British Birds 65: 527. D----, E. W. 1973. Review of The Sea Swallow, Vol. 22. Notornis 20 (3): 289-290. [DAWSON, E. W.] 1972. EDITORIAL. Notornis 19 (1): 1-3. HARRIS, M. P. 1966. Breeding biology of the Manx Shearwater Puffinus puffinus. Ibis 108 (1): 17-33.

HARRIS, M. P. 1900. Breeding biology of the Manx Shearwater ruminus pummus. Ibis 108 (1): 17-33.
 HARPER, P. C. The field identification and supplementary notes on the Soft-plumaged Petrel (Pterodroma mollis Gould, 1844). Notornis 20 (3): 193-201.
 HARPER, P. C.; WATSON, G. E.; ANGLE, J. P. 1972. New records of the Kerguelen Petrel (Pterodroma brevirostris) in the South Atlantic and Pacific Oceans. Notornis 19 (1):

56-60.

HEINEKAMP, H. F. 1973. Letter to the Editor. A plea for a standard census method. Notornis 20 (2): 173.

\* (but see JOHNSTONE, G. W. 1974. Letter to the Editor. Plumage phases of Giant Petrels. Notornis 21 (1): 91 - Ed.)

HICKS, G. R. F. 1973. Latitudinal distribution of seabirds between New Zealand and the Ross Sea, December 1970. Notornis 20 (3): 231-250.
JOHNSTONE, G. W. Giant Petrels. Australian Bird Bander 9: 83-84.
KING, W. B.; GOULD, P. J. 1967. The status of Newell's race of the Manx Shearwater. Living Bird 6: 163-186.
KINSKY, F. C.; FOWLER, J. A. 1973. A Manx Shearwater (Puffinus p. puffinus) in New Zealand. Notornis 20 (1): 14-20.
LAMBERT, K. 1971. Seevogelbeobachtungen auf zwei Reisen im ostlichen Atlantik mit besonderer Berucksichtigung des Seegebietes vcr Sudwestafrika. Beitrage zur Vogelkunde 17: 1-22. 17: 1-32.

17: 1.32.
LOOMIS, L. M. 1918. A review of the albatrosses, petrels and diving petrels. Proceedings of the California Academy of Sciences 4 (2): 1-187, 17 pls.
MATHEWS, G. M.; IREDALE, T. 1914. Notes on some birds from the Kermadec Islands. Austral Avian Records II (5): 113-114.
MURPHY, R. C. 1952. The Manx Shearwater, Puffinus puffinus, as a species of world-wide distribution. American Museum Novitates 1586: 1-21.
SPRING, L. 1971. A comparison of functional and morphological daptations in the Common Murre (Uria aalge) and Thick-billed Murre (Uria lomvia). Condor 73: 1-27.
TUCKER, B. W. 1949. Species and subspecies: a review for general ornithologists. British Birds XLII (5): 129-134; (6): 161-74; (7): 193-205.
VOISIN, J.-F. 1968. Les Petrels Geants (Macronectes hall et Macronectes giganteus) de 1/1e de la Possession. L'Oiseau et la Revue Francaise d'Ornithologie 38, Spec. no.: 55 95-122.

95-122.
 VOOREN, C. M. 1973. Notes on sea birds between New Zealand and the Bounty Islands. Notornis 20 (4): 301-310.

#### W. R. P. BOURNE

Zoology Department, Tillydrone Avenue, Aberdeen AB9 2TN. Scotland. 29 May 1974 (amended 28 October)

The Editor. Sir.

## OYSTERCATCHER ETYMOLOGY — A REPLY

- ★ -

Mr R. B. Sibson's note (1973) to two apparent 'errors' in my etymological paper on Oystercatchers (Heppleston 1973) has prompted me to defend myself in public - and I am grateful to the Editor for this opportunity of doing so. Sibson disagreed with my interpretation of the words malacophaga and Haematopus.

malacophaga: its derivation is indeed Greek, not Latin — a slip which I humbly admit. One of the standard Greek-English lexicons (Liddell & Scott 1890), to which I will refer again later, gives two meanings for *malakia*:

malakia (1) — softness

malakia (2) — mollusca — i.e. water animals of soft substance without external shells e.g. cuttlefish (Aristotle); hard-shelled molluscs Aristotle termed 'Ostracoderma."

Neither of these meanings refers to bivalve molluscs. Confusion arises from the use of the word Malacology to describe the study of molluscs, and *Malacostraca* as the name of one of the crustacean taxa; in the latter word it is the root ostrakon which means 'shell' --not malaco-.

The malacophaga subspecies (if one accepts that it is a separate subspecies) is found in Faeroe and Iceland. In Faeroe very few Oystercatchers winter; those that do would have difficulty feeding on the shore, since there is a narrow intertidal zone on a coastline which LETTERS

is precipitous in nature and frequented by storms (Dr P. J. Dare, in litt.) In the summer the breeders are almost entirely inland, where food is exclusively terrestrial. More Oystercatchers, however, winter in Iceland, and feed to a greater extent on intertidal foods, including mussels. Breeding birds also include some that feed entirely on shellfish, but many others (inland) that feed on earthworms and Tipulid larvae etc. (Dare *in litt.*). Thus the classical derivation of the word malacophaga, coupled with the fact that the majority of the birds in the area feed on terrestrial food supplies, does not permit me to withdraw my earlier interpretation.

Haematopus: Once again, I submit, the obvious derivation is not necessarily the correct one. Liddell & Scott (1890) list the word as "Haemat-opus." The position of the hyphen is important; is the same in an earlier (1869) edition; and gives an indication of the derivations of the two components of the whole word. For the true meaning and original usage of the word, the lexicon refers the reader to the Plays of Euripides.

Milman (1910) and Way (1959) offer two translations of Euripides which agree in interpretation. I quote, from the Way translation, three specific line-references given in the lexicon; each quotation refers to the use of the translated Haemat-opus:

The Madness of Hercules. Line 933 "... with bloodshot eyeroots . . ." The Phoenician Maidens.

Line 870 "... the gory ruin of his eyes..."

Orestes.

Line 256 "...yon maidens goryeved ...."

As Sibson points out, the Greek ending '-ops' certainly refers to the face or eye. If, as in *Haemat-opus*, a 'u' becomes inserted into the word, there is a strong possibility of confusion with 'pus' — the nominative form of the Greek word for foot viz. podos.

Hence my defence case rest upon three factors:

- (a) The use of the word by Euripides.
  (b) The meaning of the word 'blood-stained eye/face' (Liddell & Scott).
- (c) Linnaeus came from a classical background.

These lead me, not to the dogmatic conclusion that I am right, but to a submission that my earlier (1973) derivation is probably closer to the truth than any other.

#### LITERATURE CITED

HEPPLESTON, P. B. 1973. Oystercatcher etymology. Notornis 20 (2): 120-122. LIDDELL, H. G.; SCOTT, D. 1890. A Greek-English Lexicon. Oxford: Clarendon. MILMAN, S. D. (transl.) 1910. The Plays of Euripides. Everyman's Library. London: Dent. SIBSON, R. B. 1973. Oystercatcher Terminology. Notornis 20 (4): 384. WAY, A. S. (transl.) 1959. Euripides: Plays. Everyman's Library. London: Dent. P. B. HEPPLESTON Kirkwall Grammar School,

Orkney, U.K. 12 November 1974

[Mr R. B. Sibson has been invited to reply and any other classicist/zoologist may also comment in time for the next issue but this correspondence, elucidative though it is, will not be prolonged unduly. — Ed.]

The Editor, Sir,

# REVIEW OF "THE FIAT BOOK"

I have read not without amusement the letter in the December Notornis in which F. N. Hayes takes me to task for my comments on *The Fiat Book of Common Birds* Vol. 2. At no point does he dispute or challenge the veracity of my statements on the status of certain birds in New Zealand. Since when has a reviewer been expected to say that everything in the garden is lovely when manifestly it is not?

Of course, I rejoice that in the words of my critic I am "simply not with it." What sensitive or civilised person would wish to be so classified in the 1970s; which, even if they do have some compensating merits, have been described as sick, silly and sadistic? Is not a certain air of detachment preferable?

So my Latin tag is outmoded, is it? May I remind F.N.H. that Latin and Greek remain the basis of nomenclature in the natural sciences. Did not Dr Johnson remark "Classical Quotation is the parole of literary men all over the world"? Is not F.N.H. aligning himself with the illiterate allies of the neo-barbarism?

I am aware that there are those who think a pun the lowest form of wit. Yet my bilingual effort seems to have been appreciated by those who had the wit to understand it. The Swan of Avon was not above using puns. Maybe I am just one of his groundlings who enjoy them.

Finally, Mr Editor, I am surprised that F.N.H. was allowed to describe *Notornis* as semi-scientific. Surely if its contributors are genuinely seeking the truth about birds or are offering reasonable hypotheses such as are tenable till disproved, *Notornis* is scientific. If it is not concerned with the truth about birds, is it scientific at all? In any case, can any real meaning be attached to the word 'semi-scientific'?

#### R. B. SIBSON

26 Entrican Avenue, Remuera, Auckland 5

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[Other correspondents have written privately to the Editor about this matter; he thanks them all for their interest and advice. This correspondence is now closed, the point having been made.—Ed.]

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# EMU FOR DISPOSAL

A member wishes to sell the following parts of *The Emu:* vols 41 (1941) - 74 (1974) in as new condition. What offers? Replies to H. T. Wenham, Plant Pathology Department, Massey University, Palmerston North.

# REVIEW

"A Classification of the Rallidae" by Storrs L. Olson. The Wilson Bulletin 85 (4): 381-416, col. frontispiece & 7 figs (1973).

Using skins and what skeletons were available to him, Olson has attempted to identify the more primitive members of the Rallidae and to illuminate evolutionary trends in this relatively homogenous and generalised family of birds. Flightlessness has developed many times in island populations, and is a neotenous condition that has evolved rapidly, involving little genetic modification and lacking major phylogenetic significance. Thus, like Mayr, Olson denies generic status to flightless derivatives of recognisable ancestry.

The traditional subdivision into subfamilies (Rails, Gallinules, Coots) does not stand up to critical examination but Verheyen's subfamily Himantornithinae is justified for a long-legged West African forest rail with unusual patterned natal down (shown with others in the frontispiece) and with skeletal peculiarities that are discussed in detail. *Himantornis* thus points to forest-dwelling, long slender tarsi, broad procoracoid processes and patterned natal down as primitive characters. Barred remiges (as in our Banded Rail and Wekas) and the condition of the nasal bar are also found useful in grouping and separating genera.

Olson's classification reduces the 52 genera recognised in Peters' "List" to 35, of which 11 are monotypic, arranged in the following linear sequence:

Himantornis, Canirallus, Sarothrura, Coturnicops, Micropygia, Rallina, Anurolimnas, Laterallus, Nesoclopeus, Gallirallus, Tricholimnas, Crecopsis, Crex, Rougetius, Aramidopsis, Dryolimnas, Atlantisia, Rallus, Aramides, Amaurolimnas, Porzana, Poliolimnas, Aenigmatolimnas, Cyanolimnas, Neocrex, Pardirallus, Eulabeornis, Habroptila, Gallicrex, Porphyrio, Pareudiastes, Gallinula, Fulica.

New Zealand rails are classed as follows: Gallirallus Lafresnaye 1841 for philippensis, dieffenbachii, and modestus as well as for the wekas, living and extinct, a grouping confirmed by skeletal features (Hypotaenidia Reichenbach 1852 is a junior synonym); Dryolimnas pectoralis (with muelleri), a member of the pro-Rallus group; Crex crex; Porzana tabuensis and pusilla; Porphyrio melanotus and mantelli, Gallinula (Tribonyx) ventralis, Fulica atra. Some extinct New Zealand rails (e.g. Pyramidula, Diaphorapteryx Nesophalaris) are not mentioned; for Aptornis, Olson has a novel interpretation (pers. comm.) that will doubtless be published before long in the Records of the National Museum of N.Z.

When discussing *Gallirallus dieffenbachii* and *G. modestus*, Olson claims there is no evidence that these two derivatives of *philippensis* were ever sympatric, suggesting that *dieffenbachii* was confined to the main Chatham Island, before its early extinction there, and that *modestus* was confined to Mangare Island. This hypothesis REVIEW

could obviously be tested by study of the abundant sub-fossil bone collections from the Chatham Islands.

Any Rail classification is bound to be controversial and the main purpose of this review is to bring the study to the notice of New Zealand ornithologists. C. A. F.

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# WILD LIFE TOUR

Colin Searle is taking another wildlife tour to Australia's outback, 13 July to 10 August. Three weeks will be in the Cape York region and visits will be made to Townsville and the Great Barrier Reef. This is a camping tour and the costs will be approximately \$650 which covers most of the transport and the catering. Write to P.O. Box 2577. Auckland, for details.

# ORNITHOLOGICAL SOCIETY CAR STICKERS

These attractive car stickers are 3 inches in diameter, made of durable adhesive vinyl. They feature a picture of the Takahe (painted by Elaine Power) in three colours on a white background. The name of the Society is in black around the perimeter. These are available for 25 cents from your Regional Representative or Mrs S. M. Reed, 4 Mamaku Street, Auckland 5.

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## THE CONSTITUTION

Copies of the amended new constitution are available from either your Regional Representative or the Secretary.

In view of general dissatisfaction with the time occupied at A.G.M.s by debates on changes to the constitution, Council requests the co-operation of members by obtaining the written support of ten members to any proposal to amend the constitution. It is hoped that this procedure will reduce the number and increase the quality of future amendments to the constitution.

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# CORRIGENDA

Notornis 21 (2): June 1974

BARTLE, J.A. Seabirds of eastern Cook Strait, New Zealand, in autumn p. 140, para. 6, line 2 for Abernathy read Abernethy

para. 7, line 6 for Kts read km/h line 7 for "strong breeze" read "moderate breeze"

p. 146, para. 2, line 4 for ane read any

p. 151, para. 1, line 7 for reparture read departure

p. 153, para. 6, line 4 for Jenkins (1947) read Jenkins (1974) p. 159, para. 3, line 3 for water read waters

p. 165, line 4 for HEATHER, B. D. 1972. Southern Skua (Stercorarius skua lonnbergi) read HEATHER, B. D. 1972. Pomarine Skua (Stercorarius) pomarinus).

# FROM THE EDITOR'S DESK

# THE GREAT ART O' LETTER WRITIN'

"Give 'im a letter — can't do no better " so wrote Rudyard Kipling. The privilege, for want of a better word, of submitting "Letters to the Editor" is a tradition long-honoured in the world of journalism and in other literary circles. *Notornis*, over the years, has published a variety of letters, some critical, some informative, a few emotional or querulous, but none libellous or defamatory. It would be a pity indeed if any reader took umbrage at the provocation afforded by Dr Bourne's somewhat lengthy, but nonetheless pointed, attempt to awaken us. On the other hand, I was unamused to be admonished by a fellow member for publishing "that silly letter which [he] never expected to see (dis) gracing the pages of *Notornis*," referring to the perfectly legitimate protest made by Mr F. N. Hayes in the December *Notornis*. It seems to me time the Editor himself had a say.

Habitually, an Editor refers a letter received to the instigator of the matter in hand if a reply seems appropriate. Regrettably, on the last few occasions on which I have done this, the said instigator has cautioned me that publication of the letter would serve no useful purpose, perhaps only revealing the ignorance and/or lack of perspicuity of its author: typical remarks — "My obvious advice, therefore, is to take no notice of his letter. . . We don't want to publish more rubbish and reveal our uncritical ignorance." I firmly believe, however, that every member of the OSNZ has a right to be heard or, more precisely, to be seen in print. There is, all the same, a time for the Editor to close correspondence on a particular topic and I will not hesitate to do this when appropriate. Accordingly, we will continue to maintain the democratic right of readers to write to their editor but the basic canons of good journalism will still prevail — nothing libellous, seditious or any more than slightly irrelevant. Longwindedness will not be encouraged although even verbosity has its place.

The Editor reserves the right to refuse or reject any letter or request modification or emendation. "Letters" are, of course, subject to the "Instructions for Authors" and may be refereed in the usual way. Readers will be allowed to have their say but all members may be assured that the Editor has no intention of letting his correspondence column become tedious, repetitious or wasteful of space. Letters based solely on emotive expression or matters of opinion will not be received so kindly as those furthering the aims and objects of the Society and its journal.

# WHAT DO WE READ?

As an Editor of a journal that is not necessarily intended for reading right through at one sitting, I am never unduly distressed when someone tells me he hasn't read his *Notornis*; only when I hear of some members of the OSNZ throwing their copies away unopened,

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do I become worried. But not for myself nor for the hours that authors, editor, referees and printer have spent putting the journal together — rather for those members themselves who have missed out in sharing some of the pleasures of ornithology. Why do they join the Society? That is another question, and one that Regional Representatives might be able to answer.

There used to be a saying at one of the universities I attended that one either read books or wrote them. Some of to-day's manuscripts from particular "schools" of scientific research reflect this belief. Little seems to have been done of significance outside that particular laboratory or department. Dr Bourne's letter in this issue may remind us that to read *Notornis* only is not enough. There are many bird journals now available to us in New Zealand libraries, especially in our own OSNZ collection; with the widespread facilities of interloan, photocopying and abstracting services, there is hardly any excuse for saying that we don't know of or can't get particular articles or books. Later this year I intend to show the depth of our own resources of ornithological periodical literature in New Zealand in an attempt to encourage the wider use of what material exists as well as to reveal the gaps in the pious hope that acquisitive (as they *all* should be) librarians will take the hint.

Let us not be parochial in our reading. *Emu, Ibis, Auk, Condor, Wilson Bulletin, British Birds, Bird Study* — these names we know and their contents we should know as well. There is much of interest in all of them. The species of birds they discuss may be foreign to us but methods and conclusions have universal meaning. Much successful ornithology in New Zealand was done as a direct copy of something already found profitable overseas and the perusal of bird literature from beyond our shores is still just as rewarding for those of us who lack originality or require inspiration.

Several members have offered to compile annual or more frequent lists of new articles and books dealing with ornithology and ancillary topics likely to be of use to New Zealand readers. This is a time-consuming job and more than your Editor has been prepared to do on his own. Many of the overseas ornithological journals already publish reviews of general and regional books on birds; some select articles with abstracts from other journals, and others (as in *The Emu*) give lists of titles of current contents. I would like to know if there is a demand for any such service for readers of *Notornis* — the offer to provide it is there and some of our colleagues are willing to devote their time to it. Please make your desires known. Above all, let us not be castigated by a Letter to the Editor in the 42nd year of *Notornis* that New Zealanders are anything but catholic in their reading.

# OYSTERCATCHERS UNDER EXAMINATION

Reading *Notornis* could be a step towards academic success as a few of our younger members may have found. Allan Baker's pioneer work on the genetics of New Zealand oystercatchers takes on a novel role in last year's university entrance scholarship paper sent to us for comment by the Chief Examiner in Biology who also happens to be a "long-standing" member of the OSNZ.

## FROM THE EDITOR'S DESK

## UNIVERSITIES ENTRANCE BOARD

ENTRANCE SCHOLARSHIPS EXAMINATION-1974

# BIOLOGY

NOTE .- Answer question 1 and any THREE others. All questions in section B carry equal marks.

[Time allowed: Three hours]

Fers minutes extra allowed for reading this paper

SECTION A (Compulsory-34 marks)

Answer all of the following section.

#### 1. Introductory Statement

The information given below provides all of the facts which specifically concern New Zealand systereatchers that are needed to answer this section. You will, of course, need to use your general biological knowledge to interpret the information provided.

#### Background Information

New Zealand cystercatchers have become much more numerous since they were protected by law in 1940. Judging from the appearances of the birds there are four kinds of cystercatcher seen in the North and South Islands. These are illustrated below.



<sup>&</sup>quot;Black Oystereatcher" (BO)

Distribution: In winter and summar throughout New Realend on or near rocky shores where it feeds and breeds. Commonest in the south of the Nouth Island. Eggs laid: Mid-October to mid-Pebruary. ' Intermentate Pica Oystercatcher'' (IPO)

Distribution: In winter and summer throughout New Zealand of or near rocky shores where it feets and breeds. May tend to move onto sandy and muddy feets in summer in the far north. Commonest in north of North Island. Eggs latd: Mid-Dealour to mid-Yeloruzy.



"Variable Fied Oystercatcher" (VPO)

Distribution: In winter and summer throughout New Zealand on or near rocky shores where it feeds and breeds. May tend to move onto sandy and muddy flats in summer in the far north. Commonest in north of North Island. Eggs latd: Mi2 October to mid-February. "South Island Pied Oysterenteher" (SIPO)

Distribution: In winter on tidal and and mud dats throughout New Zealand. In summer feeds and breeds at inland localities in the South Island. Eggs laid: Beginning of August to end of November. Parents

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BO x IPO

IPO S IPO

IPO x VPO

VPO x VPO

SIPO x SIPO

VPO x BO

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TABLE 1. Winter distribution of BO, IPO and VPO according to latitude.

Latitude grouping	BÖ	IPO	$\mathbf{v}_{\mathrm{PO}}$	
34-39°S	43%	34%	23%	
39-44°S	85%	8.5%	6.5%	
44-48°S	94%	1.057	5.0%	

TABLE 3. Observed and expected frequêncies of 101 mating combinations. (Observations made in Northland.)

Mating Combination	Observed Frequency	Expected Frequency if Mating Random†	$\chi^{2}$ value
во 🗴 во 👘	17	13.53	$0.89^{*}$
VPO x VPO	7	6.56	0.03*
<b>V</b> PO x BO	14	18.78	1.22*
<b>1P0</b> x <b>IP0</b>	22	14,54	3,83°
B0 x 1P0	24	28.08	$0.59^{\circ}$
YP0 x 1P0	17	19.39	0.29*

† Based on a census of phenotypes in Northland.

 x<sup>2</sup> values marked with an asterisk indicate that the observed frequency is not statistically significantly different from the expected frequency.

TABLE 4.	Occurrence of	parasites	in the	different	forms
	ofo	ystercatch	er.		

Parasite		Form of Oystercatcher			
	BO	IPO	VPO -	SIPO	
Feather louse A	х	х	х	х	
" B	х	х	х	х	
" C	х	х	х	х	
" 1)	х	х	х	••	
Intestinal fluke	х	х	х	х	
Caccal fluke	х	х	х	х	
Closeal fluke	x	х	x	х	
Tapewerm A	-		••	x	
"В	••	-		x	
" C	х	х	х		
Roundworm			-	х	
Spiny-headed wor	m	-	-	x	

The first question is reproduced here for the benefit of any of our readers who might like to try their luck. Answers may be forwarded to the examiner c/o the editorial address, but there is no prize for a 100% pass !

SIPO

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#### QUESTIONS

#### Using the information supplied altempt the following questions.

- A. How many species of ovstcreatcher do you consider are involved in the data presented here? Give reasons for your answer and indicate your estimate of the relative importance of the different pieces of evidence you use. (8 marks)
- B. Provide a genetical explanation of the data given in Table 2.

(8 marks)

- C: Bearing in wind the data in Table 3 and the fact that some species of systematcher migrate, whilst other species do not, answer the following quarkines:
  - (i) Assuming that the breeding populations of systematcher species are large; do you consider it likely that the proportions of the different kinds of systematchers breeding in any locality will change markedly?
  - (ii) Give reasons for your answer to (i) above, and indicate the probable cause(s) of any change(s) you envisage.
  - (iii) Explain the relevance of the Hardy-Weinberg Principle to problems concerning the stability of gene frequencies.
  - (iv) What conditions must be not before this Principle can be applied? Are these conditions fully met in this case of the New Zealand ovstercatchers? What further information, if any, do you need to unswer this question?

(8 marks)

D. Briefly outline the alternative hypotheses which might be advanced to account for the data in Table 4.

(7 marks)

E. In practice the distinctions between BO, IPO and VPO are not always as clear-cut as the figures suggest, and intergrades may be found. In two or three sentences suggest a genetic mechanism(s) which could be responsible for this effect.

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(3 marks)

Readers may sympathise with the Editor who is struggling against much pressure from the North to resist using the expression "SIPO" in the pages of this journal. We now ought to consider the legitimacy, on the same basis, of IPOs, BOs and V[i?]POs in our Classified Summarised Notes. — Ed.

# ABOUT OUR AUTHORS

DAVID E. CROCKETT is Senior Science Adviser, Auckland Education Board based in Whangarei. He is Regional Representative for the Northland and Far North Regions and has been Nest Record Convenor since May 1969. His paper was compiled from observations made on Meyer Island during the OSNZ 25th Anniversary Expedition to the Kermadec Islands 1966-67. He was also a member of the 1964 Kermadec Expedition. He writes that his interest in birds started in a Christchurch bird club conducted by Dr, now Sir Robert, Falla, then Director of the Canterbury Museum. A beach patrol with Dr Falla on 9 September 1946 at New Brighton introduced him to an activity which has continued to the present.

A chance meeting with Robert Cushman Murphy in 1947 and subsequent correspondence fostered his interest in Procellariiformes. The generous support of Dr Charles Fleming in the early fifties helped further develop this interest in sea birds which has taken him to a number of offshore islands. While leading a Wanganui Museum Expedition to the Chatham Islands in 1969-70, and in the company of Fred Kinsky and Lawrence Edlin he found the Black-winged Petrel (Pterodroma nigripennis) on South East Island.

After a visit to his first "petrel island" in 1952 two papers were published — Birds of Motunau Island and The Birds of Motunau River Mouth. *Notornis* 6 (2): 40-42 and 49-50.

His interests include OSNZ activities, photography, sound recording, sea watching, bird banding and beach patrolling. His wife, Ruth, also a member of OSNZ, joins him in many of his ornithological activities.

BETH BROWN was born and educated in Napier and aided by her father developed an appreciation of natural history from an early age.

As one of many whose interest in birds was fostered by H. R. McKenzie, she served a ten-year apprenticeship before becoming RR for South Auckland when he retired in 1973. Another unfailing source of encouragement, she believes, has been R. B. Sibson, and she writes — "With the guidance of these two and living as I do close to both Manukau Harbour and the Firth of Thames, it is natural that my great interest is waders. I have taken part in a number of Field Study Courses and have helped arrange two private field trips to Fiji after the Society's original one in 1970. An ear for music is an aid to ornithology and sound recording is a satisfying adjunct. My husband shares my interest in birds and is a keen photographer."

PETER CHILD is Deputy Principal, Dunstan High School, Alexandra. He has spent most of his life in Central Otago but has had two spells in the Gilbert and Ellice Islands and has published an

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account of their birds in the Atoll Research Bulletin. He was also a member of the ill-fated Kermadecs expedition of 1964.

Mr Child's ornithological interests include migration, birds at high altitudes, Pacific birds in general, and changes in the bird life of Central Otago. Most of his summer vacations are currently spent in making a survey of the birdlife of Mount Aspiring National Park. Starved of ornithological chit-chat in Alexandra, he says he welcomes suitably qualified visitors! His other leisure-time activities are mountaineering and tramping, watercolour painting, lichenology, and lazing away part of his advancing years, as he calls them, in salubrious climates such as Fiji.

ROB GUEST joined the N.Z. Forest Service in 1972 after graduating in Forestry from Bangor, North Wales. His work has consisted of conducting surveys to determine the condition and trends of the indigenous vegetation for watershed management. He says that his exciting ornithological moments include being stooped by a peregrine falcon whilst rock climbing and being hit by a barn owl whilst he was riding a motorcycle | Apart from birdwatching, he is keen on climbing, photography and fishing.

MICHAEL IMBER is a scientist with Wildlife Service, Department of Internal Affairs, which he joined in 1966, not long after obtaining his M.Agric.Sc. degree from Massey University, with a thesis on effects of population density on reproduction in mice. He was born in the U.K. in 1940 and came to N.Z. in 1958. His early work with Wildlife was on population dynamics of Canada Geese, which continues; research on petrels began with Grey-faced Petrels on Whale Island in 1968 and extended to Cook's and Black Petrels on Little Barrier Island in 1971; studies of the food of oceanic birds derived from this interest in petrels, which also made him a keen beach patroller. He married Miriel Aitchison, then Sister in Children's Ward, Wanganui Hospital, in 1965; they have one more child, they say, than they should, and live at Raumati. A further introduction to Mike Imber's work on the food of oceanic birds appears in the latest issue of Wildlife — a review, No. 5: 23-25, 1974.

RODNEY RUSS is a wildlife trainee with the Wildlife Service, Department of Internal Affairs, which he joined in 1971. In 1972/73 he was a member of the Wildlife Service support staff for the Auckland Islands expedition, as well as participating in the general bird surveys and banding programme. He returned briefly in December 1973 on the M.V. Acheron to provide follow-up data on the Southern Royal Albatross. Participation in various recent wildlife expeditions to the Chatham Islands has allowed him to visit the majority of the islands in that group.

DICK WATLING was born in Uganda in 1951, moving soon after to Kenya where he lived until 1960 when he went to England. After school days in Yorkshire, he spent a year in the Serengeti Research Institute in Tanzania as a research assistant. In 1969 he entered Bristol University, graduating in zoology in 1973.

Since 1967 Mr Watling has spent his school and university vacations in Fiji and has been able to follow his interests in zoology

and especially in ornithology. This led directly to his present position as a postgraduate student of the Department of Applied Biology, University of Cambridge, attached to the Agricultural Department in Fiji where he is working on an agricultural bird pest, the Red-vented Bulbul.

JAMES MILLS, author of a report on the present status of the Takahe published in the December 1974 *Notornis*, is a scientist with the Wildlife Branch, Department of Internal Affairs. He has been involved with research on Takahe in Fiordland since 1972. He received his undergraduate and graduate education at Canterbury University, attaining a PhD in 1971. Other species studied have been the Red-billed Gull and the Grey Teal. His co-author ROGER LAVERS was employed with the Wildlife Branch as a scientist until 1973 and has since been a student at the Bible College of New Zealand in Auckland. He graduated from Victoria University with a BSc honours degree. As well as Takahe he has been involved with research on mustelids.

## INDEX TO NOTORNIS

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Mr Brian Ellis, former Secretary of the OSNZ, has offered to compile an index of the first twenty volumes of *Notornis*. The form of the index (whether by author and/or species and/or locality) has yet to be decided.

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We acknowledge with thanks the Universities Entrance Board for permission to reproduce part of the 1974 Entrance Scholarship examination paper in Biology.

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# LITERATURE AVAILABLE

From all bookshops:

Annotated checklist of the birds of New Zealand. (OSNZ) \$4.95 A field guide to the birds of New Zealand, by R. A. Falla, R. B. Sibson and E. G. Turbott, 2nd rev. ed. \$5.00

- From B. D. Heather, 10 Jocelyn Crescent, Pinehaven, Upper Hutt: A biology of birds, by B. D. Heather. \$1.33
- From B. A. Ellis, 44 Braithwaite Street, Wellington 5: Field guide to the waders, by H. T. Condon & A. R. McGill. Post Free \$1.20
- The following are available from Mrs. H. R. McKenzie, P.O. Box 45, Clevedon:

Back numbers of 'Notornis' at 75c (Vols 2-13) and \$1 (Vols 14-21) and \$1.50 (Vol 21-). Complete sets available.OSNZ Library catalogue, 70 pp.50c

Banding reports, Nos 8-14, 50c each. Nos 1-7 are incorporated in early issues of Notornis. Kermadec Expedition, 1964, by A. T. Edgar.

45c