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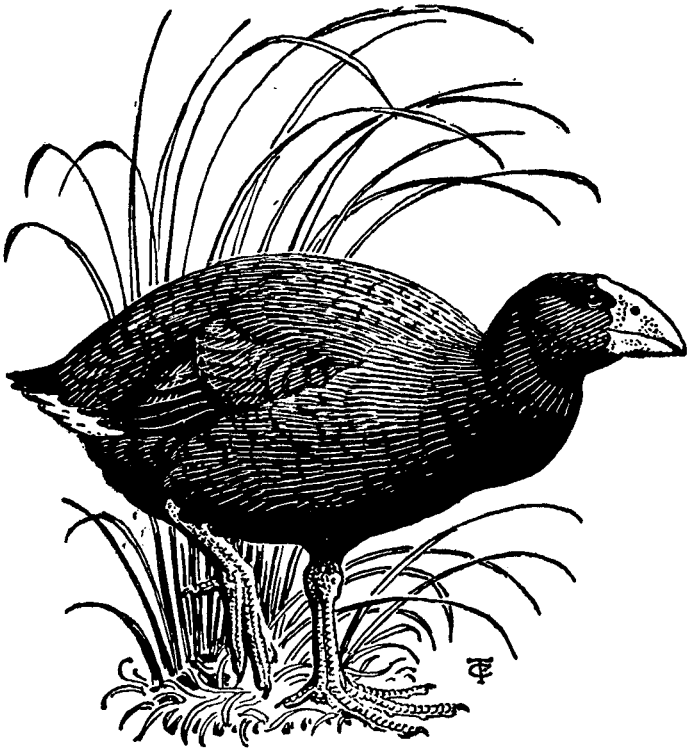

QUARTERLY JOURNAL

of the

Ornithological Society of New Zealand

(Incorporated)

Volume Seventeen, Number Four, December, 1970

NOTORNIS

In continuation of New Zealand Bird Notes

Volume XVII, No. 4 - - - DECEMBER, 1970

JOURNAL OF THE ORNITHOLOGICAL SOCIETY OF NEW ZEALAND
(Incorporated)

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

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

Annual Subscription: Ordinary Member, $2; Endowment Member, $3

Life Membership, $40 (for members over thirty years of age)

Subscriptions are a minimum of $2 a year, payable at the time of application and the first of each year thereafter.

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OFFICERS 1970-71

BIRDS AND BIRD LORE IN THE TOKELAU ISLANDS[1]

By KAZIMIERZ WODZICKI[2] and MARSHALL LAIRD[3]

ABSTRACT

The avifauna of the Tokelau Islands and the surrounding ocean consists of at least 26 species (15 sea birds, eight shore birds and three land birds). Seven of the species are now recorded from the Group for the first time. Of the 15 sea birds, seven are known to breed in the Tokelaus or to have done so until recently. At least three of the others may do so, the remainder probably being random visitors. All but one of the shore birds are migrants, as are two of the land birds. The affinities of this avifauna with those of other Central Pacific islands are briefly described, as is the status of birds breeding in the Group. Conservation issues are touched upon, and some notes on Tokelauan bird lore are presented.

INTRODUCTION

The findings reported herein resulted from five extended visits to New Zealand's northernmost dependency — 1958 and 1960 (M.L.) and 1966/67, 1968 and 1970 (K.W.). These successive expeditions had the primary purposes of research towards mosquito control (Laird, 1963, 1967, 1969) and rat control (Wodzicki, 1968a, 1968b, 1969, 1970), but during them long canoe trips and field work on most islets of Atafu, Fakaofo, and Nukunonu[4] provided excellent opportunities for bird watching. Additionally, information on the past and present status of the avifauna, also on relevant island lore, was gathered from many Tokelauans. The resultant material substantially augments that published by Thompson and Hackman (1968) on the basis of a seven-day stay in the three atolls in 1965. It is submitted that we now have a reasonably complete picture of the avifauna of the Tokelaus, and of its relationships with that of other Central Pacific islands.

MATERIALS AND METHODS

The geography and history of the Tokelau Islands were briefly described by Thompson and Hackman (1968). Further details may be found in the Annual Reports of the New Zealand Island Territories Department for the years 1966/67 and 1967/68, and in Macgregor (1937) and Huntsman (1969).

Research into the ecology and integrated control of mosquitoes carried out in 1958 and 1960 (Laird, 1967) necessitated extensive visits to many islets — " motus " — of all three Tokelau atolls (all those of Atafu and Nukunonu: a selection of those of Fakaofo) and provided excellent opportunities for bird observations. Work on rat ecology and control in 1966/67 at Nukunonu and Atafu, in 1968 at Nukunonu only, and in 1970 at Fakaofo (Wodzicki, 1968a, 1968b, 1969, 1970) was similarly conducive to observations of bird ecology. Figs. 1 - 3 show the three atolls and the place names mentioned in the text.

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4 Cartographers (e.g. " The Times Atlas of the World " 1968 Edition) generally accept Nukunon**o**, which is a misspelling by early European voyagers of the true name " Nukunon**u** " (" Nuku," island; " nonu," a shrubby tree, **Morinda citrifolia** Linn., commoner here than elsewhere in the Tokelau Islands). The New Zealand Statutes have adopted the spelling Nukunon**u** (see the Tokelau Islands Amendment Act 1969, s. 2), and this spelling is being used throughout this paper.

Ten birds representing eight species were collected during the 1960 visit to confirm subspecific identifications, and deposited (as alcohol-preserved specimens) at the American Museum of Natural History, New York. Measurements of these birds taken by Dr. Charles E. O'Brien are given hereunder in the species descriptions in the following order: American Museum of Natural History (AMNH) number, locality, date, bill, tarsus, wing and tail-length (cm.). Thirty-seven bird skins were obtained during the 1966/67 visit. These are deposited at the Dominion Museum, Wellington. Relevant data are itemized in our species synopses, where applicable, in the following order: Dominion Museum (DM) number, locality, date, sex, bill, tarsus, toe, wing and tail-length (cm.) and weight (gm.) if available.

Thompson and Hackman (1968) collected and sexed 99 bird specimens belonging to 20 species during their seven-day visit to the Tokelau Islands in 1965. Unfortunately, the lack of standardization of their evaluation of the size and condition of the gonads, and of

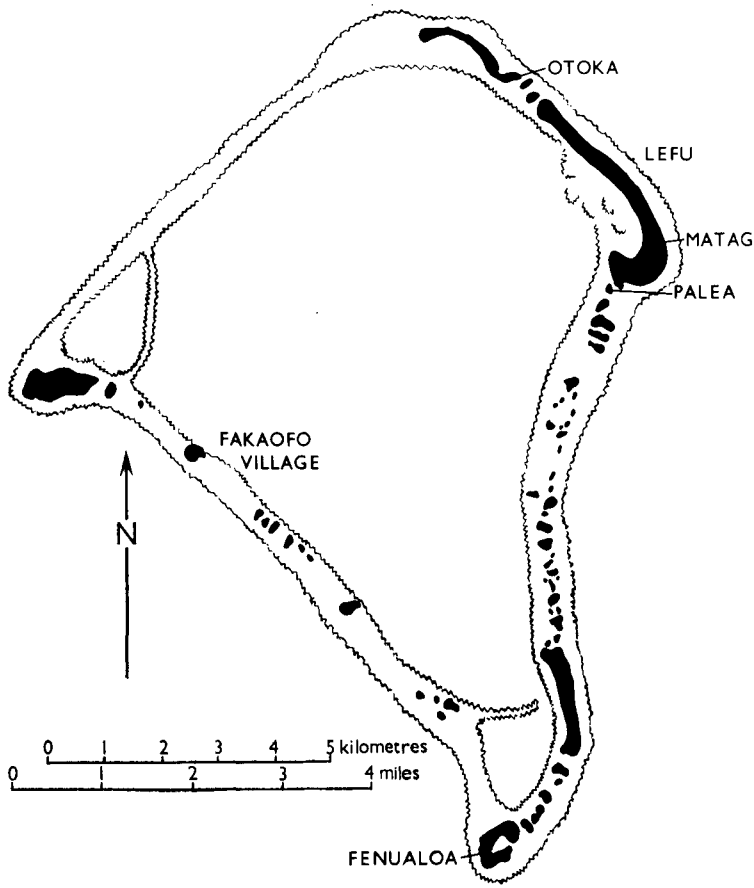


FIGURE 1 — Fakaofo Atoll

the amount of body fat, reduced the value of their results for an assessment of breeding condition.

The nomenclature and systematic arrangement of the birds enumerated in the present paper follow Kinsky (1970). An accurate knowledge of Tokelauan bird names is of basic importance to local folklore and ethno-avian studies. These vernacular names have been variously spelt between their first mention by Edwin H. Bryan, Jr. (1924) and the most recent publication (Thompson and Hackman, 1968). During the latter part of these studies, the presence in the

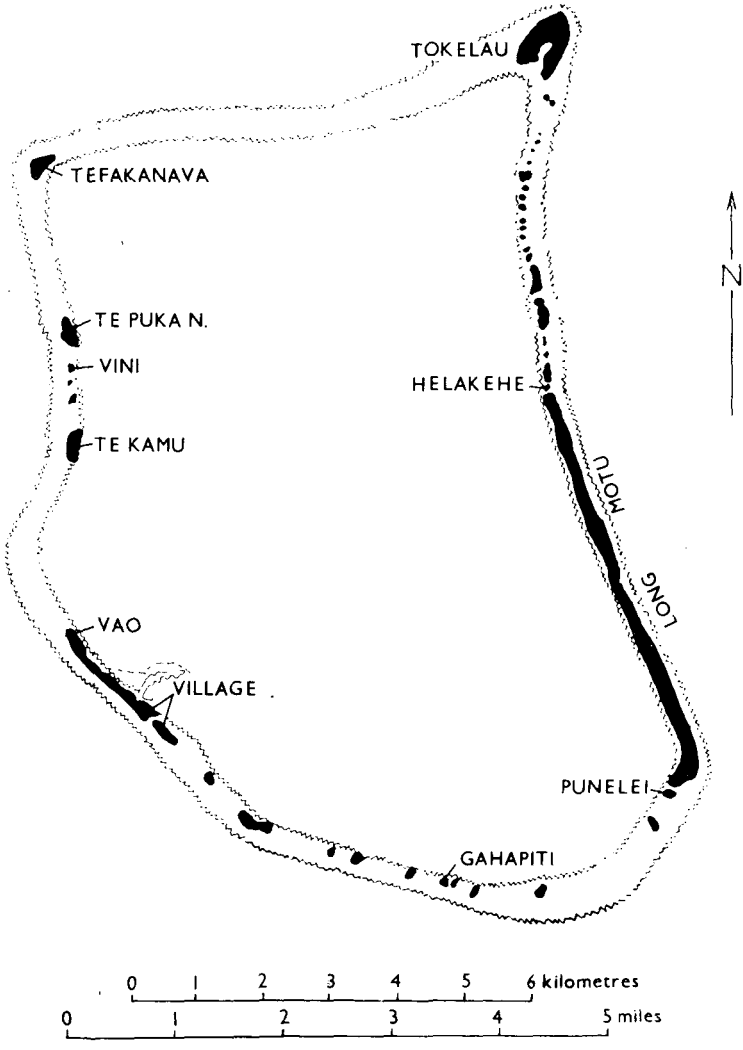


FIGURE 2 — Nukunonu Atoll

Tokelaus of two social anthropologists (Dr Antony Hooper, University of Auckland, and Dr Judith W. Huntsman, Bryn Mawr College, Pennsylvania)), made it possible to draw up the revised list presented herein.

The following brief note furnished by Dr Hooper explains the orthography adopted for the Tokelau names of birds in the present paper. " There is no ' official ' orthography of Tokelauan, but linguistic analysis of the language is under way at the University at Auckland. The orthography used here is that agreed upon by linguists at Auckland, and used by Dr Hooper and Dr Huntsman in their ethnographic studies of the Tokelau group.

In Tokelauan, as in other Polynesian languages, vowel length is phonemic. The phonemically distinct long vowels are written as double vowels, *f* is a voiceless bilabial fricative and *h* is a glottal fricative which occurs palatalised before back vowels." According to Dr Hooper " the whole question of the *wh* versus the *f* is simple. True, it sounds like *'wh'* but the *f* is simpler to write and neater." Similarly, as in Samoan, the sound *"ng"* is rendered by *"g"* to avoid confusion.

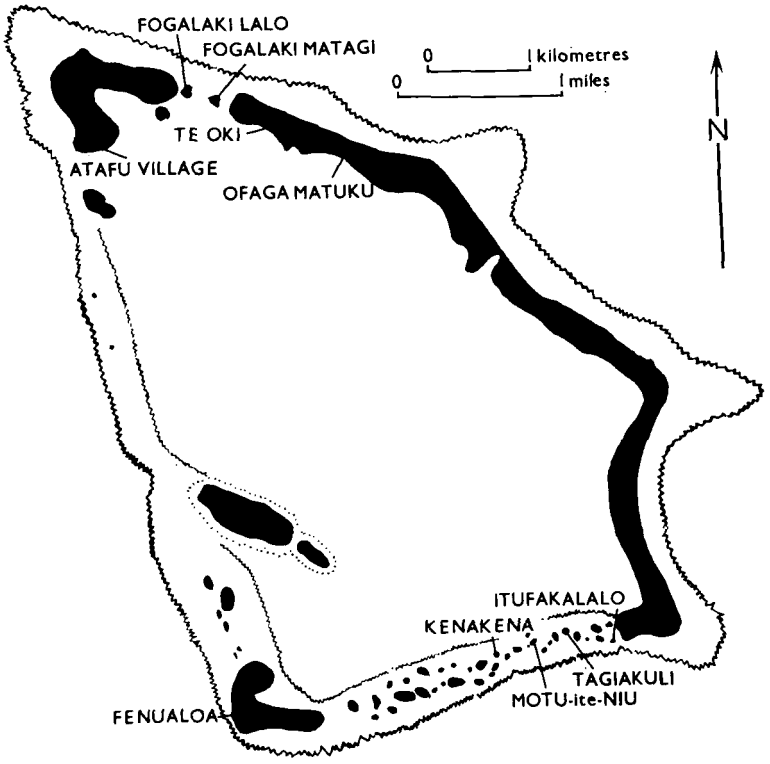


FIGURE 3 — Atafu Atoll

RESULTS

Introductory

The following account provides the scientific and vernacular (English and Tokelauan) names; the status of the birds (" na manu "); the dates of our observations, and information on specimens collected. The birds listed are broadly classified as sea birds, shore birds and land birds. Those not previously recorded from the Tokelau Islands are marked with an asterisk.

Disagreeing with Thompson and Hackman (1968) that subspecific names should await taxonomic revision, we have given subspecific names wherever sufficient taxonomic information is available.

Annotated Checklist

Order Procellariiformes

Family Procellariidae

*1. *Puffinus pacificus* (Gmelin, 1789 (subsp. *chlororhynchus* Lesson?). Wedge-tailed Shearwater, Takatai[5]. Non-resident. At 07.00 on 29/4/60, seven shearwaters were sighted (M.L.) some 300 metres from the M.S. " Aoniu," 170 km south of Fakaofo while bound for Apia, Western Samoa. A Tokelauan aboard declared these to be a bird we had often heard of, but never seen, in the Group — the Takatai (" wanderer of the sea "; " taka " wander, " tai " sea). One soon cut close to the ship, the binoculars then clearly revealing a longish wedge-shaped tail, dark-brown upperparts (black in the case of the rather similar *P. carneipes*), a brownish-grey face and throat, and brown underparts [white in the case of a smaller representative of the genus well-known from adjacent water, *P. lherminieri dichrous* (the Samoan Taio or Taiko, Armstrong, 1932)]. The strongly hooked tip of the bluish-black bill (pale flesh in *P. carneipes*) was clearly evident.

We had earlier been told at Nukunonu that the Takatai, while rare in the Tokelaus, is occasionally seen from fishing canoes on the open sea. The hooked bill was then mentioned as an identifying feature, and the size was stated to be somewhat larger than that of the Gogo or Common Noddy *Anous stolidus*. A petrel of some sort was thus indicated. Lastly, the feet were light-coloured, eliminating the black-footed Christmas Shearwater *P. nativitatis* from consideration. The wide range of this subspecies — which breeds on many islands in the tropical Pacific, including the Phoenix Group and Tonga (Baker, 1951, and King, 1967) — also supports our contention that the birds sighted were indeed Wedge-tailed Shearwaters, the most likely subspecies being *P. p. chlororhynchus* Lesson.

Order Pelecaniformes

Family Phaethontidae

2. *Phaethon rubricauda* Boddaert, 1783. Red-tailed Tropic Bird. Tavake-ulu-gahu. Resident. Well-known to the islanders, who said that it occasionally breeds on all three atolls of the Tokelaus. Its single egg is laid on the ground, beneath gasu *Scaevola frutescens*, a shrubby saltbush. According to our informants, the rarity of this

5 According to Dr Judith W. Huntsman [pers. comm., 22/4/1969], the Takatai is also known as Manutagilua [lit. ' bird with the double cry '] and so the saying goes — if one hears the cry of the Manutagilua during a storm, it indicates that the storm is almost over.

species in the Tokelaus contrasts with its abundance at Hull Island (some four degrees north of Atafu) and several other of the Phoenix and Line Islands (Child, 1960). A bird in flight was recorded off the coast of Fenualoa islet, Atafu, on 8/4/60. Thompson and Hackman (1968) reported another (1/3/65). A group of six *rubricauda* flying on the lagoon side of Fenualoa islet, Fakaofo, were seen on 22/8/70 (K.W.). David Gravatt (pers. comm., Feb. 1967) stated that in some years they nest on Atafu.

3. *Phaethon lepturus* Daudin, 1802. White-tailed Tropic Bird. Tavake-ulu-puka. Non-resident. Two White-tailed Tropic Birds were seen at 11.00 on 29 April 1960, 136 miles south of Fakaofo and approximately half way back to Apia. Thompson and Hackman quoted P. W. Woodward for a sighting at Fakaofo on 27/2/65. Isaia, a Nukunonu elder, declared that the Tavake-ulu-puka used to nest at this atoll in his father's time. Mitchell (1909) gave Tava'e as the Samoan name for both Red- and White-tailed Tropic Birds, Armstrong (1932) following Pratt (extensively quoted throughout his book) in applying this name to the latter species and *P. aethereus* too, and using both Tava'e'ula and Tava'etoto for the former.

Family Sulidae

*4. *Sula dactylatra* (Gould, 1846). Masked or Blue-faced Booby. Hakea. Non-resident. Included here because several Tokelauans volunteered a good description of the species to each of us individually, claiming that this third Booby, " larger than the Talaga or Takupu," visits the Group rather rarely.

5. *Sula sula sula* (Linnaeus, 1766). Red-footed Booby. Talaga (young), Takupu (mature). Resident. There were numerous occupied nests in a grove of pukakakai *Pisonia grandis* at Palea islet, Fakaofo, on 27/4/60. A fledgling from this colony was being kept as a pet by the head teacher at the village on Fakaofo islet, who stated that eggs are laid in February, hatching taking place in March. The subspecific identification was confirmed by Drs. Charles O'Brien and Robert C. Murphy, from a colour slide of this young bird. Two adults had already been seen off the coast of the village islet of Atafu in October 1958, an islander (with M.L. at the time) remarking that although large flights sometimes visit the atoll breeding never takes place there. The same apparently holds good for Nukunonu. Such flights could originate equally well from Fakaofo or the Phoenix Group, most islands of which have colonies (Child 1960). This species was reported by Thompson and Hackman (1968) near Matagi islet, Fakaofo, on 28/2/65, but was not observed by the senior author in 1966/67 and 1968. Single birds and pairs of Takupu were seen diving from a low altitude in the Fakaofo lagoon in August-September 1970 (K.W.).

" Takupu " is given by Child (1960) as the Ellice name for this species, with " Talaga " as a queried alternative. The Tokelau name is close to the Maori " Takapu," which applies to the Australian Gannet *(Sula bassana serrator* Gray, 1843) (see Kinsky, 1970).

6. *Sula leucogaster* (Boddaert, 1783). Brown Booby. Fuakoo[6]. Probably resident. Sighted by both authors on several occasions; for

6 Interestingly enough, a name very close to this (Fua'o) is applied to a very different bird, the Common Noddy, **Anous s. stolidus**, in Samoa (Armstrong, 1932; Mitchell, 1909), where according to the former author the Brown Booby is termed Ta'i'o.

example, two close inshore near Tefakanava, Nukunonu, at midday, 6 September 1958; another resting on a metal drum topping a metal tripod marker in the lagoon off Vao islet, Nukunonu, 18.00 hrs. same afternoon. D. Gravatt reported that the Brown Booby is only occasionally observed and is not known to breed on Atafu. On the other hand Vaopuka (pers. comm. to K.W., 19/9/70) stated that a few pairs of these boobies nest on Palea motu, but do not have a definite nesting season. These and other field records were supplemented by observations on captive birds. Thus an immature example, with a broken wing, was examined on the Village islet, Atafu, on 30 September 1958. The plumage of this was dark chocolate-brown, the line of demarcation between the dark breast and white abdomen being sharply drawn. The face and gular pouch were yellowish, as were the feet and legs, the bill being pale bluish. Another captive Brown Booby was seen at Atafu on 12/6/68. This bird (Plate XXX) had been

[The Late D. Robinson

Plate XXX — **Sula leucogaster** (Boddaert, 1783). Atafu, 12/6/68.

banded (No. 757-67076). The band proved to have been placed upon a Brown Booby at Jarvis Island by members of the Pacific Programme, Smithsonian Institution, in November 1964. According to the owner, a Brown Booby wearing this band was caught and kept as a pet for some time. On its death, the band was removed and placed on the bird actually seen.

Family Fregatidae

*7. *Fregata minor* Gmelin, 1788. Greater Frigate-Bird. Katafa Gogo or Katafa-ua-Leuleu (the Samoan name is Atafa — Armstrong, 1932; Mitchell, 1909). Resident. Uncommon, not noted by Thompson and Hackman (1968). A large black frigate bird was observed over the lagoon at Nukunonu at 11.15 on 6/9/58. Just after midday, two more were seen (off the islet of Tefakanava) harassing a White-capped Noddy *Anous minutus* which made its escape by flying off

landwards just above the water. The junior author's identification was based on the evident size and general blackness of colouring of these birds, none of which had white flank patches. Tokelauans in the canoe volunteered the information that this was the larger kind of Katafa seen in the Group, and that at times it exhibits an inflated red throat pouch — the designation Ua-Leuleu then being applied to it.

It is interesting to note that similarly distinctive but quite different names are applied to males in this state in the Ellice Islands — Talakula or Katokula (Child 1960).

On Atafu David Gravatt reported that katafas were " quite often seen soaring over the lagoon. Twelve and twenty were observed on two occasions." They were " gliding in circles using very few wingbeats " and " they were issuing their characteristic rather plaintive cry and occasionally swooping on an *Anous* or other small bird."

During the 1968 survey (end of April to mid-June), six Greater Frigate Birds were seen on the morning of 6 May and three on the following day circling at a considerable altitude. They also roost in places on very windy nights and are being collected.

Vaopuka reported that Katafa-ua-Leuleu nests regularly on Fakaofo atoll, the Palea islet being its only nesting place. As this islet is communal property a permission from the Elders is necessary for collecting the birds: about 20 - 40 birds are annually taken.

8. *Fregata ariel* (G. R. Gray, 1845). Lesser Frigate Bird. Katafa-koti. Possibly resident. Most of the frigate birds observed in 1958 and 1960 had an extension of the white breast (females) or a distinct white patch (males) on the lower flank beneath each wing, and were thus considered referable to this species. Recorded at Nukunonu on three occasions in 1960; Tokelau islet, 8 September; Vao or Village islet, 14 April; over lagoon, evening, 22 April (two groups numbering eight and 23, forming ascending spirals mounting to some 200 metres). At Fakaofo large numbers were circling above Palea islet on 25/9/58 and 27/4/60. Sibley and Clapp (1967) reported Lesser Frigate Birds as common visitors to all three atolls. Thompson and Hackman (1968) collected eight specimens at Fakaofo and Atafu between 27 February and 4 March 1965. They also recorded large flocks roosting at Fakaofo, and flocks flying northwards at Nukunonu. The eight specimens collected were all males with testes from 11 by 5 mm. to 17 by 8 mm. Fat condition was recorded in six specimens, one with medium and five with heavy fat (including one bird showing a substantial body moult).

Palea islet (Fakaofo), noted as " a nesting place for frigates " by E. H. Bryan, Jr. (1924), is the outstanding bird island of the Tokelaus. Red-footed Boobies, White-capped and Common Noddies and White Terns breed there. According to some islanders, Lesser Frigate Birds nest, or at all events, nested at Palea. Others reported that these birds simply roost in the islet's grove of pukakakai *Pisonia grandis*. The guano-spattered brownish-black humus beneath the *Pisonia* is characteristic of the heavily phosphatic Jemo series (Wiens, 1962). One very obvious consequence of the organic richness of Palea's soil is the darker green colour of the crowns of palms there by comparison with those of the adjacent sandy islet of Olokalaga.

On very dark and windy nights, visits are sometimes made to Palea islet for the purpose of clubbing Katafa. Climbing into the

pukakakai trees, men strike them down with long poles, hitting them across the base of the beak to fell them without disturbing others roosting nearby. At Nukunonu, too, we were told (in 1958, 1960, and 1968) that frigate birds are similarly taken on dark nights following westerly gales, when the fronds of coconut palms on certain western reef islets from Te Kamu to Vini (especially the latter) may be black with them. Under these circumstances one man has been known to kill as many as 50 Katafa. In 1968, however, Isaia declared that no more than 20 - 30 birds are nowadays caught annually at Nukunonu.

Order Ciconiiformes

Family Ardeidae

9. *Egretta sacra sacra* (Gmelin, 1789). Reef Heron. Matuku [the name used in the Marquesas according to Jardine, quoted by Finsch and Hartlaub, 1867. Matuku-moana is the Maori name for the Blue Reef Heron (Oliver, 1955). Armstrong (1932) and Mitchell (1909) give Matu'u as the Samoan name]. Resident.

[J. Morgan Williams

Plate XXXI — **Egretta s. sacra** (Gmelin 1789) dark morph. Nukunonu, 1966.

DM 15,342, Viliage islet, Nukunonu, 19/12/66, 75.1, 72.4, 66.2, 280 and 93 (in moult, two control tail feathers short and in sheath). DM 15,341, Vaitupu, Long islet, Nukunonu, 6/2/67, female, 88.8, 70.9, 66.2, 277, 93 (six small fish in stomach). DM 15,340, Vao, Nukunonu, non-flying chick; Tepuka N., Nukunonu on 12/1/67, male, 82.8, 78.8, 67.6, 290 and 100.

Common throughout the Group, and the only wader breeding there. According to Mayr and Amadon (1941), Reef Herons from the Tokelaus are referable to *D. s. sacra.* There are three colour phases, grey-blue (Plate XXXI), pure white and mottled. These morphs are well-known to the islanders: grey phase (Matuku uliuli), white phase (Matuku hina or paepae) and mottled phase (Matuku tavai).

Thompson and Hackman (1968) recorded " white, intermediate and dark morphs." David Gravatt found in February 1967 (Atafu atoll) that the grey and white phases were common and present in roughly equal numbers. Intermediate birds were also observed, but less commonly. Of ten birds observed at Nukunonu in September 1958, six were grey, two were white and two were mottled (M.L.). During the 1966/67 and 1968 visits to Nukunonu and the 1970 visit to Fakaofo, every bird seen was noted, together with its colour phase (Table 1). It is of course realized that the numbers reported simply represent birds seen. Clearly, some of them could have been recorded more than once.

According to Mayr and Amadon (1941), the North-west and Central Pacific (including the Marshall Islands, Fiji and the Solomons) is inhabited by Matuku populations with mottled adults. Intermediate morphs have neither been reported from the Northern Cook Islands (Suwarrow), nor from Tonga and Samoa. Table 1 shows that Mayr and Amadon's range should be extended by including the Tokelau Islands. It is proposed (K.W.) to publish a fuller account elsewhere of the distribution of the three colour morphs and their genetic basis in *Egretta s. sacra.*

Thompson and Hackman (1968) collected 10 specimens between 26 February and 5 March 1965. The three males all had large testes. Three of the seven females exhibited granular, minute and small

TABLE 1 — Numbers and Percentages of the 3 Colour Phases of *Egretta sacra*

ISLAND OR GROUP OF ISLANDS	COLOUR PHASE GRAY No.	GRAY %	WHITE No.	WHITE %	MOTTLED No.	MOTTLED %	NO. OF BIRDS IN SAMPLE	AUTHORITY
TOKELAU IS.: NUKUNONU	6		2		2		10	M.L. This paper, September 1958
NUKUNONU	50		10		4		64	K.W. This paper, November 1966 - February 1967
NUKUNONU	16		8		4		28	K.W. This paper, April-June 1968
FAKAOFO	10		16		2		28	K.W. This paper, August-September 1968
TOTAL TOKELAU IS	82	63.1	36	27.7	12	9.2	130	
FIJI	24	62	9	23	6	15	39	Mayr & Amadon (1941)
SOLOMON IS.	36	69	13	25	2.1?	6	52	Mayr & Amadon (1941)
MARSHALL, CAROLINE, MARIANNE AND PALAU IS.	27	54	20	40	2.1?	6	50	Mayr & Amadon (1941)
TOTAL FIJI, SOLOMON, MARSHALL, MARIANNE AND PALAU IS.	87	61.7	42	29.8	12	3.5	141	

ovaries, the remainder having large ovaries. From this evidence, Thompson and Hackman thought that " breeding occurs on the islands in February, March and possibly April." Fledglings were observed by us at Nukunonu in the last week of November 1966 and early in May 1968. Vaopuka found a white-phase heron incubating eggs at Otoka, Fakaofo, on 3/9/70. This would extend the breeding season considerably — from late August to late April. According to Isaia and others at Nukunonu, Matuku nest in coconut palm crowns but prefer fala (*Pandanus* spp.) trees. They lay up to six eggs. A former major nesting place on the western arm of Te Oki islet, Atafu, is still known as Ofaga Matuku (ofaga, nest).

Usually one sees single birds but occasionally they were observed feeding in pairs. Some of the birds seem to stick to a territory: at Fakaofo during the August - September 1970 visit (K.W.) a matuku uliuli was frequently seen on the reef south of the falee; and a matuku hina frequented the tidal flats between the village and the hospital.

At Nukunonu Reef Herons appear to be the only birds not taken for food, their meat being unpalatable; but at Fakaofo, according to Vaopuka they are occasionally eaten. They are, however, occasionally kept as pets, to chase poultry out of the houses.

Order Anatiformes

Family Anatidae

10. Duck (sp?). Toloa. Occasional visitors. Although no specimens or confirmed identifications of ducks are available for the Tokelau Islands, and no sightings took place during our five visits, ducks are nevertheless well-known to inhabitants of Fakaofo and Nukunonu. The birds are easily caught when resting on the lagoon by islanders who swim out with upturned baskets over their heads; when they are close enough they dive deeply, head directly up to the birds and grab. Tokelauans assured us that flocks of up to about 100 may appear at Fakaofo in September or October, keeping together on the lagoon and leaving in November. Thompson and Hackman (1968) quoted Father Goldfinch for the information that ducks are seen " nearly every year " at Nukunonu in February and March, and that one of the Sisters had identified them as Grey Ducks. They are also reported to feed in the marshes of Fenualoa islet, Fakaofo (the only significant body of fresh water in the three atolls), putting their heads down and feeding in the mud. Opeta asserted that the bird concerned is the same one found on Upolu, Western Samoa. This is the Grey Duck *Anas superciliosa* Gmelin, the Samoan name for which is also Toloa, according to Armstrong (1932); Doloa, Finsch and Hartlaub (1867). Amadon (1943) records *A. superciliosa pelewensis* Hartlaub and Finsch from Samoa, but not from the Tokelaus.

Order Charadriiformes

Family Charadriidae

11. *Pluvialis dominica fulva* Gmelin 1789. Pacific Golden Plover. Tuli[7] [a name casually applied to waders in general, both in the Tokelaus and Samoa (Armstrong, 1932)]. Non-resident, migrant.

7 Thompson and Hackman gave " Kiakiao." This is very close to the Gilbertese name for the Black-naped Tern, " Kiakia " (Child, 1960).

AMNH 2248, Punelei, southern end of Long islet, Nukunonu, 20/4/60, 24, 42, 163, and 65. DM 15,352, Village islet, Nukunonu, 24/12/66, female, 21.8, 44.1, 29.4, 154 and 58. DM 15,332, Tokelau islet, Nukunonu, 12/1/67, 24.5, 44.9, 31.3, 172 and 63.

Plovers were among tame birds seen in the village of Atafu (formerly Duke of York's Island) on the occasion of the visit of USS 'Peacock" and "Flying Fish" on 25 January 1841 (Wilkes, 1845). However, the "York Island" from which Gray (1859) listed "*Charadrius fulvus*" was presumably Eimeo, Society Islands. Stickney (1943) published April records for Fakaofo and Nukunonu, estimating the total population on all three atolls at 70 birds. They were uncommon during the 1958 and 1960 visits.

This species was frequently observed during all four visits, usually along the shore but also in other places clear of tall vegetation, e.g. the cemetery at Nukunonu. Up to four were seen at a time during spring and summer, markedly fewer birds being noticed during the southern autumn and winter. In this period, most Pacific Golden Plovers would of course be breeding in the Subarctic. This is supported by data from the 14 examples collected by Thompson and Hackman (1968), and those obtained by the Whitney Expedition in April 1924.

Family Scolopacidae

*12. *Numenius phaeopus variegatus* (Scopoli 1786). Asiatic Whimbrel. Non-resident, migrant.

DM 15,354, Avelau, Long islet, Nukunonu, 30/1/67, 82.8, 57.2, 36.8, 22 and 82 (tail moult observed).

New record for the Tokelau Islands, based on a specimen by K. W. Mitchell (1909), in mentioning that a "wimbrel" was shot in Samoa in 1902, noted that "Being so rare the Samoans have no native name for them."

13. *Numenius tahitiensis* (Gmelin 1789). Bristle-thighed Curlew. Tiafee. The alternative Tokelauan name for this species comes much nearer to the loud alarm cry "tee-ar-fay" than Mayr's (1945) "aweu-wit." Neither of the Samoan names quoted by Armstrong (1932), Tuliolovalu and Tuliisutele, resembles either of these. Non-resident, migrant.

AMNH 2250, lagoon side of northern arm, Tokelau islet, Nukunonu, 21/4/60, 82, 50, 239, 113.

Quite common (usually in pairs) on all three atolls, in 1958, 1960, 1968 and 1970. Thompson and Hackman (1968) reported that two female specimens had heavy fat, obviously in preparation for the (northern) spring migration.

The Tiafee proved more numerous between November 1966 and February 1967 than from April to June 1968, when only two birds were seen. Curlews fed both among the coral fragments of the ocean beach and on the lagoon shore but were more common on the latter. Interestingly enough, on the evening of sighting the first Tiafee on Nukunonu in 1958, the junior author sketched the bird from memory for a young man who'd never left the atoll; who said,

when the drawing was almost completed but before the downcurved bill was emphasized, " Kuaka ! " — the Maori name for the following bird, the Eastern Bar-tailed Godwit.

*14. *Limosa lapponica baueri* Naumann 1836. Eastern Bar-tailed Godwit. Tulipala. Non-resident, migrant. Stickney (1943) referred to Samoan records as the most easterly for this species, which she did not list from the Tokelaus. The only godwit we observed in the Group was at Itufakalalo, near the south-eastern extremity of Atafu, on the afternoon of 7/10/58 (M.L.). Presumably a recent arrival from the north (this species reaches the Gilbert and Ellice Group about mid-October according to Child, 1960), it was easily recognizable from a recollection of large numbers of Eastern Bar-tailed Godwits seen ten years previously at Parengarenga Harbour, North Auckland. The bird was digging its bill deeply into the coral sand, possibly in search of ghost-crabs as described by Child. At all events, just like the one he watched, it ran to the edge of the sea from time to time to clean its bill. No Tuli-pala were observed during the later visits, nor by Thompson and Hackman (1968). However, this species was evidently well-known to Isaia and other Tokelauans.

15. *Tringa incana* (Gmelin, 1789). Wandering Tattler. Kolili (Thompson and Hackman, 1968, wrongly applied this name to the Ruddy Turnstone). Non-resident, migrant. The Tokelauan name is not unlike the Gilbertese " Kiriri " (Child, 1960), and well describes the Wandering Tattler's alarm cry.

> AMNH 2243, Vao or Village islet, Nukunonu, 19/4/60, 42, 33, 171 and 79. AMNH 2244, same locality as last, 22/4/60, 40, 32, 167, 77. DM 15,333, Tepuka north islet, Nukunonu, 12/1/67, sex ?, 39.2, 34.1, 30.3, 171 and 74. DM 15,334, Tokelau islet, Nukunonu, 11/1/67, 39.2, 35.2, 30.6, 168 and 70 (primaries moulting).

Reported by Stickney (1943), this species was seen from time to time on each of the atolls during the 1958 and 1960 visits. Nine specimens were examined by Thompson and Hackman (1968). Two had enlarged gonads and heavy fat, the remainder having little to medium fat and small gonads. Although Thompson and Hackman considered the Wandering Tattler to be fairly common, it was not recorded during the April-June 1968 visit. We found this greyish wader, when motionless, very hard to distinguish among small fragments of coral along the shore. It often hurries along, skirting the foam line, head hunched down between the shoulders. Of special interest in view of Child's (1960) observation of an American Wandering Tattler perching on crowns of coconut palms, one was seen to fly up onto the roof of an Atafu hut, where it remained a minute or so, as the light was failing during the crescentic stage of the solar eclipse (approximately half-way between the beginning and totality) on the morning of 12 October 1958. Immediately after totality, it might be mentioned, the village cocks began to crow.

16. *Arenaria interpres* (Linnaeus, 1758). Ruddy Turnstone. Vaha-vaha (Thompson and Hackman, 1968, wrongly applied this name to the Wandering Tattler). Non-resident, migrant.

> AMNH 2245, Vao or Village islet, Nukunonu, 19/4/60 (as of March 1970 on loan to Dr. Michael K. Rylander, Texas Tech-

nological College, Lubbock, Texas 79409, who kindly supplied the following measurements, 19.8, 29.5, 130). DM 15,350, Vao islet, Nukunonu, 24/12/66, female, 23.7 24.4, 22.4, 159 and 63. DM 15,351, same locality as last, 9/2/67, female, 22.0, 26.1, 29.4, 154 and 66 (this bird was still in winter plumage).

First recorded at Fakaofo on April 3 and 4 by Whitney South Sea Expedition [Stickney (1943)]. Several were seen at the northern end of the Long islet, Lalo Land Division, Nukunonu, at 11.35 on 20/9/58, 12 at Fenua Fala, Fakaofa, on the late afternoon of 26/9/58. A flock of five at Te Vaipapa, a sand area with scattered shrubs and low coconut palms, just south of Tekamu (on the western side of Nukunonu reef) in the late afternoon of 16/4/60, two flocks of six and fourteen on Vao on the following morning. Scattered pairs and individuals were seen on all three atolls on various occasions in both 1958 and 1960.

Fifteen specimens were collected by the Whitney South Sea Expedition (Stickney 1943) and by Thompson and Hackman (1968). These were in various stages of moult. Among them, only one male had large testes, while three females had granular ovaries. The remaining 11 had underdeveloped gonads. With one exception, the remaining ten shot between 26/2/65 and 3/3/65 all had a heavy fat deposit. A bird collected in 1960 proved to have the rectum heavily infested by a fragellate protozoan that one of us (M.L.) had recorded from the same host in the spring of the previous year at a subarctic breeding site — False River, near Fort Chimo, Ungava Bay, Canada (58° 10′ N; 68° 15′ W).

Ruddy Turnstones were less numerous during the November 1966 - February 1967 visit, when they were only seen five times on the lagoon beaches of Nukunonu (single birds, pairs, and once a flock of eight). Pairs of Vahavaha were observed at Fakaofo in Aug. - Sept. 1970 (K.W.).

17. *Calidris alba* (Pallas 1764). Sanderling, Lefulefu. Non-resident, migrant. First recorded on 2/4/24 at Fakaofo by the Whitney Expedition (Stickney 1943) and later by Mayr (1945). This species was twice observed by us (M.L.). Both sightings were at Vao or Village islet, Nukunonu atoll. The first was made while swimming — it proved possible to approach to within a few metres, while the bird was feeding on a sandspit in the lagoon on the evening of 4/9/58. The second Sanderling was observed on the ocean shore on the morning of 17/4/60. Smallness (substantially smaller than any of the other waders discussed herein), very pale grey upperparts, the habit of running busily back and forth along the foam-line, and the conspicuous whitish wing stripe in flight, sufficiently substantiate the identification.

Two specimens with small gonads were collected by Thompson and Hackman (1968) at Fakaofo. These authors mention an observation from Fakaofo made by Huber, on 26/2/65. Not seen during the 1966/67 and 1968 visits, but well-known to the elders at Nukunonu.

*18. *Sterna bergii* (Stephens 1826). Crested Tern. Visitor. The single example seen (Village islet, Nukunonu, evening of 4/9/58)

was confidently identified by M.L. from its very large size (appreciably larger than the Common Noddy), generally white colour, black crown and crest and yellowish bill.

19. *Sterna sumatrana sumatrana* Raffles. Black-naped Tern. Tovivi. Resident.

AMNH 2251, off Vaitupu, Long islet, Nukunonu, 22/4/60, 39, 19.5, 227. 152. A non-flying chick (DM 15,349) was collected on the reef between the Village and Te Kamu islets, Nukunonu, on 18/12/66.

Recorded from the Tokelaus (Union Islands) by Mayr (1945). The Black-naped Tern was recorded from all three atolls on the 1958 and 1960 visits, being most plentiful on Atafu (M.L.). The one shot in the lagoon off Vaitupu perched on a branch protruding about a metre from the water, some 75 metres offshore. Another specimen, also from Nukunonu, was predominantly white, except for the pale greyish upper wings and mantle. It had a white-crowned head, a black nape, and a black band above the eyes. The white feathers of the underparts of the second specimen, when still fresh, were suffused with a very faint pinkish hue.

Thompson and Hackman (1968) shot 16 (all three atolls) in 1965. They considered "This tern . . . . fairly common in the Tokelau Islands," estimating that "the Black-naped Tern population on each atoll was about 40±." Observations made during the 1966/67, 1968 and 1970 visits confirmed the status of this species. It was reported to us (1958 and 1960) to nest in depressions in the sand over the greater part of the year. At Palea islet, Fakaofo, our attention was drawn to several large upended coral slabs, emerging two metres or more from the lagoon about 300 metres offshore. Relics of the disastrous 1914 hurricane, these are honeycombed with holes which, we were informed, are used as nesting sites by Tovivi. Of the 16 specimens shot by Thompson and Hackman (between 26 February and 4 March 1965) three were immature, one has small testes, while the remaining seven males and five females had large gonads. The presence of fledglings would indicate that the breeding season had been going on for some time. A very small chick, not yet fledged, was seen on 29 May 1968 at Punelei islet, Nukunonu (K.W.). All the above observations confirm Isaia's statement that the Tovivi nesting period at Nukunonuo extends from November to the end of April.

20. *Sterna fuscata* (Linn. 1766). Sooty Tern. Talagogo. Resident, probably breeding. Not seen in 1958 and 1960 (M.L.) nor in 1966/67 and 1968 (K.W.), but noted by David Gravatt at Atafu. Five specimens collected between 26 February and 4 March 1965 by Thompson and Hackman (1968) — on Fakaofo (one), Nukunonu (one), and Atafu (three). Uncommon around Nukunonu and Atafu, but several thousands seen near Atafu, where islanders were catching these birds for food at a rate of up to 60 per day with long nets from canoes. A specimen of this tern was captured on 25/1/67, by a hunter at Atafu. He took from it a United States Fish and Wildlife Service band (No. 893 - 16158), which was handed to David Gravatt (pers. comm. 1967). According to the Secretary, Pacific Project, Smithsonian Institution (*in litt.* 5/4/67) this band "was put on a Sooty Tern *Sterna fuscata* by our Pacific Project on Laysan in

August 1965 when the bird was immature." Apparently it is unusual for Sooty Terns to be captured south of the Equator when they have been banded as chicks north of the Equator.

*21. *Sterna lunata* Peale 1848. Spectacled Tern. Tala? Visitor? No evidence of nesting found, but apparently has bred in the Tokelaus (particularly at Atafu) in the past. Informants who had visited Hull Island (Phoenix Group, north of Atafu), assured the junior author that there is a large colony there (c.f. Child 1960, Clapp, 1968b). The species was seen in flight at Nukunonu (five examples, 22/5/60) and Atafu (three examples, 17/10/58), the white underparts, grey upperpart and black cap, also the distinctly larger size than that of the Black-naped Tern. all being evident. Perhaps it is worth mentioning that Tara is the Maori name for *Sterna striata.*

22. *Anous stolidus pileatus* Scopoli. Common or Brown Noddy. Gogo. Resident.

The Tokelau name is the same as that commonly used in the Ellice Islands (Child 1960). As already pointed out, though, the Samoan name resembles the one employed for boobies, especially the Brown Booby, in the Tokelaus.

A tame noddy was found among the few birds recorded from Atafu in the Narrative of the United States Exploring Expedition (Wilkes 1845). About a dozen tame Common and White-capped Noddies were observed at Atafu on 13 June 1968 (K.W.). This species and the White-capped Noddy *(q.v.)*, which it may outnumber at Atafu, but which outnumbers it at Nukunonu and Fakaofo, are the commonest birds of the Tokelaus; they have been found prevalent everywhere throughout the 1958, 1960, 1966/67, 1968 and 1970 expeditions.

Seven Common Noddies were collected by the authors, six of which were deposited in the American Museum of Natural History and Dominion Museum respectively. The measurements of these birds are found below.

AMNH 2246, Matautu, Long islet, Nukunonu, 20/4/60, 34, 22, 228 and 134. AMNH 2247, same locality and date as last, 38, 24, 260 and 152. DM 15,339, Tokelau islet, Nukunonu, 11/1/67, male. 42.4, 21.9, 41.5, 292 and 173. DM 15,348, north end of Long islet, Nukunonu, 26/1/67, sex female, 38.5, 24.9, 37.6, 283 and 164. DM 15,345, from nesting colony at Avelau, Long islet, 30/1/67, sex ?, 42.7, 26.3, 37.9, —, and 154 (moult on primaries of both wings). DM 15,346, same locality and date, sex ?, 42.7, 27.8, 41.5, —, and 164 (moult on primaries of both wings, No. 1 - 9 new, No. 10 new, ¾ grown, also strong body moult). DM 15,337, north end of Long islet, 26/1/67, sex ?, 40.5, 26.2, 36.9, 271 and 147 and Tokelau islet, Nukunonu, female, 43.4, 28.1, 40.6, 282 and 170.

Twenty-two Common Noddies were collected by Thompson and Hackman (1968) but data on size of gonads and presence of fat were recorded from 18 birds only. Four had enlarged testes (from 4 x 3 to 10 x 5 mm.) and six had enlarged ova (largest ovum from 1 to 5 mm.). Fat condition was recorded in nine birds only (one without fat, two showing light fat, four with medium fat, and two with heavy fat).

Nesting colonies were observed in *Pisonia grandis* trees and/or the crowns of coconut palms at Palea (Fakaofo), Fenualoa (Atafu) and Tokelau, Long and Tepuka islets (Nukunonu). It seems worth commenting that the old *Pisonia* trees to which the latter islet owes its name were destroyed in the 1914 hurricane, nesting there being in coconut palms (as is the case in some of the other Nukunonu islets, perhaps for a similar reason?). As indicated by Child (1960), the Common Noddy cries harshly from the nest when its nesting tree is approached. Unlike the White-capped Noddy, birds of this species have the habit of perching on driftwood near the shore, in small groups, usually facing into the wind. When seen in flight, the Common Noddy appears distinctly larger than its relative, which has a somewhat shorter tail and a whiter cap. In good light, its brownish (instead of blackish) colour is evident, too. It was often observed mobbing Matuku *(Egretta s. sacra)*. The senior author confirmed most of the above observations. The largest concentration observed were 40 Gogo roosting on sand, north of Helakehe, Nukunonu, on 16/12/66 but smaller groups of 10 - 20 birds were often noted at a time, sometimes roosting and sometimes fishing in the lagoon.

Collection of nesting material was observed in the last week of November and in December, 1966, and in late April, 1968. Also, large numbers of Gogo were observed flying in and out of the Long islet, Nukunonu, presumably still feeding chicks in nests, on 7/5/68. Isaia stated (pers. comm. to K.W., May 1968) that egg laying starts in January and goes on until June, the chicks hatching out between February and July. However, Isaia added, that October and November are the only months when no nesting takes place. In conclusion we may say that the above observations are in general agreement with the data on gonads and fat collected by Thompson and Hackman (1968).

According to Isaia, Gogos have always been used as food on Nukunonu. The taking of birds, particularly of adult ones demands great skill and a noose of coconut midrib on a long stick is used, the birds being whipped up by their necks. The Tokelauan name for this device is Tipa-manu-lele. Previously, and in areas least utilized by man, Gogo mainly used to nest on gagie trees *Pamphis acidula* but at present at Nukunonu Gogo nest on coconut palms between the stalks of two leaves. At Fakaofo, according to Vaopuka up to 800 birds are taken annually and as there are no restrictions, he and Isaia believe that the Gogo population has already significantly declined in consequence.

Seven examples were shot at Nukunonu for parasitological examination. The junior author was searching for life history stages of a heterophyiid trematode, eggs of which had been discovered during the examination of human faecal samples after the 1958 trip (Laird, 1961). Certain of these parasitic worms normally pass part of their life cycle in marine fish, part in piscivorous birds. None were recovered from these or any other of the birds dissected, and it now seems probable that the eggs earlier discovered in islanders were (as subsequently shown in Curacao) simple pseudoparasites derived from eating flying fish (Schouten *et al.*, 1968). The only recognizable remains of food organisms in the stomach contents were those of fish, including, in one instance, small halfbeaks. The latter (hemiramphids) are so common in the Nukunonu lagoon that night fishing

sorties are commonly made to capture large numbers of them as bait by means of an attractant petrol lantern and a long-handled flying fish net. They are now often referred to the Exocoetidae, the fish family most commonly found in the gut contents of *A. stolidus* on Christmas Island by Ashmole and Ashmole (1967). Two of these birds (from Tokelau islet, Nukunonu) yielded hippoboscid ectoparasitic flies duly identified by Dr. T. C. Maa of Taipei, Taiwan (*in litt.* to M.L. 15/4/63) as *Ornithoica pusilla* Schiner (not the *pusilla* Schin. misinterpreted by Bequaert and other authors) and *Alphersia senescens* Thomson. The latter fly is common in the tropics and was identified by Bequaert from this host from Rota, Mariana Islands (c.f. Baker, 1951, p. 168 — specifis name misspelt *aenescens)*. Dr. Maa pointed out that the former ectoparasite is very rare in collections. Previously he had only seen the type from Tonga and two examples from the Tuamotu Islands.

23. *Anous minutus minutus* Boie 1844. White-capped Noddy. Lakia. Resident. Seven specimens were collected. Their measurements follow:

> AMNH 2242, Matautu, Long islet, Nukunonu, 20/4/66, 47, 21, 217, and 125. DM 15,335, Tokelau islet, Nukunonu, 11/1/67, sex ?. 43, 23, 34.2, 223 and 120. DM 15,343, Avelau, Long islet, Nukunonu, 30/1/67, male from nesting colony, 40.8, 21.8, 33.4, 222 and 111. DM 15,344, same place and date, sex ?, from nesting colony, 46.3, 26.1, 25.8, 158 and 66. Tokelau islet, 11/1/67, sex ?, 41.5, 21.7, 33.3, 228 and 117. Same locality and date, male, 44.9, 22.0, 35.8, 232 and 125 and weight 133g. Same locality, 15/1/67, female, 42, 22, 34.1, 224 and 119.

Eight birds were shot for parasitological examination (by M.L.), all of them at Nukunonu. It was with respect to one of these that Dr. Charles O'Brien informed us (*in litt.* to M.L., 1 December 1960) " Your identifications are all correct with just one exception . . . which proves to be the White-capped Noddy *Anous minutus minutus.*" The interim field determination was in deference to Mayr (1945) and the Check-list of New Zealand Birds — Fleming's (1953) publication, a revised version of which will shortly appear (Kinsky, 1970). The top of the bird's head was white instead of greyish-white, the rest of the plumage being black, not sooty brown as in *A. tenuirostris.*

Sixteen specimens were obtained by Thompson and Hackman (1968), who also reported upon another 13 examples collected in April 1924 (15 were from Fakaofo, seven from Nukunonu, and seven from Atafu). Four of these birds had small testes, while in 10 the testes were large (4 x 3 mm. to 13 x 7 mm.). Similarly, 11 females had small ovaries and four had large ones.

Lakia were recorded as common at Fakaofo by Fry (1966) on 6/7/65, when both nesting adults and flying juveniles were observed. It was prevalent everywhere on all five of our trips. David Gravatt found Lakia very common at Atafu, nesting on crowns of coconut palms, *Pandanus* spp. and larger trees such as kanava *Cordia subcordata* or pukakakai *Pisonia grandis.* The senior author often observed 12 - 20 Lakia at a time in the Nukunonu lagoon between November, 1966, and February, 1967. Lakia is also very

common ot Fakaofo: on 31/8/70, within half-an-hour before sunset 47 Lakia were observed arriving into the lagoon to roost on several islets.

The following information was recorded on Lakia's nesting in the three atolls. Lakia were nesting in January - early February, 1967, at Atafu and occupied nests were found on Tokelau, Long (Vaitupu and Kavakava) and Tepuka North islets, Nukunonu (by K.W.). In 1970 rat control work was carried out on Fenualoa islet during the first three weeks of August (K.W.). Early in August only small numbers of Lakia were observed roosting during daylight but 14 nests were recorded on 14/8/70 on a pukavaka *Hernandia peltata* tree and since that time the numbers of roosting Lakia and nests seemed to increase. However, other observations seem to confuse the issue as collection of nesting material was observed during the last week of November 1966 and in late April, 1968; and on 9 May, 1968, a cluster of 20 nests was seen on Tefakanava motu. According to Isaia (pers. comm. May, 1968) White-capped and Common Noddies are well known to share nesting places.

According to Isaia Lakias have also been used as food on Nukunonu and have been taken in substantial numbers. Vaopuka estimates that about 1,000 birds are being taken a year at Fakaofo. In the past, some protection was afforded to Lakias and certain other birds in that the number of chicks to be taken each year was prescribed by the pulenuu who detailed boys to gather the victims. At present, with an increased human population, there are no restrictions. Isaia and other elders believe that the Lakia population has already significantly declined in consequence.

24. *Gygis alba candida* (Gmelin 1789). White or Fairy Tern. Akiaki[8]. Resident.

AMNH 2249, Matautu, Long islet of Nukunonu, 20/4/60, 44, 14, 245 and 126. DM 15,329, Village motu of Nukunonu, 30/11/66, sex ?, 40.4, 14.8, 26.7, 242.5, and 104. DM 15,330, Tokelau islet of Nukunonu, 28/12/66, sex ?, 39.3, 14.0, 25.9, 246 and 117. DM 15,331, same locality as last, 12/1/67.

The Akiaki follows the Noddies in order of prevalence throughout the Tokelaus. Twelve specimens were handled by Thompson and Hackman between 26 February and 4 March (1968) (four from Fakaofo, three from Nukunonu and five from Atafu). Four were males, the testes being small in one instance and measuring from 5 x 3 mm. to 7 x 5 mm. in the others. The eight females included four with granular ovaries. In two, the largest ovum measured 2 mm., one had a collapsed follicle and a brood patch, and the state of the other was unspecified.

Pairs of birds maintaining beautiful formation or hovering overhead — especially near *Pandanus* trees, as pointed out by Child (1960) — are one of the sights of the Tokelaus. The gracefulness of this species is such that we most strongly urge abandonment of the prosaic translation of the scientific name currently used (Baker 1951, King 1967, and Kinsky 1970), in favour of the more apt "Fairy Tern." This name was used by Mayr (1945) and is in common use among English-speaking residents in the South Pacific.

8 Oddly enough, "Akiaki" is applied to the Black-naped Tern in the Ellice Islands, where the Fairy Tern is called by a very different name, "Matapula" (Child, 1960).

Our subspecific identification is based on a specimen from Nukunonu examined by Dr. Charles O'Brien (*in litt.* to M.L. 1960) and the three birds deposited at the Dominion Museum, Wellington.

On occasion this Tern flies up to a considerable height, pairs of birds then being barely distinguishable as white pinpricks against the blue of the sky (as at Tagiakuli islet, Atafu, at 11.00 on 7/10/58 and on many other occasions). Its whiteness and more erratic flight than that of tropic birds combines with its numbers to make this species easily recognizable when glimpsed from flying boats landing on or taking off from Tokelauan lagoons — many were seen from approximately 300 m altitude during R.N.Z.A.F. " Sunderland " inter-island flights.

The Akiaki probably breeds on most reef islets of all three atolls. It does not build a nest, the single egg simply being deposited on a suitable site, e.g. the rough surface of a more-or-less horizontal *Pandanus* branch as at Kenakena islet, Atafu, 6/10/58 (M.L.). In this context, the observation of Thompson and Hackman (1968) that " Nests . . . were seen on all of the islands " is misleading. The egg is pale green, with brownish and purplish-grey mottling. Egg-laying was recorded at Nukunonu from the end of November 1966 to mid-February 1967, when small unfledged chicks were found. In May 1968 numbers of Akiaki were seen flying inland with fish. These observations indicate that breeding takes place at least from spring to late autumn. According to Isaia and other Tokelauans, most birds breed between September and February but eggs and young can always be found. Vaopuka stated that Akiaki has no regular nesting season on Fakaofo. This agrees with King's (1967) suggestion that breeding of this species takes places throughout the year.

According to elders of Nukunonu, there is no organized catching of this tern. However, children capture many unfledged chicks, some of which are killed. while others are kept as pets. In Fakaofo, according to Vaopuka, 100 - 200 birds are taken annually.

Order Columbiformes
Family Columbidae

25. *Ducula pacifica pacifica* Gmelin 1789. Pacific Pigeon. The Tokelauan name for this, the only resident land bird of the Group, is Lupe. This name is also the one used in Samoa (Armstrong, 1932; Mitchell, 1909) and the Ellice Islands (Child, 1960). Resident.

> DM 15,337, Tokelau islet of Nukunonu, 15/12/66, male, 32.1, 46.7, 224 and 132. DM 15,336, same locality as last, 28/12/66, female ?, 24.7, 31.0, 40.8, 228 and 130. DM 15,338, same locality and date as last, male, 27.1, 33.7, 41.8, 232.5 and 138.

" Tame oceanic pigeons " were reported from the Village islet, Atafu, by the United States Exploring Expedition (Wilkes 1845). Material collected by this Expedition was presumably the origin of Gray's (1859) record of " *Carpophaga (Globicera) microcera* " or " 'Lupi' of the natives of Samoan Islands " from Duke of York's Island (= Atafu). The Whitney South Sea Expedition (Amadon 1943) observed Lupe on Atafu and obtained specimens from Fakaofo (misspelt " Fakaafo "). This pigeon was also recorded by Mayr (1945) as present in the Tokelau Islands. Recently, Thompson and Hackman (1968) declared it to be " common on all of the atolls."

The black knob at the base of the bill, grey crown and upper back, bluish-green upperparts and pinkish-grey underparts served to identify several birds at close range.

The authors found Lupe decidedly less common than indicated by Thompson and Hackman. Thus, in a virtually complete coverage of all the islets of Atafu in October 1958, pigeons were only sighted on Gaga, Te Oki, Titi-o-Pua, Motu-ita-Niu, Tagiakulii, Hakea Losi (three birds) and Itufakalalo (two birds). In April 1960, pairs of pigeons were recorded from three additional localities — Atafu Village islet, Fenualoa and Fogalaki Lalo. The Pacific Pigeon is appreciably less plentiful than this at Nukunonu. David Gravatt found pigeons " not very common but, because of the difficulty in locating them, they may be more plentiful than is believed." On Nukunonu pigeons were only seen in September 1958 at Hologatautai, Lalo, Long islet and Gahapiti islet, and in April 1960 at Tokelau (twice) and Matautu. On the first visit every single islet was thoroughly searched (for mosquito larval habitats) by a line of men moving within talking distance of one another, and it is very unlikely that any significant number of pigeons escaped notice. The junior author failed to observe any pigeons during either visit to Fakaofo, which was not, however, covered by his ground surveys as exhaustively as the other two atolls were. The scarcity of Lupe on Fakaofo was confirmed ten years later in 1970, when most of the islets were visited (Wodzicki 1970): only a single Pacific Pigeon was seen by Vaopuka on Fenualoa islet. At Nukunou in 1966/67, Pigeons were observed three times, twice as small flocks of three to four birds on Tokelau islet. On the other occasion, a pair was seen on the small islets between Tokelau and the Long islet.

Fresh droppings of one of the Tokelau islet birds contained many seeds of gahu *Scaevola frutescens* and islanders with M.L. at the time told him that the berries of this tree and of puapua *Guettarda speciosa* constitute the usual food of Lupe. The latter species, *Scaevola* and *Ficus* are mentioned in this context by Child (1960). As in the Ellice Islands, nesting is said to take place in the crowns of tall coconut palms, at the bases of the petioles. The puapua was mentioned to us as an additional site, too.

There is little information regarding the breeding of Lupe in the Tokelaus. Among the four specimens collected and sexed by Thompson and Hackman (1968), two males had testes 14 x 7 mm., one female had an ovum of 3 mm., and all specimens had medium or heavy fat (although one had been producing crop milk between 26 February and 4 March 1965).

Order Cuculiformes

Family Cuculidae

26. *Urodynamis taitensis taitensis* (Sparrman 1787). Long-tailed New Zealand Cuckoo. Kaleva [wrongly reported as " Kaleua " by Thompson and Hackman (1968)]. Migrant. Recorded from Fakaofo in early April 1924 by the Whitney South Sea Expedition (Bogert 1937). Three specimens were recorded by Thompson and Hackman (1968) on 2-4 April 1964 and one in March 1965 — all with small gonads. Its characteristic screech was heard more often than we saw this species. Examples were glimpsed (by M.L.) flying

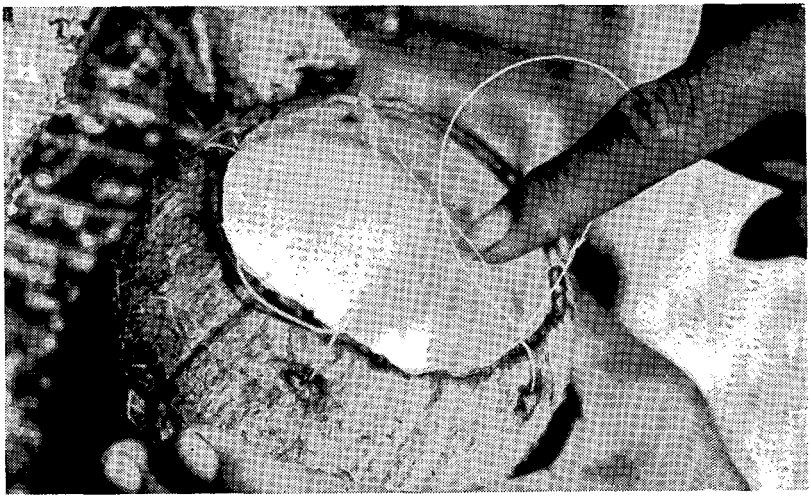
between the crowns of coconut palms at Te Puka north (16/4/60) and Matautu (20 April), Nukunonu. At least two were heard several times and seen on Fenualoa islet, Fakaofo, in the second and third weeks of August, 1970. Also heard but not seen in May 1968 at Vao and Long islet, Nukunonu. The name " Aleva " is employed in Samoa (Armstrong, 1932; Mitchell, 1909) and " Kaleva," as in the Tokelaus, is used in the Ellice Islands (Child, 1960). In New Zealand, though, this bird's Maori name is " Koekoea " (Oliver, 1955).

SOME OBSERVATIONS ON TOKELAUAN BIRD LORE

(i) *Bird Traps*

Although bird traps are known to have been used in many islands of the Pacific (Child 1960), they were not described by Macgregor (1937). The latter stated that seabird " are snared and netted " though with their eggs they " form a very small part of the food supply." Two such traps were demonstrated (to M.L.) by Opeta Faraimo of Fakaofo, and are described below.

The first of these (Plate XXXII) is called Mailei-Tuli (" Mailei," trap; " Tuli," Pacific Golden Plover). Consisting of a coconut with the husk removed and the top quarter or so of the shell sliced away, this has three vertically-orientated slip nooses of coconut fibre arranged just within the cavity and a larger slip noose standing up from the lip. A Tuli or another charadriiform bird trying to reach the undisturbed white meat would follow the route indicated by Opeta's finger in Plate XXXII, thus ensnaring itself. The coconut fibre loops are termed " mata-tipa," the shell and intact kernel being called " gai." This type of trap closely resembles the first of the two types of Gilbertese turnstone traps briefly described by Child (1960).



[Marshall Laird

Plate XXXII — Mailei-tuli, slip-noose trap for northern waders. Fakaofo Village islet, 28/4/69.

The second type, called Mailei-Fiti (Plates XXXIII & XXXIV), is somewhat more complex. In it, the cut-off end of a niumata-stage coconut is placed meatside uppermost as bait, with a vertical peg in the middle. The top of the latter abuts against a horizontal stock braced beneath a cross-piece, wedged beneath pieces of coral and holding open a slip noose depending from a gagie *Pamphis acidula* or puapua *Guettarda speciosa* upright termed the " hilaki." The taut cord at the far right of Plate XXXIII is leading up to this; although in the present case it happens to be made of nylon fishing line, the broadly spread noose is still called " mata-tipa." When a Tuli leans down into the trap as again indicated by the finger, the peg and horizontal brace are flung aside as the trap is sprung, the noose being jerked tight around the neck of the bird, which remains tethered to the top of the " hilaki " (Plate XXXIV). The name " mailei-fiti " (" fiti " spring) is applied to this device. Both types of traps, it should be noted, are carefully set with the lateral areas (shown open in the photographs) blocked up with coral fragments or wood, so that the victim approaches from the correct direction.

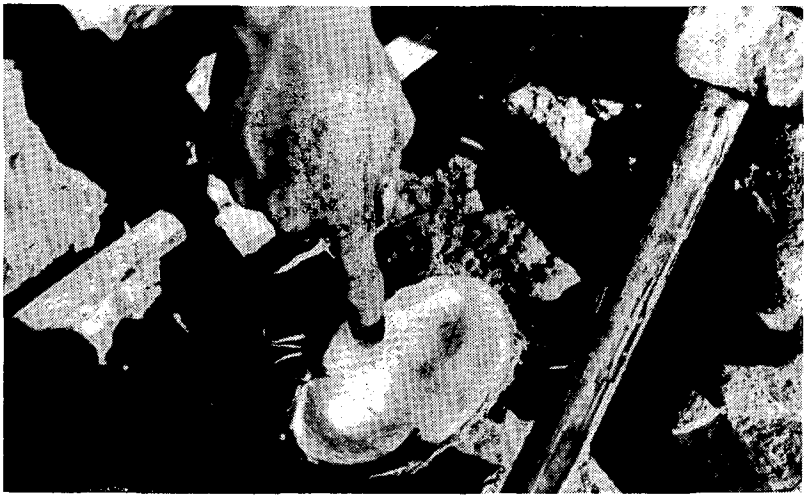
(ii) *Bird Tales*

On each of the atolls the same story of how the migratory birds reproduce was told (to M.L.) that Child (1960) relates with respect to the Gilbertese and Long-tailed Cuckoo (and also to other species including the Bristle-thighed Curlew). Namely, that these birds (and especially the Pacific Golden Plover, in the Tokelau version) fly far up into the sky before laying their eggs. As hatching takes place on the way down, and the duration of the fall further permits the chicks to become fully fledged before reaching the ground, the Tuli obviously has no need of a nest; which explains why nobody has ever discovered one in the Tokelaus.

[Marshall Laird

Plate XXXIII — Mailei-fiti, spring trap for northern waders. Set position. Fakaofo Village islet, 28/4/69.

Our second tale has strong Samoan overtones. It concerns a girl named Sina (" Hina " would be the Tokelauan version) and is probably simply put into a Tokelauan setting from a Samoan original. It seems that all the birds — and not only the common ones like Lakia, but Talagogo and Tavake, too — wanted to marry Sina. Her mother was against the idea from the start, though, saying " where would she sleep, for example ? On the sand ? In a tree ? " However, she was finally won over after Tavake had promised to provide a home in the hollow trunk of a puka tree. The marriage duly took place. Every morning Tavake would now fly off to catch fish for Sina (who had an excellent appetite) and himself. Resenting the increasing mortality, the fish declared their enmity to the union. Things came to a head one morning when Tavake was standing on a stone on the reef (to show that this is a true story, the teller can point out to this day the stone in question, " Fatu o te Tavake," on the seaward side of the Village islet, Nukunonu). Holding an emergency meeting, the fish decided that one of their number would knock Tavake into the water. Aseu (Mala-ovi in Samoan) promptly volunteered, saying that when the waves washed him up to the stone he would leap out and seize the bird. The other fish, though, felt that this plan would not work. Then a second volunteer, Gagale, said that as he somewhat resembled a leaf he would edge his way close, protected by his camouflage, and drag Tavake down. This was approved, so off he went and duly succeeded in grasping Tavake by the leg, calling out to his friends to come and help. They did, those first to arrive killing and eating the luckless bird. The ones that had been furthest away were able to eat only the feathers. To this day these species are still attracted to Tavake feathers when Tokelauans use them as fishing lures, but Gagale, sharks and others whose ancestors devoured the flesh and bones will not respond to



[Marshall Laird

Plate XXXIV — Mailei-fiti, spring trap for northern waders. Activated. Fakaofo Village islet, 28/4/69.

this lure. Poor Sina — and it is noted that the dainty Fairy Tern is called Manu Sina in Samoan (Armstrong, 1932; Mitchell, 1909) — was left alone and weeping.

DISCUSSION

Numbers and Relative Abundance of Tokelau Islands Birds

Thompson and Hackman (1968) attempted during their week-long visit to the entire Group to estimate the populations of nine species:— Matuku, Tuli, Tiafee, Vahavaha, Kolili, Tovivi, Gogo, Lakia and Akiaki. The total population of these nine species amounted to 14,094 birds for the three atolls. Unfortunately, they failed to provide information on the method they used for the assessment of the populations counted. In any case, personal experience indicates that such estimates made in so short a time are conjectures rather than evaluations of the populations present.

On the other hand, one of us (M.L.) listed the birds seen in order of abundance, by questioning various inhabitants of Atafu and Nukunonu on a number of separate occasions, often during canoe trips across the lagoon, these being made on most days of the two WHO Expeditions (Laird, 1967). Time precluded building up a similar list at Fakaofo. Table 2 presents these data in decreasing order of abundance for Atafu and Nukunonu and compares them with the population estimates of Thompson and Hackman (also set out therein in decreasing order of their population estimates for all three atolls).

Subjective though these lists are, they do serve to sum up the outstanding characteristics of the avifauna of the Tokelaus. Firstly, they show the difference in relative abundance between various seasons (the junior author's visits took place in September/October 1958 and April 1960). Secondly, they show:

the overall dominance of a few resident species of noddies and terns;

the frequency with which northern waders visit the Group;

that there are well-established resident populations of Reef Herons;

the relative scarcity of two land birds, the resident Pacific Pigeon and the migratory Long-tailed Cuckoo;

and the presence in this area of the usual South Pacific frigate birds, boobies, tropic birds and a shearwater.

Especially in view of the Tokelauans' capacities as observers, it was perhaps remarkable that we were never able to learn anything about either petrels or storm-petrels in these waters. Admittedly, the cessation of long inter-island trips many years ago must have certainly limited the opportunities for glimpsing such pelargic birds. Also, pelagic birds even in the past, seldom had the importance that nesting or roosting sea birds had as a welcome food variety in a monotonous diet of fish and coconut.

The Tokelau Islands Bird List

The Tokelau Islands are outside the main shipping lanes (Harrison 1962) and until the recent survey by Thompson and Hackman (1968), no checklist of their birds was available. King (1967)

indicated that three species (Sooty Tern, Black-naped Tern, and Brown Noddy) " may breed " and that two species (Black Noddy and White Tern) breed " all year ? " King also reported four species (Red-tailed Tropic bird, Brown Noddy, Great and Lesser Frigate birds) as visitors, and three more (White-tailed Tropic bird, Red-footed Booby and Blue-grey Noddy) as probable visitors.

The present paper provides a list of 26 species, comprising 15 sea birds, eight shore birds and three land birds (including a duck, probably the Grey Duck *Anas superciliosa,* an occasional visitor.) Five sea birds, *Puffinus pacificus, Sula dactylatra, Fregata minor, Sterna lunata* and *S. bergii,* and two shore birds, *Limosa lapponica* and *Numenius phaeopus,* are species not previously reported from the Tokelau Islands. We have not included Ramsay's (1878) almost century-old record of a Blue-grey Noddy *Procelsterna cerulea.* Neither have we attempted to guess at the identity of the Kuli, a whitish Tern, larger than the Fairy Tern, which sometimes lands in trees at Atafu but doesn't nest there (the name of Atafu's Tagiakulii islet means " the crying of the kuli "). It is likely that future investigations may add a few sea- or shore-birds to the present list.

TABLE 2 — Order of Abundance of Characteristic Tokelau Island Birds

DECREASING ORDER OF ABUNDANCE	NUKUNONU (M.L.) SPECIES	DECREASING ORDER OF ABUNDANCE	ATAFU (M.L.) SPECIES	DECREASING ORDER OF ABUNDANCE	TOKELAU IS. (Thompson and Hackman 1963)
1.	Anous minutus	1.	Anous stolidus	1.	Anous minutus
2.	Anous stolidus	2.	Anous minutus	2.	Anous stolidus
3.	Gygis alba	3.	Gygis alba	3.	Sterna fuscata
4.	)	4.	)	4.	Gygis alba
5.	)	5.	)	5.	Fregata ariel
6.	)	6.	)	6.	Arenaria interpres
7.	)CHARADRIIFORMES	7.	)CHARADRIIFORMES	7.	Sterna sumatrana
8.	)	8.	)	8.	Heteroscelus incanus
9.	)	9.	)	9.	Egretta sacra
10.	Egretta sacra	10.	Sterna sumatrana	10.	Pluvialis dominica fulva
11.	Sterna sumatrana	11.	Egretta sacra	11.	Numenius tahitiensis
12.	Fregata ariel	12.	Sterna fuscata	12.	Ducula pacifica
13.	Fregata minor	13.	Fregata ariel	13.	Phaethon rubricauda
14.	Sterna lunata	14.	Fregata minor	14.	Sula sula
15.	Ducula pacifica	15.	Ducula pacifica	15.	Phaethon lepturus
16.	Eudynamis taitensis	16.	Eudynamis taitensis	16.	Sula leucogaster
17.	Sula rubripes	17.	Phaethon rubricauda	17.	Urodynamis taitensis
18.	Sula leucogaster	18.	Phaethon lepturus	18.	Crocethia alba
19.	Phaethon rubricauda	19.	Sula leucogaster	19.	Anas spp.
20.	Phaethon lepturus	20.	Sula sula		
21.	Sterna bergii	21.	Sterna bergii		
22.	Sula dactylatra	22.	Sula dactylatra		
23.	Puffinus pacificus	23.	Puffinus pacificus		
24.	Anas spp.				

Affinities with Other Islands of the Central Pacific

Olosega or Swain's Island is the nearest neighbour, a densely forested atoll only 160 km. from the Tokelau Islands. Clapp (1968a) reported nine species of sea birds, six shore birds and one land bird (New Zealand Long-tailed Cuckoo, *Eudynamis taitensis*). The " vasavasa " referred to Clapp by the islanders is probably the Vahavaha (Ruddy Turnstone, *Arenaria interpres*).

By comparison with the birdlife of the Tokelaus, the most striking absentee from Olosega is the Pacific Pigeon *Ducula pacifica.* Also, the Reef Heron (erroneously described by Clapp, 1968a, as a migrant) appears to be much less common than in the Tokelau Islands. The same applies to the White-capped Noddy *Anous minutus.* The smaller size and the accessibility of all parts of Olosega, together with the presence of casual workers not concerned with bird preservation, help to explain the relative paucity of bird species and the apparently smaller populations present there.

The Phoenix and Line Islands are the two nearest island groups north and north-east of the Tokelau Islands. According to Clapp (1968b), of the 13 bird species recorded in these islands only four shore birds, *Egretta sacra, Numenius phaeopus, Limosa lapponica, Calidris alba,* and one land bird, *Eudynamis taitensis,* are also found in the Tokelau Islands. In the Gilbert Islands which are to the north-west of the Tokelaus, 14 sea birds were recorded (Amerson 1969), of which 12, *Phaethon rubricauda, P. lepturus, Sula dactylatra, S. leucogaster, Fregata minor, F. arial, Sterna sumatrana, S. fuscata, S. bergii, Anous stolidus, A. tenuirostris* and *Gygis alba,* are shared with the Tokelaus. Similarly, the Gilberts have 19 land and freshwater species of which 10, *Egretta sacra, Anas* sp., *Pluvialis dominica, Numenius phaeopus, N. tahitiensis, Limosa lapponica, Tringa incana, Calidris alba, Arenaria interpres* and *Urodynamis taitensis,* were recorded in the Tokelaus. The relationship between the Tokelaus and the Ellice Group is even closer, for of some 18 species of sea birds known from the Ellice Islands (Child 1960), 15 have now been recorded in the Tokelaus. Again, of the 14-odd land birds and waders, 12, *Arenaria interpres, Anas* sp., *Pluvialis dominica, Tringa incana, Numenius tahitiensis, Limosa lapponica, Sterna bergii, S. sumatrana, S. fuscata, Calidris alba, Ducula pacifica* and *Urodynamis taitensis,* are shared by the Tokelaus.

The Samoan Islands are the closest major land mass, lying just over 480 km. south of the Tokelaus. We find a considerable similarity between the avifauna of these two groups of islands. Armstrong (1932) recognized 63 bird species, including some 20 sea birds and eight shore birds in Samoa. However, more recently Ashmole (1963) claims that the Samoan avifauna consists of 53 species that include 13 sea birds and six shore birds. Twelve of these sea birds, *Puffinus pacificus, Phaethon rubricauda, P. lepturus, Fregata minor, Sula sula, S. leucogaster, Sterna fuscata, S. sumatrana, S. lunata, Anous stolidus, A. minutus* and *Gygis alba,* are also found in the Tokelaus. Of the eight shore birds observed in the Tokelaus, six, *Egretta sacra, Pluvialis dominica, Arenaria interpres, Numenius taitensis, Limosa lapponica* and *Tringa incana,* occur also in the Samoan archipelago, as do the three land birds, *Anas* sp., *Ducula pacifica* and *Urodynamis taitensis.*

Bird Movements and Dispersal

Little is known of bird movements, dispersal and even of seasonal distribution (King 1967). Also, no analysis of the recoveries made of the approximately two million birds banded by the personnel of the Pacific Biological Survey Programme, Smithsonian Institution (Amerson 1969) is yet available. However, the two records of a Sooty Tern and a Brown Booby recovered during the present work at the Tokelaus indicate displacements of at least 1,600 km. in some species.

Problems of Bird Conservation

Three species of mammals, besides man, occur in the Tokelau Islands (Kirkpatrick 1966; Wodzicki, 1968a, 1968b and 1969): pigs, cats, and one rodent *(Rattus exulans)*[10]. Pigs and cats are com-

[10] Occasional dogs have been brought in, and according to Macgregor (1967) the Spanish discoverers of Olosega (1606) reported that the long-vanished original inhabitants kept small dogs.

paratively recent introductions and have become feral in some islets of the three atolls. It is known that pigs have largely modified the invertebrate fauna of particular atolls, for example, in the Vao or Village islet of Nukunonuo. They also are potential predators on ground nesting birds, such as some terns. The discovery of Polynesian rat predation on Laysan Albatrosses (Kepler 1967) opens up the possibility that this rodent may affect the numbers and distribution of other (both ground and tree-nesting) species, although no evidence on the matter was found during our surveys. No birds of prey occur in the Tokelau Islands, but of the many invertebrates found there, the Coconut Crab *Birgus latro* may well eat the eggs and young of birds.

Man appears to be the most important and efficient factor affecting birds in tropical islands (Amerson 1969). Thus vegetational changes are caused by the planting of coconut palms or other crops, and direct predation must be admitted too, insofar as wild birds or their eggs are used as human food. According to Macgregor (1937), in former times birds and their eggs played a much less important part in the diet of the Tokelauans than did coconuts and fish. Nevertheless, we now know that practically all the birds found in the Tokelaus (with the apparent exception of *Egretta sacra*), and their eggs, are quite commonly collected. Formerly, the elders seem to have regulated this kind of collecting to a certain degree, but nowadays it seems that any number of birds or eggs may be taken by any inhabitant of the islands on their own family holdings.

During our discussions with many Tokelauans, evidence was advanced that most of the birds particularly sought for food, such as noddies, terns and pigeons, are steadily though not drastically declining. It is thus felt imperative that not only should the existing ban on firearms in the Tokelaus be rigorously maintained, but that a return to the pre-European policy of a *regular* and *controlled* exploitation should be advocated. As in olden times, the control of the bird life — and also of some other natural resources — in the three islands should be entrusted to the Council of Elders (Fono Toeaina) of each atoll, who should decide about the numbers of birds to be taken, and the time when it is permissible to hunt them. The "Big Fono" (a two-days meeting of delegates from all three atolls convoked by the Administration from time to time) would be the appropriate forum where the necessary legislation could be mooted before being tabled before Parliament in New Zealand. Concurrently it is recommended that an account of the Tokelau Islands birds and of other important renewable natural resources of the atolls and of their conservation should be included in the Tokelau schools curriculum.

ACKNOWLEDGEMENTS

Enthusiastic support from successive Administrators of the Tokelau Islands was fundamental to the success of these investigations. Transportation was furnished by the Royal New Zealand Air Force (No. 5 Squadron, Lauthala Bay, Fiji) and the Royal New Zealand Navy (H.M.N.Z.S. "Endeavour") in 1958 and 1968. R.N.Z.A.F. Sunderland flying boats were again the mainstay in 1960, when, as in the later visits, inter-island voyages were arranged by the Tokelau Islands Administration; whose District Officer, Mr. H. L. Webber, helped immensely by organizing these and other aspects of the logistics

of all five expeditions. Mr. Opeta Faraimo, also of the Administration, provided much-appreciated assistance too (particularly to M.L. in 1960).

The senior author would not have been able to work in the Tokelaus in 1966-67, 1968 and 1970 without the support of Mr. John R. Springford (Director, Islands Division, Maori and Island Affairs Department) and Mr. Ian L. Baumgart (Assistant Director-General, Department of Scientific and Industrial Research). On all four trips, the Faipule and Pulenuku of each atoll organised local canoe transportation and working parties. Their generous co-operation, and the ready and cheerful help of individual Tokelauans too numerous to mention, made our separate field studies a pleasure to us both — and to our companions in 1958 (Dr. D. H. Colless) and 1966/67 (Messrs. Morgan Williams and David Gravatt), whose assistance is gratefully acknowledged, too.

Thanks are also due to Isaia, his son Alofa Isaia, Teoni Basileo and Dr Ropati Logologo, all from Nukunonu, Vaopuka, Iulio and Dr. Iona Tinielu, all from Fakaofo, for sharing (with K.W.) their considerable knowledge of the flora and fauna of the Tokelaus. At the taxonomic level, we record our sincere appreciation of the kind help of Dr Charles O'Brien (American Museum of Natural History, New York) and Mr. Fred Kinsky and Dr John Yaldwyn (Dominion Museum, Wellington), also of Mr. Edwin H. Bryan, Jr. (Manager, Scientific Information Centre, Bernice P. Bishop Museum, Honolulu), who much interested himself in our joint undertaking and supplied important bibliographic information.

The assistance of Dr. Antony Hooper and Dr Judith W. Huntsman in providing proper spelling of Tokelau names and in other ways is greatly appreciated.

Last, but far from least, it is our pleasant duty to thank Fathers Camille Desrosiers, S.M., Peter Mauga, S.M., and W. Hansell, S.M., and Sisters Mary Julienne, S.M.S.M., and Mary Alfred, S.M.S.M., for warm and unfailing hospitality.

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THE EMPEROR PENGUIN COLONY AT CAPE WASHINGTON IN THE WESTERN ROSS SEA, ANTARCTICA

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The colony of Emperor Penguins *Aptenodytes forsteri* at the tip of Cape Washington (74° 40′ S, 165° 30′ E) (Fig. 1) was first sighted on 29 October, 1965 (Cranfield, 1966), although the presence of such a colony in the vicinity of Wood Bay had been postulated earlier by Harrington (1959). Cranfield *(loc. cit.)* had only a brief view from a passing aircraft but estimated a population of 4,000 to 6,000 adults and the same number of chicks, on the grounds that it appeared about one-half the size of the colony at Cape Roget.

On 14 November, 1968, while in a low flying U.S. Navy C-130 Hercules assessing seal distribution and numbers, I had the opportunity to photograph this penguin colony. Colour slides were taken through the cockpit windows at a minimum distance of 1500 feet to avoid

[U.S. Navy

Plate XXXV — South side of Cape Washington showing distribution of breeding groups of Emperor Penguins and orientation of sastrugi.

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possible disturbance to the birds by such a large aircraft. Thus the clarity of the photos was not ideal but by projecting the slides on a large screen and comparing the size of countable groups with uncountable ones, the total number was estimated to be about 7,600 birds of which about one-third to one-half were chicks in creches.

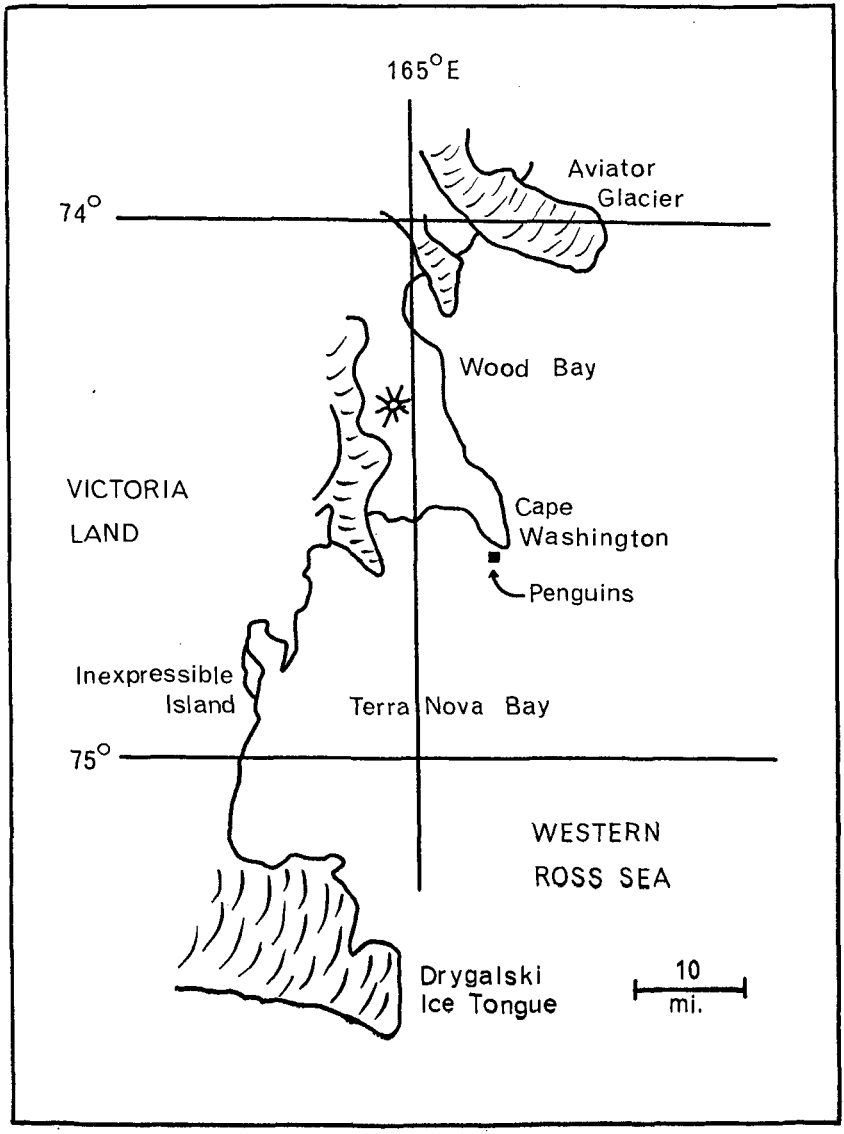

FIGURE 1 — Map Showing Location of Emperor Penguin Colony at Cape Washington

Stonehouse (1968) makes the point that the existence of a penguin breeding colony at high latitude is a certain indicator of open water early in the spring. Open water has been recorded in mid-winter SW of Cape Washington at Inexpressible Island (Priestly, 1914), at which there is a colony of Adelie Penguins *Pygoscelis adeliae.* Thus it is likely open water occurs near Cape Washington in early spring to permit the adult birds to obtain food for the chicks. On 14 November, 1968, there was open water and pack ice about one mile north of the cape.

Plate XXXV is a photo of the south side of the cape showing the location of the penguin colony. The direction of the sastrugi indicate the high degree of exposure of the birds to the prevailing winter winds. Cranfield *(loc. cit.)* suggested the exposed nature of the colony might subject it to the risk of premature break-up of the sea ice. However, the U.S. Naval Oceanographic Office, *Sailing Directions for Antarctica* (1960: p. 232) state, "This rocky peninsula [Cape Washington] separates Wood Bay and Terra Nova Bay [see Fig. 1] and traps vast quantities of drift ice swept northward by the tidal stream and forced against the shore by the summer prevailing winds [SE]." Thus it seems unlikely the fast ice immediately south of the cape might be blown away in early spring and that in fact large areas of stationary ice are normally present, even if in floes, until well after all the chicks are fledged.

The colony of Emperor Penguins that breeds on the sea ice between Coulman Is. and the mainland is similarly exposed to the prevailing southerly winds (personal observation) and although near open water early in the season (Harrington, *loc. cit.*), it is unlikely the sea ice breaks out before the chicks are fledged. In January, 1967, and February, 1968, I visited the west coast of Coulman Is. aboard the icebreakers *Glacier* and *Westwind* respectively and in both years this channel was still blocked with ice.

Budd (1961) rightly considered that safety from break-up of the sea ice prior to fledging of the chicks was one of the most important factors determining the location of Emperor Penguin colonies and Stonehouse *(loc. cit.)* has clarified the importance of open water close to the colony early in the season.

The significance of shelter is much less clear although Budd *(loc. cit.)* felt the available (if weak) evidence suggested that colonies might be located away from the greatest exposure to wind. The exposed location of the Emperor Penguin colonies at Cape Washington and Coulman Island suggests that shelter is much less important than stability of sea ice and nearness of open water in early spring.

ACKNOWLEDGEMENTS

I am very grateful to the following for support: Zoology Department of Canterbury University, Antarctic Division of the D.S.I.R., U.S. Navy Squadron XVE-6, and U.S. Coast Guard Cutters *Glacier* and *Westwind.*

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BODY MEASUREMENTS AND COLOUR PHASES OF THE McCORMICK SKUA
Catharacta maccormicki

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While body measurements have been used in an attempt to elucidate the taxonomy of the stercorariidae (for a review see Murphy, 1936) a lack of standardized and accurate methods has hampered comparisons of skua and jaeger forms. Colour phases and their geographical distribution have also caused some confusion in this family and there is no extensive quantitative study of the southern hemisphere *Catharacta* colour phases.

This report does not purport to be a substantial contribution and is simply a presentation of some data collected at opportune moments during an ecological study of the McCormick Skua *Catharacta maccormicki*.

MATERIALS AND METHODS

McCormick Skuas were trapped at the Canterbury University Field Station at Cape Royds, Ross Island, Antarctica, during the three summers 1963/64 - 1965/66. The birds were immobilized (Spellerberg, 1969) with pentobarbital sodium or thiopental sodium while measurements and colour phases were recorded. Linear measurements were taken either with vernier callipers accurate to .01cm. or a steel rule accurate to .1cm. Weights were determined with a spring balance calibrated to 2.0gms.

After a preliminary examination of the colour phases a colour chart was prepared which could be used to determine the phase of each bird after matching the nape, breast and scapular feathers. Samples of each of these feathers were collected and a further check of the allocated phase was made later in the laboratory at Canterbury University. This check resulted in rejection (2.1%) of some doubtful colour phase identification.

RESULTS AND DISCUSSION

1. Body Measurements.

Delineation of the linear body measurements (Table 1, 2) were as follows: Culmen — tip of bill to base of maxilla horny covering; Ear to bill tip — centre of aperture to end of bill tip; Gape — tip of bill to corner of closed mouth; Tarsus — distal end of upper side of web to articulation with tibio-tarsus; Third digit — ventral surface and excluding claw; Claw — exposed base to tip; Wing length — axilla to tip of largest primary feather with wing extended; Wing span — maximum length obtained with bird supine; Body length — tip of bill to tip of largest rectrice while bird suspended by neck.

Web and wing areas were calculated from weighed paper cut-outs and included the total area of each of the paired limbs. Wing areas were taken from the maximum area that could be obtained while the wing was laid out on a flat surface.

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Table 1. External measurements from live McCormick Skuas.

Measurement.	Mean. mm.	Standard deviation.	Number in sample.
Culmen.	49.3	2.3	285
Ear - bill tip.	92.3	2.4	285
Gape.	69.1	1.9	285
Tarsus.	63.1	4.2	285
Third digit.	74.0	1.3	285
Second claw.	5.3	0.5	199
Third claw.	7.2	0.8	199
Web area (Total)	62.4 cm^2	-	6
Wing area (Total)	1640 cm^2	-	48
Wing length.	40.5 cm.	1.1	285
Wing Span.	139.3 cm.	-	9
Body length.	59.0 cm.	0.98	285
Body weight.	1263 gms.	128 gms.	285

Table 2. External measurements from 21 males and 24 females before dissection.

	Male.	Female.
Measurement.	Mean. (Range)	Mean. (Range)
Culmen.	49.4mm (48.1-51.3)	50.9mm (47.0-53.6)
Ear - bill tip.	90.4mm (87.0-96.0)	92.3mm (89.1-95.0)
Gape.	68.3mm (65.7-71.2)	69.3mm (63.7-74.3)
Tarsus.	62.4mm (58.6-68.0)	64.8mm (58.0-76.0)
Third digit.	69.9mm (61.0-76.2)	71.6mm (65.0-75.3)
Wing length.	41.0cm (39.0-42.0)	41.5cm (40.0-43.0)
Weight.	1228gms (899-1392)	1366gms (9660-1619)
Body length.	59.5cm (58.0-61.0)	60.0cm (58.0-62.0)

Sixteen percent of the birds examined (included in Table 1) were smaller than the average breeding birds and as they lacked the paired brood patches during the summer they were identified as juvenile birds (2 - 5 year olds) and not yet breeding. Thirteen of these were caught in the first summer and again two years later. Over this period all linear measurements increased: the culmen showed a mean increase of 2.5mm. (R.=2.2-3.4mm.), the third digit showed a mean increase of 1.2mm. (R.=1.1-1.3mm.) and the tarsus a mean increase of 1.4mm. (R.=1.1-1.5mm.).

Forty-five birds (24 females and 21 males) were also measured and dissected for sex identification. Females that were about to lay eggs were excluded from the sample as they weighed 200 - 300gms. more than the mean weight of females (Table 2). In this small sample females averaged larger than the males, which agrees with the report by Falla (1937), who examined several *C. maccormicki.*

Similar results showing the female to be larger than the male have been found for the Jaegers *Stercorarius pomarinus, parasiticus* and *longicaudus* (Murphy, 1936) although Brooks (1939) reported body measurements of *S. pomarinus* showing the male to be larger than the female.

Female Great Skuas *C. skua* are also larger than males (Perdeck, 1960) and a similar situation exists with *C. chilensis* and *C. antarctica* (Murphy, 1936). Measurements given by Murphy for the Brown Skua *C. lonnbergi* show the female to be larger only in the tarsus length while Falla (1937) has reported a slightly greater size in the tail, tarsus and culmen of the female Brown Skua.

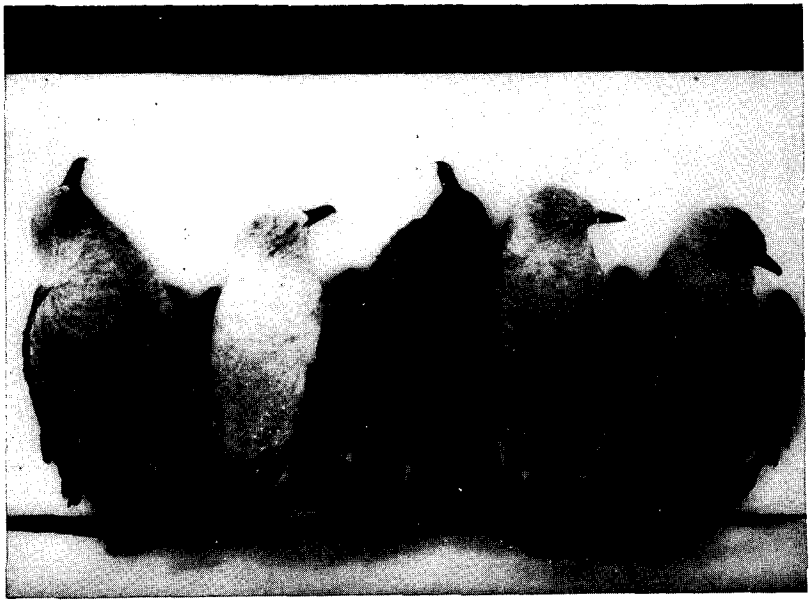

Plate XXXVI — The three colour phases of the McCormick Skua. From left to right: Intermediate, pale, dark, intermediate, intermediate.

2. Colour Phases.

There was considerable variation in the colour of the adult plumage (Plate XXXVI). Generally it was a paler brown than in either the northern Great Skua *C. skua* or other southern hemisphere forms and lacked the cinnamon-red or rufous colouring found in most other forms. The ventral surface was light grey with some white tipped or yellow tipped feathers and the dorsal surface was dark grey or black with a few white tipped feathers. The head and neck feathers were predominantly grey (tinged with light brown) and strongly marked with yellow or golden feathers on the nape and top of the head. The wings had a white band on the primaries which was displayed during 'Wing Raising' and flight. This band was seven to eight cm. wide narrowing to a point on the first primary when the wing was spread.

The adult plumage colour phases could be classified into three phases: pale, intermediate, and dark. As with the Arctic Skua *S. parasiticus* the greatest variation was found on the nape and head feathers (Table 3). The pale phase was characterised by feathers tipped with light yellow or white so that overall the plumage appeared light yellow. The dark phase was characterised by nape feathers which were dark brown and tipped golden yellow.

TABLE 3 — Colour Phases and Plumage Characteristics

Plumage	Pale	Intermediate	Dark
Head and Nape	Many feathers tipped with light yellow or white and generally plumage is grey and white.	Few yellow tipped feathers. Plumage generally light grey or white.	Many feathers tipped with golden yellow. Generally plumage is dark brown with some black tinting.
Ventral Plumage	Some feathers tipped with light yellow otherwise almost white.	Uniform grey and few feathers tipped white or pale yellow.	All feathers dark grey or dark brown. Yellow tipped feathers rare.
Scapulars	Feathers light brown or grey tipped white and yellow.	Feathers light brown or grey. Few feathers tipped white or yellow.	All feathers black or dark grey. White tipped feathers rare.

Information on the incidence of each phase (Table 4) was collected from the captures of two summers, from field notes on breeding birds, and from the 45 birds that were dissected for sex identification.

Both sexes were found to exhibit any one of the three phases and all the phases occurred in non-breeding juvenile birds (2 - 4 years old) as well as banded birds that were at least 6 - 7 years old (Friedman, 1945). No change in colour phase was detected during the summer months while the reverse has been reported to occur for *C. lonnbergi* (Stonehouse, 1956).

As it was considered that the three phases were quite distinct, that all bred in the Cape Royds area, and that the frequency of the rarest (dark phase) did not suggest recurrent mutation, it would appear that these phases indicate a colour polymorphism.

Other than reports of the melanic form (dark phase) off the coast of Japan (Kuroda, 1962) and at Cape Hallett, Cape Bird, and Cape Crozier (Falla, 1964) there is little information on the colour phases of *C. maccormicki.*

Southern (1943) has described two phases of *S. parasiticus* and illustrates the range of each phase. O'Donald and Davis (1959) have reported three phases for the same species and by using the numbers of the different phases suggest that a cline in these phases is a stationary one. More recently Forsten and Tuominen (1967) described three colour phases for *S. parasiticus* and contributed further evidence to the report of O'Donald and Davis showing that the pale phase predominates in the north while the dark predominates in the south of the Arctic.

An extensive literature survey was made by Southern (1944) on the distribution of the colour phases of *S. pomarinus* and it was

Table 4. Ratio of colour phases week by week for all McCormick Skuas caught at Cape Royds during two summers.

Week commencing.	No. 64/65	No. 65/66	Pale % 64/65	Pale % 65/66	Intermediate % 64/65	Intermediate % 65/66	Dark % 64/65	Dark % 65/66
1 7.11.64	-	19	-	21	-	69	-	10
2	24	19	9	36	62	54	29	10
3	12	58	16	25	68	46	16	29
4	8	5	25	40	63	20	12	40
5	12	12	33	8	50	59	17	33
6	16	13	31	38	50	55	19	7
7	15	28	13	17	67	76	20	7
8	19	35	15	25	75	67	10	8
9	14	58	28	27	72	65	0	8
10	32	20	21	40	58	60	21	0
11	25	16	20	25	80	75	0	0
12	31	32	0	72	87	22	13	6
13	40	-	18	-	72	-	10	-
14	21	-	4	-	72	-	24	-
Total.	269	315	16	31	69	56	15	13

Ratios.

	Pale.	Intermediate.	Dark.
1964/65	1.0	4.6	1.0
1965/66	7.4	4.3	1.0

concluded that this species was dimorphic with the dark phase evenly distributed throughout the breeding range.

ACKNOWLEDGEMENTS

I am grateful to Dr. B. Stonehouse and Dr. E. C. Young for their assistance during the preparation of this report. In particular I acknowledge the logistic support given by Antarctic Division (D.S.I.R., N.Z.) during my stay at Cape Royds.

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SHORT NOTE

SOME NOTES ON THE NESTING OF WELCOME SWALLOWS IN CENTRAL NORTHLAND

For some years the Welcome Swallow *Hirundo neoxena* has been a common bird in Central Northland and breeding seasons have been surprisingly long and successful.

At Waiotira, on the northern boundary of the Otamatea County and a little south of the area covered by Murray Munro (Notornis 16, 198-201), Welcome Swallows start breeding at the beginning of August. This year three nests were found containing eggs on 21/8/70. The clutches were 3, 3, 1 respectively. Several days later two of the nests contained four eggs, which is not an uncommon clutch in this area. As early as 31/8/70 one of the nests contained chicks. These three nests were located under wooden farm bridges, typical nesting sites, but recently two nests were found in more unusual sites.

In October a nest was found inside a large hollow totara tree. The birds entered the dark cavern inside the trunk by either of two natural holes. The nest when found contained four fully fledged chicks which left the nest on 25/10/70. The nest was firmly cemented to rotten wood about five feet off the ground.

Another nest was found under a large fallen log on an open hillside. Part of the log had fallen over a small undulation in the ground so that the nest, tucked away beneath, was about a yard above the ground. It contained one egg on 25/10/70.

— T. G. LOVEGROVE

ON THE SPECIFIC STATUS OF THE KERGUELEN SHAG AND ITS AFFINITIES

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Museum National d'Histoire Naturelle, Paris

1. SPECIFIC STATUS OF THE KERGUELEN SHAG

The Kerguelen Shag was first described by Cabanis (1875) as a full species, *Phalacrocorax verrucosus*. It was then considered either as a full species related to the Rock Shag *Phalacrocorax magellanicus* (Gmelin) of southern South America (Falla, 1937) or as a mere subspecies of the King Shag *Ph. albiventer* (Lesson), which inhabits southern South America and some subantartic islands (Milon et Jouannin, 1953; Johnson, 1965; Dorst, manuscript) [1].

First it should be emphasised that the Kerguelen Shag is, by its general pattern and more especially by that of its head, a true " Blue-Eyed-Shag." This group comprises two very closely related species, *Ph. atriceps* and *Ph. albiventer,* which are widely distributed in the Subantarctic Region (Murphy, 1936; Falla, 1937; Holgersen, 1945), as well as a third, *Ph. carunculatus* of the New Zealand region. Three other species are usually connected to this group, for, if they are not true " Blue-Eyed Shags," they show close affinities with them. They are *Ph. magellanicus* and *Ph. bougainvillei* of South America (Murphy, 1936) and *Ph. campbelli* of the New Zealand region (Oliver, 1955; Falla, Sibson and Turbott, 1966).

All these species build up a group of Shags of " pan-antarctic origin " (Murphy, 1936; Falla, 1937) which constitutes by now the sub-genus *Leucocarbo* Bonaparte (Dorst, manuscript). It is then inside of this subgenus that the affinities of the Kerguelen Shag are to be found.

Phalacrocorax verrucosus possesses many features which separate it sharply from *all* subspecies of *Ph. albiventer,* the great homogeneity of which has been emphasised by several authors (Falla, 1937; Hlogersen, 1945; Rand, 1954; Oliver, 1955). Some of these features, such as the lack of a white alar bar and certain biological characteristics, were already mentioned by Falla (1937). Comparison of specimens led to the discovery of additional differences between the species:

— The measurements of the length of culmen, tarsus and wing (Figs. 1, 2 and 3 and Table 1) show far lower values in *Ph. verrucosus* than in *Ph. albiventer.* From this point of view the subspecies of the latter are very constant.

— The wing is much more rounded in the Kerguelen Shag; its longer primaries being the 3rd and the 4th, and not the 2nd and 3rd.

— The demarcation line between the white and the dark colours of the head and neck passes much *under* the ear opening and reaches down the sides of the head under the base of the lower mandible.

— The feet of the Kerguelen Shag are heavily stained with dark brown, which sometimes extends so much as to hide their pink

fundamental colour. This feature is unique among Blue-Eyed Shags. Furthermore, the blue ring around the eye is, in life, of a far less bright blue than in *Ph. albiventer.*

— The plumage of immature birds is very different in both species. In *Ph. albiventer,* this plumage is a dull brown-grey on the upperparts and white on the underparts. In *Ph. verrucosus* on the contrary, the immatures show a dark brown plumage on their upperparts, with a bottle-green gloss on the wings and a blue gloss on the back. The region of the thighs is deep black. Furthermore, the immatures of the Kerguelen Shag present a colour dimorphism on their underparts, with a dark and a pale phase. This dimorphism was

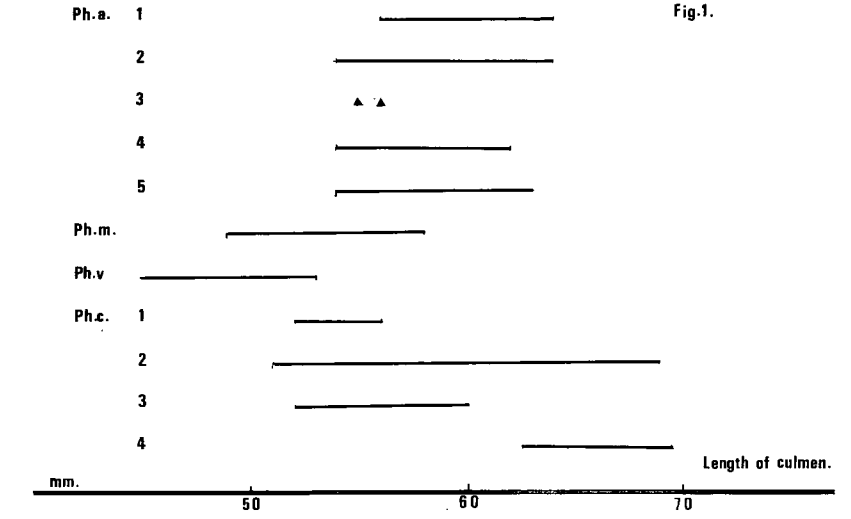

Fig.1.

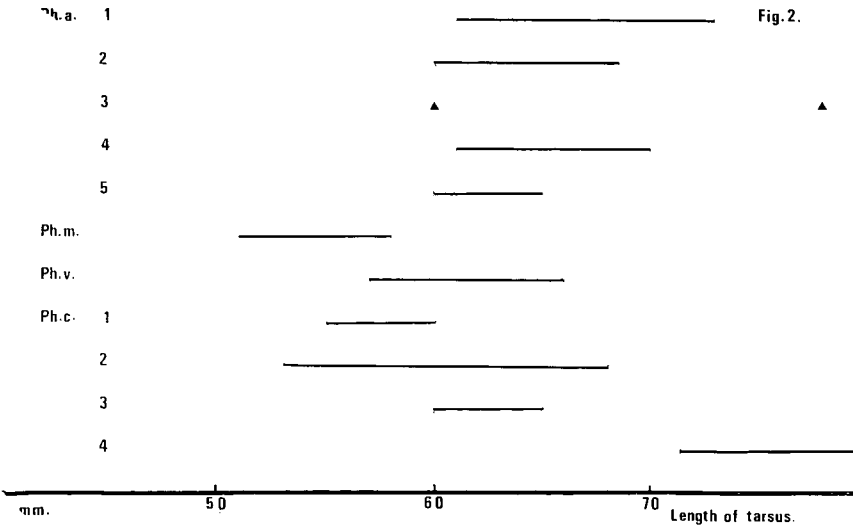

Fig.2.

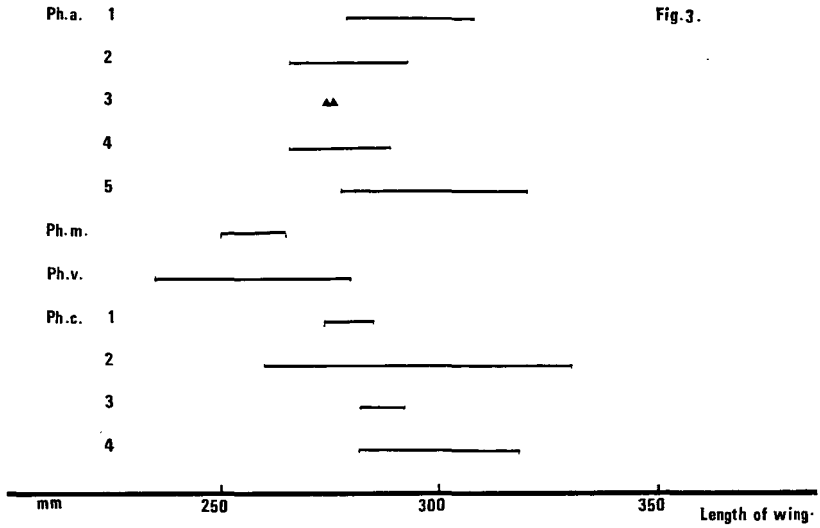

Fig.3.

FIGURES 1, 2 and 3 — Variation Ranges of the Length of Culmen, Tarsus and Wing in four species of Shags.
When no specimen was available, bibliographical data were used.
Symbols: Ph.a.: *Phalacrocorax albiventer.* 1: *Ph. a. albiventer* (Tierra del Fuego, Magellan Strait). 2: *Ph. a. albiventer* (Falkland Islands, Murphy, 1936). 2: *Ph. a. melanogenis* (?) (Marion Island, Rand, 1954). 4: *Ph. a. melanogenis* (Crozet Islands). 5: *Ph. a. purpurascens* (Macquarie Island, Falla, 1937).
Ph.m.: *Phalacrocorax magellanicus* (Tierra del Fuego and Magellan Strait).
Ph.v.: *Phalacrocorax verrucosus* (Kerguelen).
Ph.c.: *Phalacrocorax carunculatus.* 1: *Ph. c. onslowi* (Chatham Islands, Oliver, 1955). 2: *Ph. c. chalconotus* (Southern New Zealand, Oliver, 1955). 3: *Ph. c. ranfurlyi* (Bounty Islands, Oliver, 1955). 4: *Ph. c. carunculatus* (New Zealand, Pr. Kinsky, pers. comm.).

Species and subspecies	N	Culmen	Tarsus	Wing
Ph.albiventer albiventer (Tierra del Fuego and Magellan Strait)	8	(64-56) 61,00	(73-61) 67,37	(308-279) 294,5
Ph.albiventer melanogenis (Crozet Islands)	13	(62-54) 58,52	(70-61) 64,79	(289-266) 273,25
Ph.magellanicus (Tierra del Fuego and Magellan Strait)	9	(58-49) 53,44	(58-51) 55,11	(265-250) 253,22
Ph.verrucosus (Kerguélen)	8	(53-45) 50,00	(66-57) 61,50	(280-245) 260,87
Ph.carunculatus carunculatus (New Zealand, by courtesy of Pr. F.C.KINSKY).	8	(69,6-62,5)66,06	(79,7-71,5)74,75	(318-282) 301,25
	8			

Table 1. Dimensions of culmen, tarsus and wing in four species of Shags. Specimens preserved in the Dominion Museum (New Zealand) and in the Muséum National d'Histoire Naturelle, Paris (France). N = Number of specimens examined.

already mentioned by Falla (1937) and Paulian (1953). The dark-phase immatures are not numerous, and during January, 1967, I saw only a few of them out of several scores of immature birds observed in the region of Port-aux-Francais.

All these characteristics set *Ph. verrucosus* completely apart from all subspecies of *Ph. albiventer*. It seems then logical to consider *Ph. verrucosus* as a full species.

2. AFFINITIES OF THE KERGUELEN SHAG

The features which were enumerated in the preceding paragraph obviously set *Ph. verrucosus* completely apart from *Ph. atriceps* as well. On the other hand, some of them bring it closer to the Rock Shag, *Ph. magellanicus*. Falla (1937) already pointed out their similarities in the coloration of the upperparts and in certain biological features. The coloration of the immatures is very alike in both species, and the dimensions of the adults may be interpreted in the same way (Figs. 1, 2 and 3, Table 1). But it should be noticed that *Ph. magellanicus* differs from all other species of *Leucocarbo* by the pattern of its face and of its throat. On the other hand, immatures of this species are not dimorphic, and get their dark ventral colour nine to ten months after hatching (Murphy, 1936). Furthermore, biological features are no good criterion where allopatric species are concerned, because they can result from a convergence. Consequently, if the Kerguelen Shag is more closely related to the Rock Shag than to *Ph. atriceps* or *Ph. albiventer*, the relationship remains nevertheless remote.

On the other hand, the Kerguelen Shag shows clear affinities with the New Zealand King Shag, *Ph. carunculatus*. The pattern of the bare skin on the face and throat, as well as the pattern of their heads and necks, is very like in both species. The plumage of the upperparts of immature birds is also very alike, and dimorphism does occur as well in the immature as in the adult in *Ph. carunculatus chalconotus* and in *Ph. c. ranfurlyi* (Oliver, 1955; Sibson and Turbott, 1966). Of the four subspecies of *Ph. carunculatus* the nearest to *Ph. verrucosus* is *Ph. c. onslowi*, by its dimensions (Figs. 1, 2 and 3, Table 1) and by the occurrence of a cephalic crest, but it lacks dimorphism. One can see here the difficulties encountered when one wants to place *Ph. verrucosus* closer to one subspecies of *Ph. carunculatus* than to another. The Kerguelen Shag shows in a rather synthetic way characteristics of *all* these subspecies, and may stand near their common ancestor. It should be noted there that *Ph. c. carunculatus* is farthest from *Ph. verrucosus* by its larger dimensions, and by its lack of both crest and dimorphism [1].

It is yet noteworthy that *Ph. carunculatus* has a white alar bar as well as a white scapular and dorsal patch. These features, which show a variable development according to subspecies and specimens, set it closer to *Ph. atriceps* and to *Ph. albiventer* than the Kerguelen Shag.

It is well known that the true "Blue-Eyed Shags" have an austral, circumpolar distribution. If they are considered in the order in which they are encountered moving eastward from Kerguelen, it is possible to observe a gradual change in some of their peculiarities. First, with *Ph. c. carunculatus*, an increase of size is to be noted, as is the appearance of patches of white in the upperparts plumage. The dark blotches on the leg and feet disappear, but may remain on

the sole of the feet and on the joints of the toes. Colour phases are restricted to two subspecies only. Secondly, with *Ph. atriceps* and *Ph. albiventer,* immatures take a dull, grey-brown and white plumage, without any colour phase. The dark colour of the head and neck of adults shows a trend toward surface reduction, and the metallic gloss in the upperpart plumage becomes brighter.

In these conditions, it is likely that *Ph. albiventer* and *Ph. atriceps* have no direct relationships with the Kerguelen Shag, and that the closest relative of this species is at present *Ph. carunculatus.* This was what Cabanis (1875) asserted, without any further comment, in his original description of *Phalacrocorax verrucosus,* the Kerguelen Shag (2).

ACKNOWLEDGEMENTS

I am greatly indebted to Prof. Dorst, who kindly lent me his manuscript on the systematics of the Pelecaniformes, and to Mr. F. C. Kinsky, Curator of Birds at the Dominion Museum, Wellington, who very kindly measured for me the available specimens of *Ph. c. carunculatus* and *Ph. verrucosus* in the Museum. My thanks are also due to Mr. C. Schlotter, who corrected my English.

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CURLEW SANDPIPERS IN NEW ZEALAND 1969 - 70

By R. B. SIBSON

ABSTRACT

Exceptional numbers of Curlew Sandpipers were reported in New Zealand during the summer of 1969-1970. The opportunity is taken to review the history and status of the Curlew Sandpiper in New Zealand.

In B.T.O. News 36, November 1969, there appears a preliminary account of what was obviously an exceptional influx into Britain of Curlew Sandpipers *Calidris ferruginea.* The first were noted about August 23rd. Subsequently they were reported in unprecedented numbers in many different places within the British Isles, especially from the east coast where they made their landfall after crossing the North Sea.

Here in New Zealand at one of the far extremes of the range of the Curlew Sandpiper it became clear, as reports came in, first from the northern harbours and later from Lake Ellesmere and the Southland lagoons that during the summer of 1969-1970 there were more Curlew Sandpipers in New Zealand than had ever been reported since any kind of systematic recording began.

It may therefore be an appropriate time (a) to review briefly the history of the Curlew Sandpiper in New Zealand (b) to gather up the data collected during the recent invasion.

The Curlew Sandpiper was added to the New Zealand list early in the twentieth century but there seems to be some uncertainty about the exact date and place. Stead (1) claims that two specimens which he shot on Lake Ellesmere on 5/4/1903 were the first of the species to be recorded for New Zealand; but Oliver (N.Z. Birds 1930) states that " the first example to be taken in New Zealand was obtained at Lake Te Anau in March, 1903. A month later Stead shot two at Lake Ellesmere." However in his second edition (5) Oliver writes that " the first example to be taken in New Zealand was shot on Lake Ellesmere in February 1902. In March of the following year a specimen was obtained at Lake Te Anau." The matter may be purely academic; but what is the truth ? Incidentally Te Anau is still the only inland locality in New Zealand from which a Curlew Sandpiper has been reported.

In 1923 after twenty years' experience Stead considered that the Curlew Sandpiper 'may be put down as one of our regular migrants.' He had seen it on many occasions and had secured several specimens. " It is usually to be found," he adds, " associating with the Banded Dotterel. On one occasion I saw between twenty and thirty Curlew Sandpipers, which were in a large company of dotterel. When disturbed both species rose and flew around together and when they settled again the Curlew Sandpipers all settled together and slightly segregated from the dotterel."

Falla (2) had little to add except that further specimens had been collected or seen. The species was still unknown in the North Island. But in the early 1940s the big flocks of migratory shorebirds in the Firth of Thames and Manukau Harbour began to be studied

much more regularly and methodically; and one of the byproducts of this study has been a greatly increased knowledge of several of the smaller arctic migrants, one of which is the Curlew Sandpiper.

In the northern harbours Curlew Sandpipers are attracted not so much by Banded Dotterels as by Wrybills *Anarhynchus frontalis*. The first Curlew Sandpiper to be found in the North Island (3) — the date was 27/10/41 — had joined a small lingering flock of Wrybills. This pattern of behaviour is repeated over the years. Stray Curlew Sandpipers as they arrive from the arctic in September-October are drawn, preferentially it would seem, to flocks of Wrybills which have not yet gone south. After the New Year when the flocks of Wrybills are building up in their northern winter quarters, they are habitually joined by such Curlew Sandpipers as may be present; and these stay with the Wrybills, till they themselves leave for their arctic breeding grounds between the end of March and May.

In the Firth of Thames on 12/4/70 at least 20 Curlew Sandpipers together with other small arctic waders were scattered through a gathering of Wrybills, estimated by Ross McKenzie, John Jenkins and John Croxall to contain not fewer than 3500 birds as they rested at full tide over the ridges and among the hollows of a large shellbank. The well-reddened adults were conspicuous enough; but the pale juveniles could easily escape notice in such a dense throng. It is not surprising therefore that the few Curlew Sandpipers that have been found over-wintering in the northern harbours have been in company with Wrybills.

The Curlew Sandpiper is one of those migratory waders in which adults in breeding dress are very differently coloured from adults in eclipse and juveniles. Observations now made over many years show that the times of assumption and loss of breeding dress may vary considerably.

These apparent irregularities may simply indicate that there are early and late moulters and therefore early and late breeders. Adults, in post-nuptial moult and patchily marked with red when they arrive in September - October, are normal; but to see one still in fine nuptial plumage as late as 26/10/59 was most unusual. By the end of January some adults are showing red and some are fully red by the end of March, though in others the moult is far from complete by mid-April. Finally, there is the problem of adults in fine red feathering still present in New Zealand in mid-May. Thus, in the Firth of Thames on 19/5/64, in a flock of nine, four were fully red, two well-reddened and pale; and on 8/5/66 seven out of nine were very red and two pale. If these 'red' birds of mid-May are going to breed the same season some 7500 miles away, they have to travel fast.

In Table 1 the story of the discovery of the Curlew Sandpiper in the North Island is outlined. While the figures undoubtedly reflect a growing interest in the study of the migratory shore-birds and an increase in the number of critical observers visiting likely estuaries, they also show that since the middle 1950's more Curlew Sandpipers have been spending the summer in the Firth of Thames, and by New Zealand standards the numbers have been quite impressive throughout the 1960's. They may, of course, have been attracted to the Firth of Thames from other areas in New Zealand where

TABLE 1 — Curlew Sandpipers in the North Island

Summer	F.O.T.	Manukau	Comments and Sightings Elsewhere.
1940-41	-	-	Regular counts of wader flocks begin.
1941-42	1	-	First North Island record.
1942-43	-	-	
1943-44	-	-	
1944-45	-	-	
1945-46	-	-	
1946-47	1	-	Second N.I. record
1947-48	13	-	
1948-49	6(1)	-	First record of over-wintering
1949-50	4	-	
1950-51	2	-	
1951-52	2	-	
1952-53	2	-	
1953-54	2	-	1 at Paua on 2 Sept.
1954-55	2	-	
1955-56	5	-	
1956-57	5(2)	1	First Manukau record
1957-58	9	1	
1958-59	6	9	
1959-60	9	4(1)	
1960-61	10	-	Manawatu estuary. Feb-April Max.4
1961-62	8(3)	1	" " 3 on 24th Feb.
1962-63	8	3	" " 1 on 2nd Mar.
1963-64	11(9)	-	Ahuriri lagoon, Napier. 5
1964-65	13(2)	1	
1965-66	11	2	
1966-67	17	2	
1967-68	15	-	Manawatu estuary. 1 - Dec. 23rd.
1968-69	11	-	Manawatu estuary. 1 - Oct.Nov.
1969-70	20 (10)	14 (2)	Paua, present Oct-Feb. max.8 (A.T.E.)
			Rangaunu Bay 6 on 1st Nov. (J.S.)
			Muriwai Lagoon, Gisborne. 1 on 9th Dec. (A.B.)
			Whakaki Lagoon, H.B. 1 on 20th Jan. (A.B.)
			Westshore Lagoon 3 on 12th Dec. (I.G.A.)
			Waitotara estuary 4 on 11th Dec. (D.M.)

Figures in brackets are for birds over-wintering.

feeding grounds have deteriorated. But it is reasonable to suppose that the figures for the Firth of Thames are good evidence that for some years the number of Curlew Sandpipers annually reaching New Zealand has increased. It is regrettable that a comparable set of figures is not available for Stead's historic area, Lake Ellesmere; but the record count (60+) made there late in October 1969, suggests that conditions there are as favourable as ever. A somewhat similar increase in the number of Red-necked Stints *Calidris ruficollis* has already been described (13). The two species, of course, are often found in close company and, despite a considerable difference in size, may be able to travel together on their long oceanic flights.

In the well-matched assemblages of waders in Manukau Harbour, no Curlew Sandpiper was identified till 1956; and in only two years since that first finding have palpable flocks been noted as present. In the summer of 1958-59 the many acres of shallow water provided by the partly constructed ponds of the A.M.D.B. acted as a magnet to great numbers of waders, both large and small, and an environment which was exceptionally favourable existed for a while. Up to nine Curlew Sandpipers stayed for some weeks in the latter end of summer.

A possible reason for the scarcity of records of Curlew Sandpiper in Manukau Harbour may be that whereas in the Firth of Thames a sizable flock of non-breeding Wrybills usually remains between September and December when it is boosted by the first migrants returning from the South Island, Manukau seldom seems to retain such a non-breeding flock throughout spring and early

summer. Knots *Calidris canutus* however are usually plentiful; and if Curlew Sandpipers associate with them, the scarcer and slightly smaller species is easily overlooked. In the Firth of Thames and Manukau, it is not unusual for flocks of Knots to contain thousands of birds. They are less approachable than the smaller flocks of Wrybills. At full tide Knots tend to pack densely and they have been described as covering a shell-bank like a vast swarm of bees, even clinging uncertainly to its steep sides. Among them Curlew Sandpipers, being smaller in body, though much the same in length of bill and leg, and cryptically coloured in all plumages, virtually disappear.

During the spring of 1969 a dwindling company of Wrybills when driven off the Puketutu flats by the incoming tide, used as a loafing ground some acres of dredged and roughly levelled shell beside No. 4 pond, A.M.D.B. It was here that the biggest flock of Curlew Sandpipers so far recorded in Manukau Harbour gradually built up and gave the first hint that the 1969-70 season was to be an exceptional one. On Sept. 18 about 140 Wrybills had been joined by a single Curlew Sandpiper. It was lean, tired and sleepy. When flushed it flew a short distance to a patch of swamp, played at feeding for a short while; then returned to the Wrybills and resumed its dozing. On October 2nd there were four Curlew Sandpipers among 70 Wrybills; then six on October 24th when the Wrybills had declined to 33. By November 4th the Wrybills were reduced to about 20 but the Curlew Sandpipers had increased to nine. Twenty-four Wrybills were still present on November 16th, but none could be found thereafter till well into the New Year. On November 20th and 28th at least eight Curlew Sandpipers were seen, once in a typical darting flock calling with a lively twitter as they turned and twisted. But by now they were much more difficult to find on the ground at their roosts as Godwits and Knots were now plentiful; and usually it was only possible to track down the few Curlew Sandpipers among the hundreds of Knots when they moved to the fringes of the resting flocks. With the return of the Wrybills after the New Year the search for Curlew Sandpipers was simplified. Throughout February, 12 - 14 associated with flocks of roosting Wrybills which varied in number from 25 to c. 400. Curlew Sandpipers were last seen here in early March. During the late summer and autumn the acres of dredged shell, now a small artificial desert thinly vegetated also proved attractive to more than a hundred Banded Dotterels. The flocks of Wrybills and Banded Dotterels tended to roost apart, as is normal. It was noted by many observers that the Curlew Sandpipers showed little interest in the Banded Dotterels, and generally rested right among the Wrybills.

Meanwhile Curlew Sandpipers were being found in the North Island on other estuaries and coastal lagoons from which they have seldom or never been recorded in the past. A. T. Edgar was visiting Paua on Parengarenga almost monthly; Dr. John Seddon came upon a small flock near Kaimaumau. On the east coast several likely localities were investigated by Dr. Ian Andrew, A. Blackburn and B. D. Heather; on the south-west coast David Medway found some at Waitotara, but curiously enough, none was reported from the Manawatu where they have come to be expected with some regularity.

Apart from the isolated Te Anau record, there still seem to be only three localities in the South Island where so far Curlew Sandpipers have been recorded. Although Lake Ellesmere is an historical area for them and it is likely that they are regular summer visitors, there are actually few years in which flock counts have been made or numbers assessed. At Farewell Spit few could be found during surveys of waders conducted by the O.S.N.Z. in 1961 and 1967. For subsequent reports we are indebted to B. D. Bell and other Wildlife officers. In the far south persistent field work by a team of local observers, led by Mrs. M. Barlow and Roger Sutton, has shown that small numbers may be expected annually, since they were first discovered on the roomy Southland lagoons in January 1963 (14). Here, as in the north, the 1969-70 season was well above average.

TABLE 2 — Counts of Curlew Sandpipers in the South Island since 1960

Summer	*Farewell Spit*	*Lake Ellesmere*	*Southland Lagoons*
1960-61	2		
1961-62			
1962-63	1		3
1963-64		27	
1964-65	7		14
1965-66			5
1966-67	4		7
1967-68	4		3
1968-69			
1969-70		60+	12

It is perhaps worth mentioning that while the summer of 1969-70 may have been a ' vintage year ' for Curlew Sandpipers in New Zealand, our bumper crop of perhaps 150 is a very modest one by Australian or Tasmanian standards. In south-east Tasmania, S. lat. 43° Thomas (15) suggests that there has been an increase in the 1960's. For one specially favoured locality he gives the following figures:— 244 in 1964-65; 414 in 1965-66; 769 in 1966-67; 950 in 1967-68; 606 in 1968-69. One thing of which we may rest assured is that the Curlew Sandpiper has been enjoying a series of successful seasons on its arctic breeding grounds.

ACKNOWLEDGEMENTS

Once again I am happy to acknowledge my indebtedness to Ross McKenzie, who made available figures carefully obtained over more than a quarter of a century's patrolling of the shores of the Firth of Thames and southern Manukau Harbour. I am also grateful to Mr. A. T. Edgar, who apprised me of his findings at Paua and delved into the O.S.N.Z. recording files; to numerous correspondents, named in the text, who answered letters; and finally to Mrs. Sylvia Reed and Mr. Pat Crombie, who were responsible for two over-wintering records in 1970, after no Curlew Sandpipers had been acceptably identified on winter censuses in the Firth of Thames and Manukau Harbour.

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BIRDS OF LITTLE OHENA ISLAND

By A. BLACKBURN

SUMMARY

The birdlife of all islands of the Mercury Group, with the exception of Little Ohena, has previously been recorded in detail; but owing to inaccessibility in all but ideal conditions, no record has been made of the birds of Little Ohena. A brief description of the island and its birdlife is given, in particular of the occurrence of the White-faced Storm Petrel **Pelagodroma marina**, which has not been found breeding on any other island of the Mercury Group.

INTRODUCTION

In the course of a survey of Cuvier Island and of five islands of the Mercury Group in June 1970, a party consisting of D. V. Merton (leader), I. Crook, R. Simpson, all of Wildlife Service, Dr. I. A. E. Atkinson, Botany Div., D.S.I.R., A. H. Whitaker, Ecology Div., D.S.I.R., and the writer, landed on Little Ohena Island (more correctly Little Ohenau), and spent 24 and 25 June ashore. Landing is possible at one point only, and then under good conditions, for elsewhere the coastline consists of sheer cliffs. A steep climb to the backbone ridge to the only suitable camping area is involved.

We had expected to find the island comparatively unmodified by man, but there has obviously been considerable disturbance, the vegetation being largely of fairly recent origin. Exposed areas are very battered by salt and wind. There are ample signs of earlier Maori activity, including middens containing large numbers of Storm Petrel bones. Later in Whitianga, we had the opportunity of discussing Maori occupation of the Mercury Group with Mr. Ben Davis, oldest member of the Arawa sub-tribe Ngatihei, owners of the Mercury Islands until the recent gift to the Crown. He stated that within his lifetime no Maoris lived on any of the islands, presumably with the exception of Great Mercury, but visited them regularly for mutton-birding. He recalled that as a small boy he used to accompany his grandmother to Big Ohena Island in a rowing-boat, and she would regularly set fire to the vegetation.

DESCRIPTION OF ISLAND

Cliff-bound Little Ohena lies some 600 yds. north-east of Ohena Island, and has an area of about 14 acres. A ridge, rising to 160 ft. at its highest point, connects a fairly flat area of an acre or more at the northern end with an easy slope at the southern end, terminating in a high, attached, and vegetated stack. Many large pohutukawa grow on the northern ' plateau,' but otherwise the vegetation is generally a low canopy of karo, 12 to 15 feet high, with patches of houpara, wharangi near the margins, and *Hymenanthera* in more open places. The slopes above the landing are intensively burrowed by petrels, as are the western slopes generally, whilst there are considerable concentrations of burrows on the ' plateau ' and the southern slope.

BIRDLIFE

Edgar (1962) and Skegg (1963) cover the birdlife of the Mercury Islands, with the exception of Little Ohena, very completely, and the only addition of note to their records is the Saddleback *Philesturnus carunculatus* now flourishing on Red Mercury Island,

following its introduction on 30/1/66. The population is well scattered, but will be limited in numbers, as the habitat is generally not comparable with that of Cuvier Island. Birds were seen in all situations, at the camp site, in the pohutukawa forest where previous sightings of adults and juveniles were mostly made, and surprisingly even in the low mapou scrub.

Falla (1934) recorded the White-faced Storm Petrel as breeding in the Mercury Islands, without defining the locality; but *in pers. comm.* states that he made three visits to Little Ohena between 1926 and the early 1950's. He found White-faced Storm Petrel and Fleshfooted Shearwater *Puffinus carneipes* breeding in numbers.

The following notes on species were made:

Of the *Procellariiformes,* we were too late to record the Fleshfooted Shearwater observed by Falla, as the fledglings take their departure in April (Falla *et al.* 1966). The Fluttering Shearwater *Puffinus gavia* was recorded as coming ashore in small numbers, the Allied Shearwater *P. assimilis* in greater numbers, and just a few Grey-faced Petrel *Pterodroma macroptera.* The White-faced Storm Petrel was not seen, as it was too early in the season, but we found three shells of the previous season's eggs, and there were indications of a high population. The Diving Petrel *Pelecanoides urinatrix* was present in considerable numbers, but not in concentrations comparable with those on Middle and Green Islands.

Of the bush birds, the Red-crowned Parakeet *Cyanoramphus novaeseelandiae* is common, as on all the Mercury Group, with the exception of Great Mercury. It was observed feeding on flowers of *Coprosma macrocarpa.* and scratching in the litter for seeds. Another source of food on Middle Island was the apical shoots of tawapou *Planchonella novo-zelandica* and of the milk tree *Paratrophis banksii.* One Morepork *Ninox novaeseelandiae* was heard calling. The Fantail *Rhipidura fuliginosa* and the Grey Warbler *Gerygone igata* are present in small numbers, as are the Blackbird *Turdus merula* and the Dunnock *Prunella modularis.* The Bellbird *Anthornis melanura* is equally common with the Red-crowned Parakeet, numbering about 20 of each, and here it has an unusual dialect in its song. Small flocks of Silvereye *Zosterops lateralis* were recorded.

Several Northern Blue Penguin *Eudyptula minor* were seen coming ashore at the landing place, apparently the only spot accessible even to penguins; the usual Harrier *Circus approximans* was circling over the island as we landed; and two Kingfishers *Halcyon sancta* were observed perched on the summit of a stack off the north-western coast. and feeding round its shoreline. Goldfinch *C. carduelis* and Chaffinch *Fringilla coelebs* were recorded, and a small flock of Starling *Sturnus vulgaris* came from the mainland to roost.

DISCUSSION

Skegg (1963). writing of visits to the Mercury Islands in August 1962, and in the following November, says " seas again prevented our landing on Little Ohena, where both tuatara and White-faced Storm Petrels are said to be found." If tuatara are present, they must be few in number, for a thorough search by night revealed no trace of them. This is surprising in view of the

apparent absence of kiore *Rattus exulans,* for it has been found that where island communities of kiore are large, the tuatara is scarce, and *vice versa.* Neither Edgar (1962) nor Skegg (1963) found evidence of breeding of the White-faced Storm Petrel on any of the islands visited, so the breeding population recorded by Falla is apparently confined to Little Ohena; although B. D. Bell *(pers. comm.)* found the remains of the species in Harrier 'middens' on Double Island.

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SHORT NOTE

ANOTHER OCCURRENCE OF GREAT KNOTS IN NEW ZEALAND

A Rotorua party of the O.S.N.Z. visited Miranda, Firth of Thames, for the week-end 7th, 8th and 9th February, 1970, taking advantage of the very high tides of that period. They were joined by Miss Susan Fogarty and the H. R. McKenzies of South Auckland. The weather was fine, visibility good and birds were plentiful, both as to numbers and species.

On the 7th, with a rising tide, an inner flat of wet soft mud was being scanned for the counting of large and small waders, the latter among Pied Stilts, Bar-tailed Godwits, Lesser Knots and a few gulls, when I noted among the knots a bird with black markings on the upper surface and the whole of the breast. I directed the others of the party to it, and Ross McKenzie promptly identified it as a Great Knot *Calidris tenuirostris.* Its larger size was evident when compared with a Lesser Knot *Calidris canutus* which stood a few inches from its side, both facing us. The crown was definitely but not strikingly striped. The black dots all over the breast were large and clearly defined on a white or light ground. The bill was dark or black and was longer and heavier than those of the surrounding Lesser Knots. The rump was not visible. A second, slightly less coloured bird, was soon found a few yards away, also among knots. Both were equally well seen again on the next day.

These birds so closely matched the description by Ian G. Andrew (Notornis 15, 207-209) and the accounts and pictures in the literature that there could be no doubt as to identity.

Rare waders are most often found during regular watching activities. The northern breeders often pose problems for most of their stay here because so many are dressed in drab grey and brown. Near the time of their return north, however, they assume part of their breeding colours so that identification is easier. This makes it well worth-while to keep a special watch in February, March and early April. The more uncommon birds seen by this party were Sharp-tailed, Curlew, Terek and Broad-billed Sandpipers, Red-necked Stint, Large Sand Dotterel, Great Knot, Long-billed Curlew and Sanderling.

— MARGARET BROUN

ROOKS ON THE WAIUKU PENINSULA

By MURRAY E DOUGLAS

ABSTRACT

This article is an account of the first recorded Rooks in the Waiuku area, their recorded sightings and nestings, over the past five years. The arrival of two at first and the appearance of a third bird after four years of their establishment.

The first report of Rooks *Corvus frugilegus* on the west Waiuku area, South Auckland, was by Mr. Ben S. Ross, of Waiuku, foreman there of the Franklin Electric Power Board, to Mr. Norman Douglas, of Kaihau Road, Taurangaruru, Waiuku Peninsula.

Ben S. Ross and the men with him were, on 28/10/64, disconnecting the electricity from an old farmhouse at the end of Craig's Road (one inch to one mile Map Ref. N47/175167) when they noticed two agitated large black birds. A big nest of sticks, enough to fill a wheelbarrow, was located about sixty feet up in the crown of a flat-topped green pine *(Pinus pinea)*. As the men were leaving, one bird returned to the nest. The two birds were again seen on 8/11/64.

On 5/12/64 H. R. McKenzie went with Ben Ross and two of his men to the nest. No birds were seen.

On 7/12/64 D. V. Merton, H. R. McKenzie, Ben Ross and one of his men found the nest to be definitely deserted. A 30-foot extension ladder reached hardly half-way and the tree was quite unclimable. Droppings on the ground below the nest could have been from young which had fledged but were more likely to have been from the roosting adults. Two birds were later seen by Mr. Craig on a hillside pasture not far away.

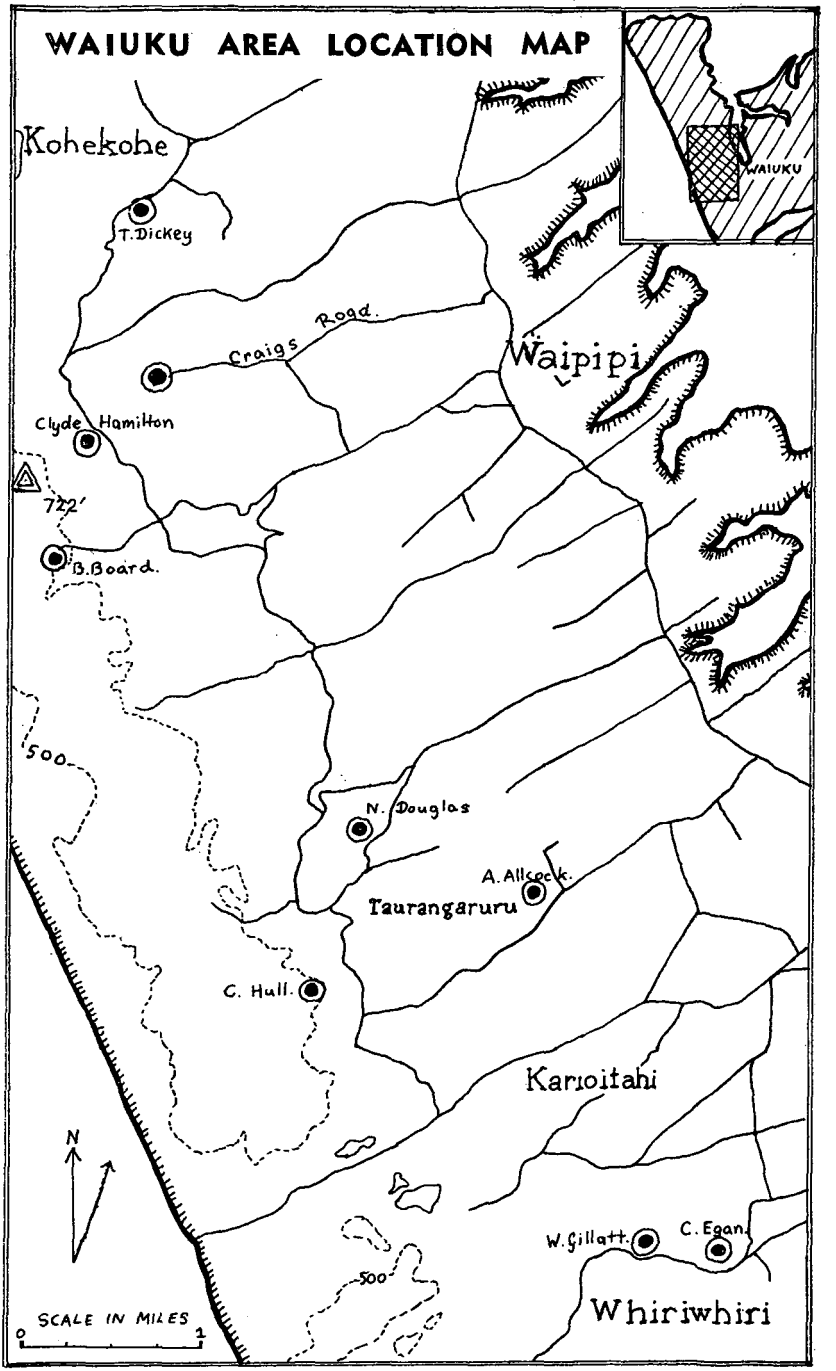
1965 produced several reported distant sightings of dark birds, all close sightings being of two only.

On 1/10/65 N. Douglas heard that they were living at Mr. Colin Hull's farm (N47/190104). On 6/1/66, on further evidence, N. Douglas, Mr. and Mrs. J. A. Brown, W. L. Moisley, H. R. McKenzie and the writer went to Hull's and saw the birds distantly. A nest was found about sixty feet up in a pine tree *(Pinus radiata)*. I returned a few days later but the nest by that time was not being used, though it looked quite fresh. Mrs. Hull later heard the birds a few times. There is, of course, no doubt that this was a 1965 nest. In the autumn of 1966 they established themselves at the farm of Mr. B. F. Board (N47/167148).

In the spring of 1966 they nested at Mr. Con Egan's farm at Whiri Whiri (N51/232080), near Waiuku. I did not hear about it until it was too late to investigate.

On 2/9/66 J. L. Kendrick and A. M. C. Davis saw the two birds and considered them to be Rooks. During 1966-67 N. Douglas saw them several times flying over his farm, one mile N. of Hull's.

In the spring of 1967 they nested in the trees on the farm of Mr. L. T. Allcock at Taurangaruru. The birds suddenly departed and were next reported at Colin Hull's. On 1/10/67 they were positively identified by Mr. R. B. Sibson, with Mrs. Sibson, N. Douglas, H. R. McKenzie and myself. They had a nest a few yards from the 1965 one, found on 6/1/68, in a different tree and they kept returning anxiously to it. The party had excellent views with binoculars and a very large telescope.


WAIUKU AREA LOCATION MAP
Kohekohe
T. Dickey
Craigs Road
Waipipi
Clyde Hamilton
722'
B. Board.
500
N. Douglas
A. Allcock.
Taurangaruru
C. Hull.
Karioitahi
N
W. Gillatt.
C. Egan.
500
Whiriwhiri
SCALE IN MILES
0
1
WAIUKU

Taking the Craig nest as the focal point the nests located in the four years were:—

1964	Craig's Road, N47/175167	(1 inch to 1 mile)	
1965	Hull's, Taurangaruru, N47/190104	$3\frac{3}{4}$ miles	S. (of Craig's)
1966	Egan's, Whiri Whiri, N51/232080	$5\frac{1}{8}$,,	S.E.
1967	Allcock's, Taurangaruru, N47/212115	$3\frac{5}{8}$,,	S.E. by E.
1967	Hull's, Taurangaruru, N47/190104	$3\frac{3}{4}$,,	S.
1967	Gillatt's, Whiri Whiri, N51/224080	$5\frac{1}{2}$,,	S.E.

At 1630 hours on 7/10/67 H. R. McKenzie and I went to the Hull nest. Colin Hull reported that they had been about and calling as usual up to the evening of the 6th. I went to the nest site while H. R. McKenzie watched for 45 minutes from about 300 yards to check movements. No birds were seen or heard. I found a predated egg on the ground immediately below the nest. It was fresh, having a small amount of partly congealed yolk adhering to the inside of the shell. Three Mynas were about the site and others were near. A single oval hole in the small end of the egg measured 18 mm. x 14 mm. Owing to the hole the length could not be accurately determined but was approximately 39 mm. or more. The width was 29 mm.

We then went to Allcock's to look for the reported nest of 1967. I found it in the green top of a very high pine. On the ground immediately below it was the side, including the complete ends, of an egg, length 39, width 27. The shell was clean and white inside, possibly finally cleaned by insects, but it showed no sign of incubation.

The egg colour and pattern is according to Witherby. The sizes are above his measurements and those of Oliver. The shape is pyriform, a little less so than the White-fronted Tern's. The shells were retained.

The rather small hole in the Hull egg could indicate myna predation and the absence of nearly half of the Allcock one, perhaps magpie.

Further occurrences of the 1967-68 season were 14 October, 1967, two returned to Hull's; 7 November, two flew over N. Douglas's; 22 November, carrying twigs at W. Gillatt's, Whiri Whiri (N51/224080); 27 December, nest found at Gillatt's; 2 January, 1968, old nest found at Egans'; 12 March, two flying from Douglas's towards Allcock's.

Three birds were seen by Miss B. Hamilton, from March 1968 to early July, at Clyde Hamilton's farm (N47/168160). The third bird is thought to have been reared from an unlocated nest in the February-March period.

About 13/10/68, Con Egan found three birds and a nest being built on top of the old one. By November there was also a new nest. Two birds used the new nest and the odd bird sat on the old one at times. Magpies worried them. Mynas were not seen to interfere. All left the first week in December and appeared at C. Hull's trees. Up to 21 August 1969, sightings were made of one, two or three birds at a time on the properties of Clyde Hamilton, Colin Hamilton (N47/189131) and T. M. Dickey (N47/173183).

No reports of Rooks have been received from beyond the area described. Lack of breeding success is apparently due to persistent predation. Rooks nest in colonies where Magpies and Mynas dare not approach. These birds may have largely failed through not realising the danger, when breeding alone, of leaving their nest unattended.

THE GENUS CAPELLIRALLUS

By R. J. SCARLETT
Canterbury Museum

ABSTRACT

Rallus hodgeni Scarlett is discussed and compared with **Capellirallus Karamu** Falla, and placed in the same genus. Additional details are given for **Capellirallus Karamu.**

DISCUSSION

In 1955 the writer published, as *Rallus hodgeni,* a new " rail " from South Island localities. In the same year Dr. W. R. B. Oliver created a new genus, *Pyramida,* for this bird. In 1954 Dr. R. A. Falla also published a new " rail " *Capellirallus Karamu,* from North Island caves. Since both papers were published, many more bones of each form have been found in the North Island, and a review of the available material seems desirable, as evidence has accumulated to show that *hodgeni* is a larger form of *Capellirallus,* and that *Pyramida* is an unnecessary generic separation.

The localities from which *Rallus hodgeni* were known in 1955 were Glenmark Swamp and Pyramid Valley Swamp, North Canterbury, and Marfell Beach, Lake Grassmere, Marlborough. To these can now be added, for the South Island, Rockshelter No. 1 on the farm of Euan Murchison, Weka Pass, North Canterbury, which is only 7 or 8 miles from Pyramid Valley, and S29/7 Wairau Bar Moahunter Camp, Marlborough, a few miles from Marfell Beach. It will be seen that the present known range from the South Island is from two restricted areas. The North Island localities for *hodgeni* include a group of caves and rockshelters in Hawkes Bay (Pigeon Bush Nos. 1 and 2, Hukanui 3, 7a and 7b, Bushface No. 3, and Te Weka No. 1, all investigated by the late W. H. Hartree and the writer); N128/3 Kaupokonui Moa-hunter site, and Ohawe Moa-hunter site on the Taranaki Coast; caves in the Mahoeni district, North Taranaki, and Harrison's Hole, Ruakokopatuna, Martinborough district. Mr. Russell Price has also found it at Poukawa Swamp, Hawkes Bay.

So far, no specimens of *Capellirallus Karamu* have been found in the South Island: The locality of the Holotype of the latter is Karamu Cave, about 13 miles from Hamilton, Waikato: Dr. Falla also had it from Conoor Cave, near Dannevirke, and Waitanguru, Waitomo. To these localities can be added several caves in the Mahaenui district (Skyline, Robbers Hole, Murder Canyon) — mostly collected by the Taranaki Caving Club — Papa Maru Cave, near Te Kuiti, Harrison's Hole, Ruakokopatuna, and sandhills, Tom Bowling Bay, Northland.

The Mahoenui-Waitomo-Te Kuiti limestone caves are part of one system.

When I published the original description of *Rallus hodgeni* no cranial material was available. Since then the position has improved slightly, and other parts of the skeleton are also better known.

DESCRIPTION

CRANIUM

Capellirallus hodgeni (Scarlett 1955)

Av. 22,951 A. From bones of five mixed individuals. Harrison's Hole, Ruakokopatuna, Martinborough. C. 2,000 feet, 1968: Coll. John Marston and Ian Peyton.

Av. 27,763 A. Posterior portion. Same locality and collectors, 1966. From mixed bones of at least 19 individuals.

Av. 18,308. Posterior portion, with part skeleton. Hukanui No. 3 cave, C. 30 miles from Napier, Hawkes Bay. C. 2,500 ft. April, 1960. Coll. W. H. Hartree. These bones are all the cranial material as yet available for study. They are very similar in size and shape to those of *Capellirallus Karamu.* Av. 22951 A differs mainly in being wider in the pre-orbital region. It is imperfect, being holed below (ventral aspect) on the left side. No pre-maxilla or mandible of *hodgeni* has yet been found, but despite this, the close similarity of *hodgeni* and *karamu* in all but size, shows that they are con-generic.

	Length posterior to beginning of pre-maxilla	Height	Minimum width at temporal fossae	Width at post-orbitals	Width at squamosals	Width of foramen magnum	Depth of foramen magnum
Av.22,951A	2.55+	1.65	0.625	1.95	2.1±	0.55	0.415
Av.21,763A	-	-	-	-	2.05	04.95	0.5
Av.18,308	-	-	-	-	2.0+	0.55	0.4±

PELVIS

None of the pelves is complete. I have taken measurements wherever available. Where a star (*) appears, it indicates that the sound half was measured and multiplied by two. Several other pelvic fragments, besides those listed, are in the Canterbury Museum collection, but are not measurable. All the pelves lack pubes.

Dr. Oliver considered the pelvis allied to *Tribonyx* and *Gallinula.* I have no *Tribonyx* for comparison, but have used two skeletons of *Gallinula chloropus cachinnaus Bangs,* and one of *Gallinula chloropus chloropus* (Linne) for comparison, as well as *Fulica atra australis,* Gould, *Fulica atra atra* (Linne), *Fulica americana americana,* Gmelin, and *Nesophalaris chathamensis* (Forbes).

Capellirallus is certainly allied to the Gallinules in the pelvis, differing from *Gallinula* and *Fulica* mainly in the relatively larger frontal iliac region.

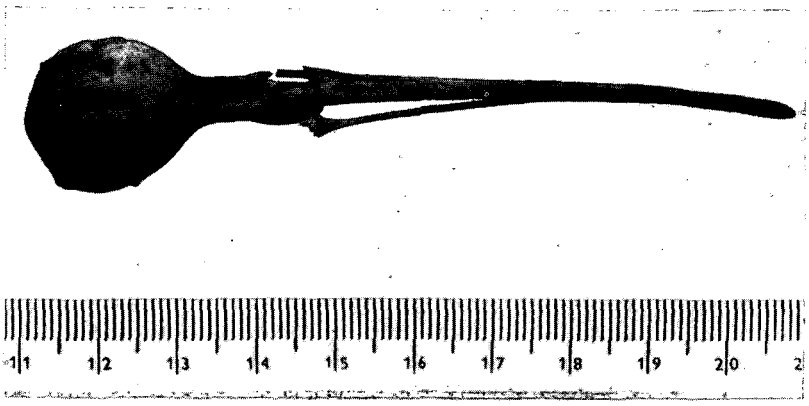


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Plate XXXVII — Av. 20,615. **Capellirallus Karamu** Falla. Dorsal view of cranium and pre-maxilla.

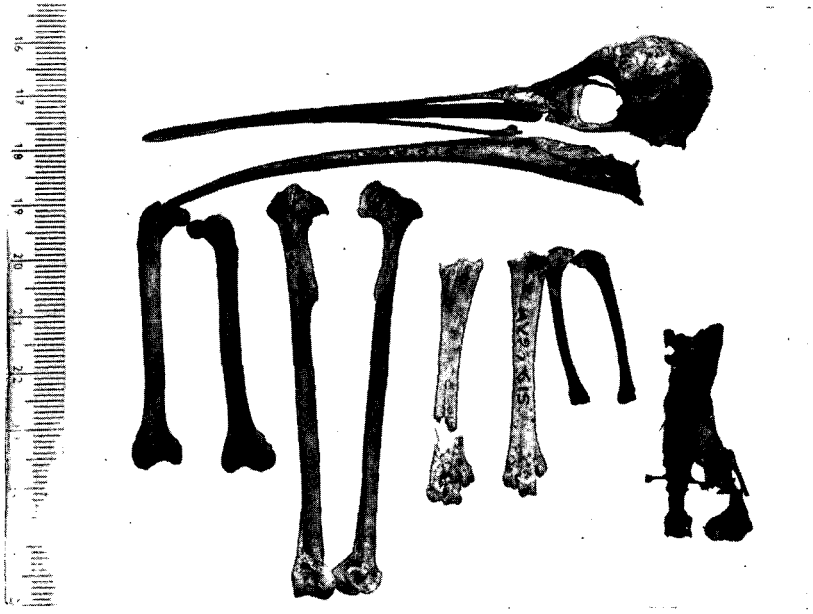

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Plate XXXVIII — Av. 20, 615: **Capellirallus Karamu** Falla. Cranium, pre-maxilla, mandible: Side view: R. and L. femora, tibio-tarsi, tarso-metatarsus, humeri and partial pelvis.

I have followed Dr. Oliver's excellent description of this bone. The anterior ends of the ilia slope steeply downwards from well behind the front of the first pelvic (sacral) vertebra, for about half their width, with the margins concave upwards. They then extend forwards, their transverse borders being thickened and fused on the inside to the transverse processes of the first sacral vertebra. Posterior to the short junction with the iliac crest, the upper margins of the ilia bend downwards for about a third of the width of the ilia, then gradually reach the crest again in front of the acetabulum. The iliac crest is arched. The post-acetabular portion of the pelvis is shorter than the pre-acetabular part. Its upper surface slopes backwards, gradually converging towards the lower border. The ischio-iliac plate slopes away from the upper surface at an angle of about 40 degrees from the vertical.

The pelves of *Capellirallus, Fulica, Nesophalaris* and *Gallinula* differ markedly from Rails — e.g. *Gallirallus,* in one aspect. In Rails, the anterior ischia completely cover the " spine " of the sacrum for about a third of the total length, then fall steeply, exposing the dorsal surface of the sacrum.

In *Capellirallus,* Coots and the other Gallinules, the dorsal surface and " spine " are exposed except for a very small portion at the anterior end.

As will be seen from the table, *Capellirallus lodgeni* is closer to *Gallinula* than *Fulica* in general proportions. Av. 5,803; 5,804; 6,197 are from Pyramid Valley Swamp, North Canterbury; Av. 21,763 B, C. D, H. from Harrison's Hole, Ruakopatuna; Av. 13,308 from Hukanui No. 3 cave, Hakes Bay; and Av. 17,510 from Hukanui 7A cave, Hawkes Bay. *Gallinula c. chloropus,* Av. 10,286 is a skeleton from Europe. *Gallinula chloropus cachinnans* Av. 21,194 and 21,195 are from Ontario, Canada (the pelvis of Av. 21,195 is broken). *Fulica atra atra,* Av. 5,229 is a European skeleton (from a dealer in Prague). *Fulica atra americana.* Av. 21,193 is an Ontario specimen, and *Fulica atra australis* is a skeleton from New South Wales.

STERNUM

Only one specimen, imperfect, is available of this bone of *Capellirallus hodgeni.* Av. 21,763I. It lacks most of the posterior lateral processes, but is otherwise complete. Length: Anterior to end of central lateral process 2.8. Width at anterior lateral processes: 1.9. Waist width 0.95. Keel length 1.7. Greatest depth of keel from body of sternum 1.0.

The anterior lateral processes project sharply forward, and on the inner surface slope steeply backwards, forming a 'V.' In this area the sternum closely resembles *Gallirallus* and *Nesolimnas.* There are 6 " notches " on each side to socket the sternal ribs, 4 of them prominent, the posterior and anterior ones shallow. *Gallinula* and *Fulica* also have six sternal ribs to each side.

The general shape is triangular as far as the posterior lateral processes, the central process being *sharply* so, and ending in a flattened point, 3 mm. wide. Only the bases of the posterior lateral processes remain, but they appear to have been moderately divergent, giving each side of the sternum a somewhat crescentic appearance.

	Length of body (minus pubes)	Anterior width	Posterior width	Width across supra-trochanteric processes	Depth of acetabulum	Width of acetabulum	Sacral length	Least width (middliac)
Capallirallus hodgeni								
Av. 5,803 Holotype	5.8	-	2.4±	-	0.3	0.35	4.8	1.0
Av. 6,197	5.5	-	2.5	2.6	0.3	0.4	4.9	1.0
Av. 5,804	5.4	1.45	2.6±	-	0.3	0.35	4.55	1.1
Av.21,763C	5.35	-	2.4 ±	2.5	0.4	0.3	4.55	1.0
Av.21,763B	-	-	-	2.55	0.35	0.35	5.1	1.15
Av.21,763H	-	1.4	-	-	-	-	-	-
Av.21,763D	-	-	-	-	0.35	0.3	4.2+	-
Av.18,308	-	-	-	2.6±	0.4	0.4	4.8+	-
Av.17,510	-	-	-	-	-	-	4.55	-
Gallinula C.chloropus								
Av 10,286	5.35	1.75	2.5	2.2	-	-	4.3	0.95
Gallinula chloropus cachinnans								
Av.21,194	5.15	1.7	2.25	2.3	0.3	0.3	4.4	1.1
Av 21,195	-	-	2.3±	2.35	0.325	0.325	-	1.1
Fulica atra atra								
Av 5,229	7.0	2.0	2.1	2.15	-	-	6.6	1.25
Fulica atra americana								
Av.21,193	6.95	1.8	1.7	2.1	0.4	0.4	6.3	1.0
Fulica atra australis								
Av 5,216	6.7	1.6	1.9	2.2	0.4	0.4	6.1	1.0

Viewed from the side, the sternum is " boat-hsaped," with the anterior and central processes sloping upwards. The keel is extremely shallow.

From the bottom of the V at the front, an acute triangular depression extends backwards for approximately 7 mm. to the anterior end of the keel.

In *Fulica, Gallinula,* in *Gallirallus,* which is flightless, *Nesophalaris,* flightless or nearly so, and *Hypotaenidia,* the keel is strong, fairly deep, and projects forwards.

In *Nesolimnas,* also presumably flightless, and *Porzana,* the keel is also deep in proportion to the size of the sternum, but further back under the body.

It is in this very shallow keel that *Capellirallus* differs most sharply from the other Gallinules, and from Rallines in general.

FEMUR

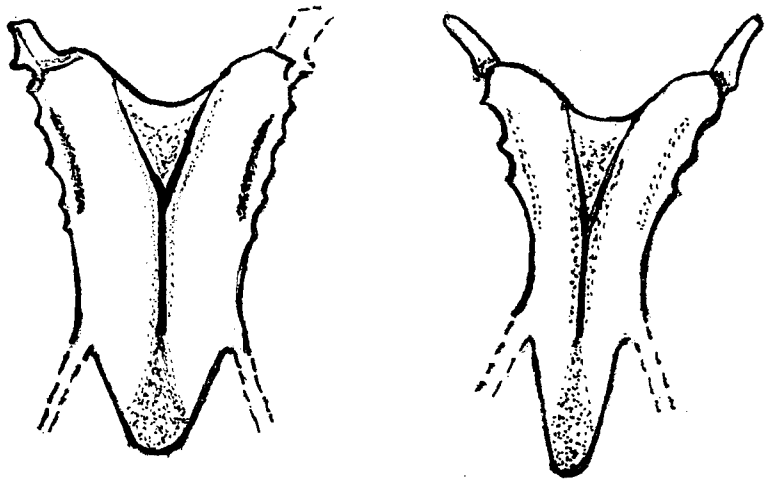
The trochanter major slopes in a pronounced curve, raised sharply above the body of the shaft. In this and other particulars it is closely similar to, in fact almost indistinguishable from *Gallinula. (Gallirallus hartreei* Scarlett with a femur of similar proportions, is distinguishable here, because the trochanter major lips inwards, in a much more pronounced fashion than in *Capellirallus* or *Gallinula. Fulica* has slightly more " lip " than the former two.) Articular head rounded with a flattened appearance below: Shaft with moderate torsion. Distal condyles expanded, with a deep groove between them:

Capellirallus hodgeni North Island	L.	D.	M.	D.
Maximum : Av.21,763N :	6,375	1.1	0.4	1.1
Minumum: Av.21,763P	5.3	1.075	0.4	1.0

29 measured

Capellirallus hodgeni South Island	L.	P.	M.	D.
Maximum : Av. 6,194	5.8	1.1	0.4	1.0
Minimum : Av. 2,056	5.375	1.05	0.4	1.0
Gallinula c.chloropus				
Av.10,286	5.4	-	0.4	0.95
Gallinula chloropus cachinnans				
Av.21,195	5.45	1.0	0.475	0.975
Av.21,194	5.4	1.0	0.475	1.0

Several femora of *c. hodgeni* had a mean of 0.5, and one a proximal width of 1.125 c.m. It was not possible to obtain the proximal width of Av. 10,286 because it is socketed in the pelvis in the mounted skeleton.



STERNA OF CAPELLIRALLUS

Capellirallus hodgeni (Scarlett). Av. 21,763I, ventral view, X2

Capellirallus Karamu (Falla). Composite; drawn from several fragments. Ventral view, X2

TIBIOTARSUS

The cnemial crest is large and oblong (in *Gallirallus hartreei* it is square), projecting forward and upward from the shaft. The ridge for attachment of the fibula is sharply defined, and roughened on the outer surface. The shaft is straight. The general resemblance to *Gallinula* is strong, except in the shape of the cnemial crest, where *Gallinula* is intermediate between *Capellirallus hodgeni* and *Gallirallus hartreei*.

Cnemial crest. In the North Island *Capellirallus hodgeni* the maximum width was 1.45. The maximum proximal width was 1.075, the greatest mean width 0.425, and the maximum distal measurement was 0.825.

The South Island bones had a maximum proximal width of 1.025, maximum cnemial crest 1.475, minimum mean of 3.5, and maximum distal width of 0.825.

Unfortunately, most of the cnemial crests were broken.

Capellirallus hodgeni : North Island :	L	P	Cnemial Crest	M	D
Maximum: Av.21,763W	8.05	0.95		0.4	0.75
Minimum: Av.21,7630	7.3	0.95	1.375	0.4	0.7

32 measured.

South Island :						
Maximum: Av.	5,985	7.8	1.1	1.5	0.425	0.8
Minimum: Av.	20,056	7.2	0.9	-	0.375	0.725
10 measured.						
Gallinula c. chloropus						
Av.	21,195	9.1	1.1	1.4	0.4	0.8
Av.	21,194	8.3	0.9	1.275	0.4	0.75
Gallinula chloropus cachinnans						
Av.	10,286	8.5	1.0	1.4	0.4	0.75

TARSO-METATARSUS

This is a short, squat bone, not easily distinguishable from that of *Gallirallus hartreei.* It is relatively shorter than the corresponding bone of most rails, *Gallinula* and *Fulica.*

Capellirallus hodgeni					
North Island :		L.	P.	M.	D.
Maximum : Av.	21,763Z	4.5	0.825	0.4	0.875
Minimum : Av.	21,763Y	4.1	0.8	0.4	0.75
20 measured.					
South Island :					
Maximum : Av.	5,803	4.25	0.7	0.4	0.75
Minimum : Av.	13,778	3.95	0.7+	0.4	0.75
Gallinula c. chloropus					
Av.	10,286	4 85	0.8	0.35	0.8
Gallinula chloropus cachinnans Av.	21,195	5.7	0.8	0.4	0.9
	21,194	5.3	0.75	0.4	0.825

The considerable variation in length of the tarso-metatarsus in both *Capellirallus* and *Gallinula* will be apparent.

The North Island *C. hodgeni* had a maximum proximal width of 0.85 (2 bones) maximum mean of 0.5 (1 bone) minimum mean of 0.375 (1 bone) and maximum distal width of 0.9 c.m. (3 bones).

In the South Island, the greatest proximal width was 0.75 (one bone) and the same bone measured 0.775 distally.

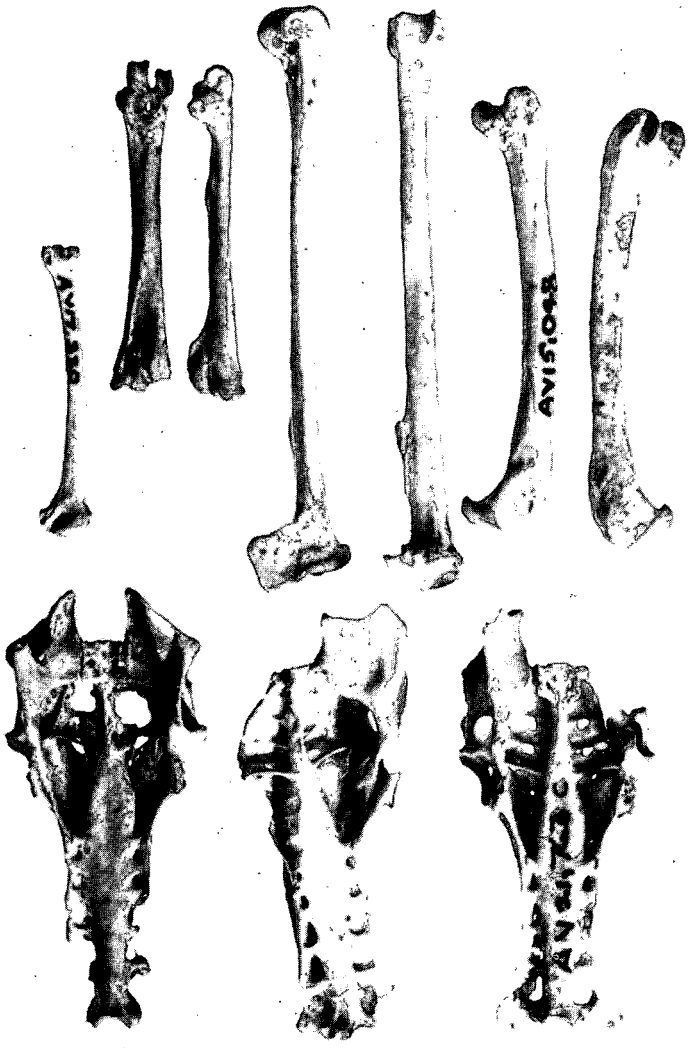


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Plate XXXIX — **Capellirallus hodgeni** (Scarlet). Pelves: North Island. Av. 21,763C: South Island Av. 5803 C (PARATYPE); Av. 6197 (HOLOTYPE). Ventral view.

Femora: North Island: Right: Av. 21,763Z. South Island: Left, Av. 15,048: Tibio-tarsi: North Island: Right: Av. 21,763O. South Island: Left, Av. 8281 (PARATYPE) Tarso-metatarsi: South Island: Right: Av. 5803 (PARATYPE); Left, Av. 8282 (PARATYPE). North Island: L. humerus Av. 17,330A. Posterior view, except Left tibio-tarsus and R. tarso-metatarsus, shown in side view.

HUMERUS

The humerus of *Capellirallus hodgeni* is typical in shape for the Gallinule - Ralline group. Proportionately it is much larger than that of *Capellirallus karamu.*

From the wings and sternum there is clear evidence that both *Capellirallus* were completely incapable of flight.

North Island.	L .	P.	M.	D.
Maximum : Av. 21,763d	4.325	0.825	0.3	0.65
Av. 21,763g	3.9	0.8	0.275	0.6
Minimum : Av. 21,763h	3.425	0.75	0.225	0.525
13 measured.				
South Island.				
Maximum : Av. 7,238	4.075	0.75	0.275	0.55
Minimum : Av. 17,330A	3.725	0.7	0.25	0.475

The North Island bones are from Harrison's Hole. Av. 21,763h seems abnormally small. The South Island Av. 7,238 is from Pyramid Valley, and Av. 17,330A from Euan Murchison's Rockshelter No. 1 Weka Pass.

ULNA

The North Island ulnae which I have atrributed to *Capellirallus hodgeni* are rather smaller than those from the South Island. They are all from Harrison's Hole. As will be seen, *Gallinula* exhibits a similar variation. The two South Island bones are from Marfell Beach. The Pyramid Valley ulna listed in my original paper was, by a printer's error, numbered Av. 6,647. It is Av. 6,646.

Capellirallus hodgeni

North Island	L.	P.	M.	D.
Maximum : Av. 22,245B	3.175	0.45	0.25	0.4
Minimum : Av. 22,245E	2,85	0.4	0.25	0.4
3 measured.				
South Island.				
Maximum : Av. 14,152	3.65+	0.625	0.4	0.5
Minimum : Av. 14,426	3.55	0.575	0.4	0.525
6 measured.				
Gallinula c. chloropus Av.10,286	4.3	0.7	0.35	0.55
Gallinula chloropus cachinnans :				
Maximum : Av. 24,195	4.7	0.65	0.325	0.55
Minimum : Av. 24,194	4.3	0.65	0.325	0.55

CARPO-METACARPUS

The bone is, in shape, typical of the Gallinule - Ralline group. Six were measured, all from Harrison's Hole.

Maximum length: Av. 21,763X, 2.175.

Minimum length: Av. 21,763I, 1.9.

CORACOID

Again, this bone is typical in shape of the Gallinule - Ralline group. The nine measured are all from Harrison's Hole. The greatest distal measurement was 1.0 c.m.

		L.	P.	M.	D.
Maximum :	Av. 22,245j	2.1	0.65	0.275	-
Minimum :	Av. 22,245k	1.8	0.55	0.215	0.8

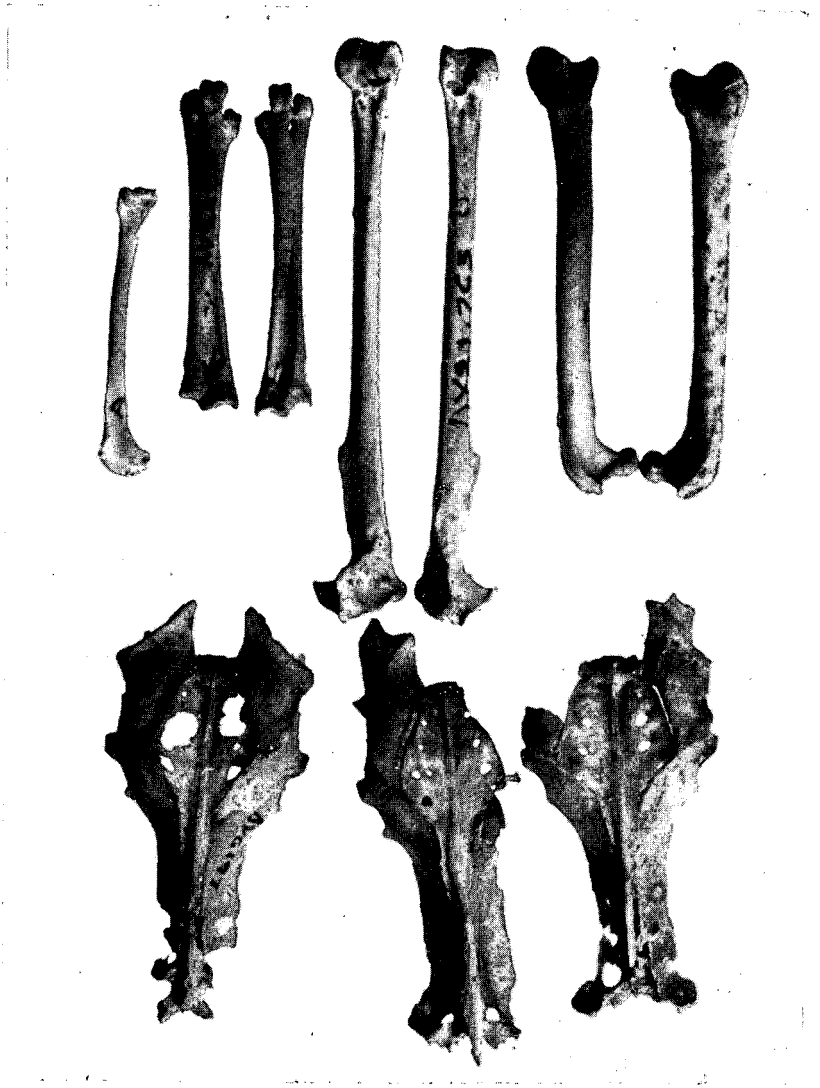
There are many hundreds of mixed vertebrae and phalanges from Harrison's Hole yet to be sorted. Some of these may eventually be found to belong to *Capellirallus hodgeni.*

Capellirallus karamu Falla 1954

In 1954, Dr. R. A. Falla published a description of the skeleton of this bird, from Karamu Cave, and gave particulars of additional bones from Conoor Cave, near Dannevirke, and a limestone cave at Waitanguru, near Waitomo. Dr. Falla stated " Pectoral girdle, sternum, and wing-bones are missing, so that its flight potential remains unknown and can only be guessed at. From the fact that the legs have the proportional stoutness found in known flightless rails *(Gallirallus, Cabalus)*, a similar condition might be inferred." The Holotype is Auckland Museum No. 901.1.

In recent years, Canterbury Museum has been fortunate in obtaining several part skeletons of this bird, some of which contain the bones which were absent from the Holoytpe. These show that Dr. Falla was correct in his inference.

Av. 20.615: Skyline Cave, Mahoenui, North Taranaki, was collected on 26/9/1965 by the Taranaki Caving Club, and presented to the Museum, per David Medway. This skeleton is the *piece de resistance* of the Canterbury Museum's collection of these birds. The cranium is in good order, although a little eroded on the posterior. The detached pre-maxilla is almost complete. The mandible is complete although the right ramus fell off while it was being photographed. The pelvis is eroded, particularly at the posterior, but is otherwise in reasonable preservation. Thesternum is broken: R. and L. femora, tibio-tarsi, fibulae and R. tarso-metatarsus are in good order. The left tarso-metatarsus is broken in the shaft near the distal end. 17 phalanges are present. R. and L. humeri, ulnae, radii, carpo-metacarpi, coracoide, scapulae, 23 vertebrae and two caudal vertebrae were found. There are also 14 ribs, 5 sternal ribs, 5 and several broken trachaeal rings. Of the cranial bones, R. and L. quadrates, quadrato-jugals, pterygoids, and the R. and L. hypo-branchials (the hyoid " rods " of the tongue) are present, but detached. This is an almost complete, and rather fragile skeleton.



[Frank McGregor

Plate XL — **Capellirallus hodgeni** (Scarlett). Pelves: North Island: Av. 21,763C: South Island Av. 5803 C (PARATYPE); Av. 6197 (HOLOTYPE). Dorsal view.

Femora: North Island: Right: Av. 21,763Z. South Island: Left, Av. 15,048: Tibio-tarsi: North Island: Right: Av. 21,763O. South Island: Left, Av. 8281 (PARATYPE) Tarso-metatarsi: South Island: Right: Av. 5803 (PARATYPE); Left, Av. 8282 (PARATYPE). North Island: Left humerus: Av. 17330A. Anterior views (Left tibio-tarsus twisted to show cnemial crest).

Av. 20,614, another part skeleton, was also collected in Skyline Cave on the same day as Av. 20,615. The cranium has the base detached and the pre-maxilla and mandible are broken. The pelvis lacks the pubes, but is otherwise in good order. The posterior portion of the sternum is missing. R. and L. femora, tibio-tarsi, proximal R. fibula, R. and L. tarso-metatarsi are present, as are 8 phalanges, R. humerus, R. ulna, 18 vertebrae, part R. coracoid, L. radius, 8 and fragments of several other ribs, and a broken L. quadrate.

Av. 20,649: Skyline Cave, 20/2/1966. Same collectors. Part pre-maxilla, pelvis (a little worn), R. femur, R. tarso-metatarsus, proximal and distal ends of L. tarso-metatarsus, proximal R. and L. fibulae, 16 phalanges, R. and L. humeri, L. ulna, proximal L. scapula, L. coracoid, 11 vertebrae, 8 ribs, R. and L. quadrates, R. palatine and R. quadrato-jugal.

Av. 21,759: Murder Canyon, Mahoenui, 10/1/1968: coll. Philip Allen; per David Medway: Cranium in good order; part pre-maxilla and mandible, R., proximal and distal ends of L. femora, R. and L. tibio-tarsi and tarso-metatarsi, 19 phalanges, worn pelvis, R. carpo-metacarpus, R. ulna, L. radius, 23 vertebrae, 3 trachaeal rings, proximal fragment of R. scapula, 2 ribs, R. and L. quadrates, L. coracoid, R. hypo-branchial.

Av. 20,648: Skylint Cave, Mahoenui, 20/2/1966. Taranaki Caving Club, per David Medwav. Part cranium, fragment of mandible, part pelvis, worn sternum, R. and L. femora, and tibio-tarsi, proximal and distal ends of R. tarso-metatarsus, 6 phalanges, R. humerous, L. scapula, 11 vertebrae, 5 ribs, L. quadrate.

Av. 22,650: Skyline Cave, Mahoenui. Same data as Av. 22,648. Part pre-maxilla, mandible, worn pelvis, part sternum, L. tibo-tarsus, L. fibula, L. tarso-metatarsus, 21 phalanges, R. and L. humeri, ulnae and radii, coracoids, L. scapula, 21 vertebrae, 6 ribs, 9 trachaeal rings, R. and L. quadrates, part R. and L. palatines.

Av. 19,994: Robber's Hole, Mahoenui. -/9/1964. Coll. Algy Watson. Cranium, fragments of mandible, part pelvis, part sternum. R. and L. femora, tibio-tarsi, tarso-metatarsi, 1 phalanx, R. and L. humeri, L. ulna, 7 vertebrae, 3 ribs, trachaeal ring, R. quadrate.

Av. 20,616: Robber's Hole, Mahoenui. 6/1/1966. Taranaki Caving Club, per David Medway. Cranium, in good order, fragments of mandible, L. femur, R., distal end and part shaft of L. tibio-tarsi, 1 vertebra.

Av. 21,465: Robber's Hole, Mahoenui. 19/7/1967. Coll. R. Banham, per David Medway. Part mandible, part pelvis, distal end and shaft of R. tibio-tarsus, 9 vertebrae, L. quadrate.

Av. 18,849: Papa Maru Cave, near Te Kuiti. -/12/1962. Coll. Dorothy I. Gardiner. 20 vertebrae; R. and L. humeri, coracoids, L. ulna, part R. carpo-metacarpus, 5 phalanges, 12 ribs, L. quadrate.

Av. 19,256: Limestone Cave, Mahoenui, -/11/1963, coll. John Kendrick; 2 fragments of mandible, pelvis, part sternum, R. and L. femora, tibio-tarsi, tarso-metatarsi, 2 phalanges, proximal R. fibula, R. and L. humeri.

Av. 20,646: Skyline Cave, Mahoenui. 20/2/1966. Taranaki Caving Club per David Medway. Part cranium, part mandible, pelvis, 13 vertebrae, part R. and L. humeri, R. ulna, R. quadrate.

Av. 20,647: Skyline Cave, Mahoenui. Same data as Av. 21,646. Part cranium, part pre-maxilla, part mandible, R. and L. femora, proximal end and part shaft R., distal end and part shaft L. tibio-tarsi, proximal R. and L. fibulae, broken R., proximal L. tarso-metatarsi, 11 phalanges, 19 vertebrae, R. and L. humeri, 8 ribs, R. quadrate.

Av. 20,726: Robber's Hole, Mahoenui. 12/6/1966. Taranaki Caving Club, per David Medway. L. femur, proximal end and shaft of L. tibio-tarsus, R., distal end and shaft of L., tarso-metatarsi, 3 phalanges, R. and L. humeri, L. scapula, 4 vertebrae.

That exhausts the list of part skeletons of *Capellirallus karamu* in the Museum collection. The others are either add bones, or mixed lots. Av. 20,878 is a R. femur from Tom Bowling Bay, Northland. -/1/1966, coll. Jack Grant-Mackie; Av. 20,649A a R. tibio-tarsus from Skyline Cave, 20/2/1966. Av. 21,764A a mixture of at least 7 individuals from Harrison's Hole, in 1966. Coll. John Marston and Ian Peyton: Pelvis, fragments of 2 other pelves, 5 R., 6 L. femora, 4 part R., 3 and 4 part L. tibio-tarsi, 7 R., 2 L. tarso-metatarsi, 3 R., 2 and part 1 L. humeri, 1 R., 3 L. ulnae, 1 R., 1 L. coracoids. Av. 22,246: Harrison's Hole, 1968. Same collectors. Part cranium; L., distal L. femora. R. and L. tarso-metatarsi, 1 R., 2 L. humeri, L. coracoid — a minimum of 2 individuals.

CRANIUM etc.	Length with pre-maxilla	Length of pre-maxilla	Length, posterior to beginning of pre-maxilla	Height	Length of mandible	Minimum width at temporal fossae	Width at post-orbitals	Width at squamosals	Width at basi-occipetals	Width of foramen magnum	Depth of foramen magnum
Av.20,615	9.7	7.1	3.2	1.85	8.4	0.615	1.95	1.7	1.525	0.55	0.45
Av.20,614	-	-	3.15	-	-	0.525	2.0	1.85	1.4	0.55	-
Av.19,994	-	-	3.15	2.0	-	0.55	-	-	1.[illegible]	0.55	0.4
Av.21,753	-	-	3.2	1.85	-	0.525	1.8	1.725	1.4	0.6	0.4
Av.20,616	-	-	3.15	1.025	-	0.575	1.975	1.7	1.55	0.525	0.5
Holotype	8.8	5.6	-	-	-	0.57	-	-	-	-	-

It will be noted that no clavicle of this bird has yet been found, and it seems probable that the bird did not possess one.

All the measurements of the Holotype quoted in this paper are taken from those published by Dr. Falla.

I measured the pre-maxilla on the chord of the culmen.

	PELVIS							
	Length of body (Minus pubes)	Anterior width	Posterior width	Width across supra-trochanteric processes	Width of acetabulum	Depth of acetabulum	Sacral length	Least width Mid-iliac
Av.21,764A	4.5	1.5	2.1	1.9	0.4	0.35	4.1	0.9
Av.20,614	4.075	1.4 ± *	1.75	1.8	0.3	0.3	3.4	0.9
Av.20,649	4.0	1.1 ± *	4.8	1.8	0.25	0.275	3.5	0.8
Av.20,615	3.7	1.2 ± *	-	1.7 ± *	0.3	0.325	3.6	0.7 ± *
Av.19,256	-	-	1.9	1.8	0.35	0.325	-	0.8
Av.21,759	-	-	-	1.4 ± *	0.25	0.35	-	-
Av.20,648	-	1.2 ± *	-	-	0.275	0.3	3.5	0.8
Av.21,465	-	-	-	1.7 ± *	0.3	0.35	-	-
Av.20,646	-	-	-	1.6 ± *	0.3	0.325	3.95	0.8
Holotype	3.8	-	-	2.0	-	-	-	0.8

* Measured on the sound half, and doubled. By this means, a measurement accurate to within half a millimetre can be obtained.

STERNUM

All the sterna in the Canterbury Museum collection are broken, but some — e.g. Av. 20,648, Av. 20,650, are sufficiently complete to show that they are miniatures of that described for *Capellirallus hodgeni*, except that the point of the central processes is a little narrower in proportion, and they have a more slender anterior process. I have drawn the sternum as a composite of several fragments.

	FEMUR			
	L.	P.	M.	D.
Maximum: Av.19,256	4.75	0.925	0.4	0.9
Minimum :Av. 20,649	4.3	0.8	0.325	0.85
Holotype	4.43	0.76	0.38	0.8

6 measured (besides Holotype). The least distal width was 0.8 in the Canterbury Museum specimens.

TIBIO-TARSUS

		L.	P.	Chemial Crest	M.	D.
Maximum :	Av.19,256	7.3	0.925	1.1	0.4	0.7
	Av.20,615	7.1	0.95	1.2	0.425	0.7
Minimum:	Av.20,649	6.425	-	-	0.45	-
Holotype		6.5+	1.03	-	0.35	0.6

6 measured, besides Holotype

TARSO- METATARSUS

		L.	P:	M.	D.
Maximum :	Av.20,615	4.225	0.7	0.4	0.715
Minimum :	Av.20,649	3.7	-	0.4	0.775
Holotype		3.9	0.67	0.38	0.7

HUMERUS

		L.	P.	M.	D.
Maximum :	Av.20,615	2.8	0.6	0.2	0.35
Minimum :	Av.19,994	2.6	0.5	0.2	0.35

ULNA

		Length
Maximum :	Av. 20,615	1.725
Minimum :	Av. 19,914	1.575

Five measured :

CARPO- METACARPUS

		Length
Maximum :	Av. 20,615	1.125
Minimum :	Av. 21,759	1.0

CORACOID

		Length
Maximum :	Av. 21,615	1.6
Minimum :	Av. 20,649	1.4

Four measured.

These bones, for which I have given the length measurements only, are typical of the Gallinule - Ralline group in form, but are very small.

The overlap between the minimum length of some of the leg-bones of *hodgeni* and maximum length of *karamu* will have been noted, but the wing bones of *karamu* are very much smaller than those of *hodgeni.*

If *karamu* were found in both islands, there might be a case for considering these two forms as con-specific, the difference being sexual.

As *karamu* is confined to the North Island, it seems better for the present to maintain them as separate species, with the leg measurements sometimes converging. Complete skeletons of *hodgeni* are greatly to be desired.

The size range *within* each species is consistent with that found in Gallinules and Rails.

Gallinula, Fulica, Gallirallus, Nesophalaris, Nesolimnas, Hypotaenidia, for example, exhibit similar variations.

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A NOTE ON MEASUREMENTS OF THE HARRIER *Circus approximans*

By A. L. K. CARROLL

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In the course of a study of the food of Harriers (Carroll 1968), 134 adult and fully-grown first-year (juvenile) birds, collected between October 1963 and July 1967, were weighed, sexed and measured.

Excluding three birds in which damage prevented sex being ascertained, there were 61 males (40 adults, 21 juveniles) and 70 females (30 adults, 40 juveniles).

In following seasonal changes in weight, the small number of specimens necessitated condensation of results into one composite year. As there were no statistically-significant differences between the weights of adults and juveniles, both sets of data have been combined. Table II shows mean monthly weights for each sex. Exclusion of two incomplete specimens reduced the total number to 129. Despite gaps in August and September and the small size of many samples, mean weights followed a similar pattern for both sexes — a mid-winter maximum and mid-summer minimum. Monthly mean weights invariably were greater for females than males and the female mean for the year exceeded the male by 195.2 gms. The table implies an unbalanced sex ratio, with an excess of females, particularly in summer (December to February inclusive). However, as the data are for two age-groups and for more than one year, the results should be interpreted cautiously until more become available.

TABLE I — Measurements of Harriers

	MEAN		RANGE		STANDARD DEVIATION		NUMBER OF SPECIMENS	
Sex	Female	Male	Female	Male	Female	Male	Female	Male
Culmen	36 mm.	33mm.	39-32mm.	35-30mm.	1.4	1.2	66	58
Mid-toe and Claw	59mm.	54mm.	66-50mm.	59-48mm.	3.1	2.5	70	57
Tarsus	93mm.	90mm.	102-84mm.	99-77mm	3.5	3.5	71	60
Tail	239mm.	231mm.	258-224mm.	251-211mm.	8.7	8.3	70	61
Wing	408mm.	402mm.	455-390mm.	429-381mm.	11.7	10.5	66	58
Weight	800gm.	605gm.	999-615gm.	770-470gm.	10.3	6.5	69	60

Table I shows mean, range and standard deviation of external measurements and weights for males and females (both age classes combined). Variations in sample sizes occurred because of damage to several specimens. Mean measurements of females were in every

instance greater than those of males, although in wing length the difference was small. The difference between the sexes for each set of measurements is statistically significant (at the 5% level, or better).

TABLE II — Mean Monthly Weights of Harriers

	Female		Male	
	No.	Wgt.(gms.)	Wgt.(gms.)	No.
January	19	744.0	544.2	13
February	9	760.0	600.2	4
March	2	780.0	590.0	2
April	3	870.0	628.7	6
May	9	871.8	644.6	12
June	4	940.8	648.3	6
July	5	912.6	653.8	6
August	-	-	662.0	1
September	-	-	-	-
October	3	761.7	615.0	2
November	3	788.3	586.6	3
December	12	776.6	532.0	5
Year	69	800.0	604.8	60

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NORTHERLY MOVEMENT OF SILVEREYES IN WINTER ON THE WEST COAST SOUTH ISLAND

By PETER GRANT

Mr. G. E. Logie, Ngahere, told me that some years ago he had seen a strong northerly movement of Silvereyes *Zosterops lateralis* along the coastal strip between Hokitika and Greymouth. This was probably in the late 1940's.

On 2/6/70, a clear day with a strong easterly wind, I saw a large flock of small birds flying northwards along the coastal strip about half a mile south of the Greymouth aerodrome. The weather deteriorated and it was not until Saturday, 6th June, that I again saw birds on the move. A strong easterly caused some birds to hug the lee of the terrace behind my home and in about 40 minutes of watching I counted some 520 birds in intermittent flocks numbering from 10 to 50. However, birds were also going beyond the terrace top and I could not count these. Others were passing along the shore strip. A count from half a mile south from 11.05 - 11.35 a.m. gave a rate of flow of about 2,000 per hour, and this did not include the flocks right by the beach. Mr. H. C. Hooper said they were passing over a position by the coast in quite large flocks which tapered off by 11.35 a.m. I had neither seen nor counted these birds in my tally. The flow was light and intermittent until about 4 p.m. when larger flocks began moving past steadily. This continued until nearly sunset.

On Sunday, 7th June, further counts were made and a flow rate of up to 2,000 per hour was counted. However, this would be conservative in the viewing conditions. Quite frequently birds could be heard but not seen. Higher flying birds up sun were very difficult to pick. With little wind the birds were noticeably higher.

On 8th June a much lower rate of flow was occurring, possibly as low as 200 per hour behind my home and some flocks were still moving on 22nd June, the last date on which I recorded them.

The movement of the flocks was interesting. It appeared that the birds settled in the bush and scrub-covered gullies for the night, then in the morning started calling. A longish call is made for a start and is repeated steadily. Some birds gather together on this call; then short flights are made through the covering foliage until more and more birds join together. The calling becomes more rapid and excited until it becomes a fast twitter, when the flock will suddenly burst forth. In some cases a small flight will be made and the flock will return to the bush or scrub but in most cases the flock burst forth and made some altitude before flying directly north. Flocks holding to the lee of the terrace to keep out of the wind tended to keep low, but some making a line nearer the coast flew to a height of several hundred feet. On the bush-covered slopes, and also on the lupin- and scrub-covered flats on the coastal strip the flocks seemed often to leapfrog along. Birds frequently dropped into the cover then came out again. They were difficult to observe in these conditions.

However, over clear ground they held well together in flocks of up to 100 birds. At one point Black-backed Gulls *Larus dominicanus* caused relatively large numbers to drop into a clump of larger trees from which they would burst in smaller numbers from time to time. Thet gulls circled the trees. The main flow of birds did not seem to get under way until the sun was shining well on the hills — about 8 a.m. — and went on until it tapered off about 11.30 a.m. An intermittent flow lasted until about 4 p.m. then a strong flow built up until nearly sunset.

It is difficult to estimate how many birds passed in a day but at a flow rate of at least 2,000 per hour and, possibly markedly more than this for at least 3 hours in the morning (6,000), with a reduced flow of say 200 per hour during the day until 4 p.m. (1,000), and a further 1,000 before sunset (1,000), 8,000 would, in my opinion, be a conservative estimate. This rate was observed for two days and could have gone on longer. A light flow still continued nearly three weeks after the first movement was noticed.. In view of the incomplete daily information and period of the flow it is not possible to estimate how many birds may have passed.

The cause of the movement was possibly the onset of snow on the hills. This would tend to force the birds to the lower levels and the configuration of the land would tend to bring them out to the sea coast. However, a television item at the time showed a discussion between two persons in the Ashburton area, and the same excited Silvereye calls could be heard in the background. The movement may have been up the eastern side of the Southern Alps as well. It would be interesting to know just how far and what proportion of the flocks moved. At least some Silvereyes remained in the Greymouth area over the winter.

LEG AND FOOT COLOUR OF THE MARSH CRAKE *Porzana pusilla*

By K. E. WESTERSKOV
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In most of the ornithological literature examined, including textbooks, field guides and general texts, the Marsh Crake *Porzana pusilla* is credited with having brownish, greyish, reddish grey or flesh-coloured legs. The leg colour of this species has even been claimed to be diagnostic, aiding in identification and separation from related species.

The "Handbook of British Birds under 'Field-characters and General Habits' of this species says: "legs brownish or greyish flesh-colour, not green." And further (*op. cit.*, p. 192): "legs and feet dirty greyish-flesh, joints inclined to be yellowish (Naumann)". Undoubtedly Naumann must bear the main responsibility for this statement, so often repeated in the literature; he not only says (1905: 175) about the colour of the feet of *pusilla* (translation): "*It is never green*" but elaborates further that this has been the case in both live and dead birds examined. To this he adds a footnote to the effect that leg colour in earlier publications has been given as green, but that this is incorrect. After this firm rejection of former descriptions that the legs are green — in one of the classics of European ornithological literature — no wonder that in particular European texts from then on accepted Naumann's "dirty greyish-flesh to pale reddish-grey."

In Peterson, Mountfort and Hollom's *Field Guide* (1954: 106): "dull flesh legs" are given as diagnostic for the Marsh Crake while "Legs *green* (Baillon's are dull flesh coloured)" is given under Little Crake *P. parva* as characteristic of this very similar species; this difference is also shown in the colour plate (Plate 17). Frieling (1936: 141) also gives "Fleischfarbene Fusse" as diagnostic of *P. pusilla* in contrast to greenish feet in *P. parva*. Other examples are Fitter (1952: 100): "legs greyish" in Marsh Crake while "legs green" in Little Crake; Fisher (1955: 39): "legs brownish flesh" in *P. pusilla* and "legs green" in *P. parva*. A great many other works have been consulted with much the same result.

On 25 May 1969 I had the opportunity to examine a fresh specimen of the New Zealand subspecies *P. pusilla affinis* (Gray) a few hours after it was accidentally killed by a dog during duck shooting. This specimen was found at Hooper's inlet, Otago Peninsula at Dunedin. While a duck was shot down, the retrieving dog brought its surprised master, Mr. T. E. Fitzgerald, Lower Portobello, the just dead, slightly damaged crake. Within a couple of hours I obtained the specimen which is now in the Otago Museum, Dunedin.

The Marsh Crake — or Baillon's Crake as it is called in Britain — is quite a common bird in New Zealand in swamps and lagoons, although it is rarely seen. Given the opportunity of examining a fresh specimen, I made a thorough investigation of plumage, bill, legs and feet measurements. Comparing the results with standard

texts — and as it happened I first consulted the *Handbook* — I was immediately aware of a discrepancy which was confirmed by subsequent further examination of the literature and specimens in the Otago Museum.

The specimen examined, an adult female, had the following measurements: wing 82 mm., free culmen 17 mm., tail 42 mm., tarsus 26 mm. Iris bright red; bill bright pale greenish, darker horny brown on culmen. *Legs and toes yellowish olive-green* with the long nails pale horn brown. First primary and outer (longest) alula feather with a narrow white line on edge of outer (narrow) web. Weight 38.4 g.

The quite brightly coloured yellowish olive-green legs and feet attracted my attention and as a quick look at the literature showed a description at variance with the facts, I asked the two artists of the Otago Medical School's art department, Mr. J. B. Irwin and Miss Y. R. Joel, to paint water colours of the legs, which they readily did. This permanent record is available. I should add that the green colour of bill, legs and feet over the couple of days while examination and painting took place gradually lost intensity and gave way to a darker coloration; in the dry specimen legs and feet were horny brown with no green at all.

In the Otago Museum's collections I examined 12 specimens of Marsh Crake. Ten study specimens all had horny brownish legs, so typical of museum specimens of a great many birds. There is hardly any doubt that the repeated literature description of horny brown legs in this species had its origin in examination of dried study skins without label entries on true fresh leg colour.

Two display specimens (a female from Waiho River, 13 June 1901, and a female from Te Anau, 3 October 1966) had legs and feet painted a life-like olive greenish. There are no details available on original leg colour in the Waiho River specimen, but the museum taxidermist, Mr. P. J. O'Brien, advises me that the Te Anau specimen from 1966 had bill and legs painted according to details given on the original field label; in this specimen the legs and feet were correctly painted a distinct yellowish olive-green.

Further to these two specimens, while the other skins examined had dried horny brown legs and feet, labels of four of the ten specimens contained information to the effect that in fresh condition the legs had been green; this information was given on labels of these specimens:

(1) a male from Middlemarch, 6 May 1961; label about feet: " Yellowish olive ";

(2) a male from Papakaio, 12 April 1962; label note on feet: " Greenish horn ";

(3) a female, Dunedin, 16 June 1961; label note on feet: " Greenish brown ";

(4) a female, Pyramid, Southland, 6 June 1961; label on legs and feet: " Greenish brown."

The New Zealand subspecies *P. pusilla affinis* is endemic and was first described by Gray. I have checked the original description by Gray (1845: 14) who, however, does not mention the colour of legs and feet of what he called *Ortygometra affinis*.

Hutton (1871: 33) says this species has: " legs, feet and bill brownish green." Buller (1888: 103) says that the Marsh Crake has " bill, tarsi and toes pale brown, tinged with olive." Oliver (1930: 344) about the Marsh Crake states: " Bill and feet olive brown," while in his second edition (1955: 359) he says: " Bill and feet brownish green." Falla, Sibson and Turbott (1966:106) say almost identically: "Bill, legs and feet brownish-green."

Of the five New Zealand specimens of which leg colour was known, two were males and three females, and they were from the months of April, May and June. But before the widely-accepted brown leg colour in the Marsh Crake can be decisively refuted, it is necessary to establish beyond doubt that leg colour is not affected by: (1) subspecific, (2) sex, (3) age or (4) seasonal differences and thus showing variation.

Peters (1934: 183) divides *P. pusilla* into five subspecies: (1) *P. p. intermedia* (Hermann), breeding in central and southern Europe, east to Persia, and wintering north and south of the Sahara; (2) *P. p. pusilla* (Pallas), breeding in central and eastern Asia, wintering in India, Ceylon, Malaya and the Philippines; (3) *P. p. obscura* Neumann, eastern and southern Africa, Madagascar; (4) *P. p. palustris* Gould, Australia with Tasmania; (5) *P. p. affinis* (J. E. Gray), New Zealand.

Thanks to co-operation of colleagues and as a result of my own examination of New Zealand and Australian specimens (the latter during visits in August 1969 to museums in Sydney and Adelaide), observations have been obtained on leg and foot colour of all five subspecies. It should be noted that Benson (1964: 2-5) after comparing 45 European with 108 African and Madagascan specimens concluded " in my opinion *obscura* is not worrth recognizing as distinct from *intermedia.*"

Specimens of *intermedia, pusilla* and *obscura* were kindly examined for me in the British Museum (Natural History) by Mr. P. Colston.

P. p. intermedia. An adult male, collected at Karyatan, 4 March 1905, by D. Carruthers and J. H. Miller had on field label this information about legs and feet: " Olive green." British Museum.

P. p. pusilla. A total of 30 specimens in the British Museum had records on field label as to colour of legs and feet. The 17 adult specimens were all recorded to have had greenish legs although descriptions varied: (1) Males, Deesa in September (" greenish olive "), central Annam in April (" dull green "), central Siam in January (" olive green "), Calcutta in February (" pale dingy olive green "), Tirhot in March (" dusky green "), Tenasserim in May (" dull green "), central Annam in April (" gris verdat "), Borneo no date (" dark green-brown "), Katmandu in April (" greenish brown "): (2) Females, Nepal in February (" greenish grey "), Kohat in March (" green "), China in April (" greenish grey "), central Annam in April (" vert sombre "), Sandee in March (" light green "): (3) Unsexed, Shanghai in May (" pale green "), Khandesh in December (" green "), and Nepal Valley, no date (" buffy green "). The remaining 13 immature specimens had field labels with varying information about leg colour,

7 with green, greenish or olive green colour; 4 with olive brown but olive in itself means a " dull yellowish green colour " so this colour is yellowish green-brown; the remaining 2 immature specimens, collected by the same persons, at Quetta in October, were both listed as having " brownish pink " legs and feet. As these are the only two cases of all records available indicating aberrant colour, is it possible that misinterpretation of colour, late writing of field labels or some other factor accounted for the description? From the Russian literature Professor L. A. Portenko has kindly extracted the following pertinent information. Menzbier (1895: 470) correctly attributed the Marsh Crake with having " legs olive." Kozlova (1935: 17) said it has: " legs olive brownish." Buturlin (1935: 240) recorded: " Legs yellowish-green or dull green, or olive-brownish." Spangenberg (1951: 676) says *pusilla* has: " Legs olive-brown." I also note that Smythies (1960: 179) for this species records: " feet greenish-horn, claws horn," and that Rand and Gilliard (1967: 111) found: " feet greenish grey to pale green."

P. p. obscura. In the British Museum (Natural History) are found 12 specimens with field labels with information about leg and foot colour; all were recorded to have olive green or greenish legs and feet: 6 adult males, Angola in August (" pale dull olive green "), Uganda in July (" pale greenish brown "), South-west Africa in January (" olive green "), Angola in August (" brownish olive-green," and 2 specimens: " dull olive green "); 3 adult females, Ethiopia in July (" flesh olive "), Angola in August (" pale dull olive-green "), South-west Africa in January (" olive green "); 2 immature males, Angola in August (" brownish olive-green "), and Angola in August (" pale dull olive green "); and an immature female from Angola in August (" brownish olive-green "). Several of the African ornithological handbooks correctly describe the leg colour of this form, e.g. Clancey (1964: 131): " legs and toes olive-green."

P. p. palustris. In August 1969 I examined the 30 specimens of the Australian subspecies of the Marsh Crake in the Australian Museum, Sydney, but unfortunately no labels or card entries contained information about fresh leg colour. I also examined the 12 specimens in the South Australian Museum in Adelaide; 6 of these specimens carried field labels with pertinent information: 3 adult males, all from Paradise, South Australia, in August (" feet and toes green " and " feet and bill, green ") and November (" legs green "); and 3 adult females, one from Robe, South Australia, in November, breeding (" Feet: olive green "), and 2 from Paradise in August (" legs and bill green " and ' legs and toes olive green "). While in Australia, Mr. W. Roy Wheeler of Melbourne kindly advised me that Mr. F. T. H. Smith of Kew, Melbourne, might have colour photographs of this species. Mr. Smith has lent to me three of his transparencies and in two of these. leg and foot colours are quite distinct. One is of an adult bird, held in the hand and photographed at Kororoit Creek, Altona, on 22 January 1956, and shows clearly both legs of an olive green colour; the other transparency taken at Fisherman's Bend, Melbourne, on 15 November 1955, shows a crake standing up over its eggs with one leg — olive green — clearly showing. Mr. Smith has further advised me that on 25 October 1969 he saw this crake in a swamp near Patterson River at Carrum: " I eventually had it feeding, mostly in the open, in front of me for at least 10

[F. T. H. Smith

Plate XLI — Marsh Crake **Porzana pusilla** on nest at Fisherman's Bend, Melbourne, Australia, 15/11/55.

minutes. It was a very handsomely hued adult. I saw the legs extremely well with a 10 x 50 binocular from about 30 feet. Again I would have put down the leg colour as greyish-green, or perhaps more descriptive: light olive. The leg colour is lighter than the bill colour." Tracing the history of this species in the Australian ornithological literature, Gould (1848: 80) stated: " bill and feet olive-brown." Mathews (1910-11: 214), quoted above statement directly from Gould, but interestingly enough and in contrast to the text, the legs on the colour plate (57) are hand-painted a near-correct pale olive-green (in the copy examined by me, at the Australian Museum Library, Sydney). North (1913-14: 213) on the other hand correctly stated: " legs olive; feet slightly tinted with brown." Sharland (1958: 12) also correctly said: " bill, legs, feet greenish ").

P. p. affinis. The information about New Zealand specimens examined was presented above in the introductory section, showing that males and females from April, May and June have yellowish olive-green legs and feet.

Concluding the review of leg and foot colour in the five subscpecies of the Marsh Crake, it will be seen that the colour of these soft parts is olive greenish and alike in all subspecies — as would be expected although it hardly can be taken for granted.

Sex differences. To rule out a possible sexual dimorphism in leg and foot colour, the available records were reviewed. Of the total sample, collating information on all five subspecies (excluding the two possibly mislabelled specimens referred to above under *pusilla*), 27 were males and 20 were females, and all had greenish olive legs.

Age differences. The possibility also existed that leg colour may change with age, as in many species of gull, oystercatchers and stilts. The sample of 13 immature specimens of *P. p. pusilla* in the British Museum referred to above provides evidence that there is no or only slight if any change in leg coloration from immature to adult. The only two specimens with labels indicating leg colour at variance with all the rest — and already mentioned twice above — are two immature males, collected at Quetta on 8 October 1881 by the same person (Sir O. St. John); for both he wrote for leg and foot colour " brownish pink." It is impossible now to trace or verify the origin of this statement and as it differs so radically — in fact coincides with some of the repeated incorrect descriptions in past and present texts — I consider it justified to disregard these label entries. The remaining 11 immature specimens consist of 4 males and 7 females: Males, Turkistan in October (" pale olive green "), Deesa in September (" pale olive brown "), S. Andamans in December (" olive green "), Khandesh in October (" olive green "); Females, Calcutta in February (" dull pale yellowish olive "), Deesa in September (" pale olive brown "), Bangkok in February (" plumbeous with greenish tinge on tarsus and tibia "), Deesa in September (two specimens both labelled: " pale olive brown "), Malegaum Nasik in October (" greenish flesh "), and Khandesh in October (" greenish "). There is also in the British Museum collection an immature female of *P. p. obscura* from Angola in August with field label describing legs and feet as " brownish olive green." The above information may be interpreted as immature birds possibly not having the intensity of olive green of the adults but maybe rather more brownish olive green or paler, less intense olive green. There is, however, no doubt that leg and foot coloration in immature Marsh Crakes is in the greenish (olive or brownish green) area and not brownish or flesh-coloured.

Seasonal variation. A final possibility is some variation in relation to season as is the case in for example species of egrets, stilts and oystercatchers. Of the total 51 specimens included in this study and having olive green legs, seasonal distribution is as follows: January 3, February 4, March 3, April 7, May 4, June 2, July 2, August 12. September 5, October 4, November 3, December 2. If, however, the six-months' differences between seasons in the northern and southern hemispheres are considered, the results are different but adequate samples from all seasons are still represented: spring 14, summer 3, autumn 12, winter 22. No seasonal variation in leg and foot colour is detectable.

Summarizing the information presented above, the Marsh Crake *Porzana pusilla* has olive green legs and feet which fact is in contrast to a prevailing error in the ornithological literature; the green leg colour applies to all five subspecies, to both sexes, to all seasons, and to immature birds as well as adults although some immatures have brownish olive-green or paler olive green legs than the adults.

ACKNOWLEDGEMENTS

I am indebted to Mr. T. E. Fitzgerald for letting me examine the freshly killed crake; to Mr. P. Colston of the British Museum (Natural History) for his invaluable help in examining the collection of Marsh Crake in the museum for me; to Professor L. A. Portenko, Leningrad, for his help with the Russian literature; to Professor J. M. Winterbottom of the University of Cape Town for help with the African literature; to Mr. F. T. H. Smith, Kew, Melbourne, for the loan of colour transparencies and for field notes; and to the undermentioned museums where I have personally examined the collections of this bird: Australian Museum in Sydney (Mr. H. J. de S. Disney), the South Australian Museum in Adelaide (Mr. H. T. Condon) and the Otago Museum (Dr. R. R. Forster and Mr. J. T. Derby).

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REVIEW

The Life of the Kookaburra and Other Kingfishers, by William Eastman. Angus and Robertson Ltd., Sydney, 1970. $3.75.

Books on families, orders or genera should be more frequent; for not only do they give broad comparisons of a number of species but they give the author scope to discuss evolutionary and ecological processes.

The present book, though interesting enough, does not fulfil its potentialities. It is rather repetitious — which to some extent is understandable when one is dealing with a family — but a considerable amount of the repetition could have been avoided and replaced with other material, so preventing an already not very large book becoming too small. However, having read it you will certainly know a considerable amount about the kingfishers of Australia. There are a number of pleasant colour plates to show you what they look like and many black and white photographs which will give you a good idea of their habitats, though many are a little disappointing or poorly reproduced.

What should have been the opening chapter — a discussion on classification, general ecology and behaviour — comes after two chapters on the kookaburras; but perhaps the author — or the publishers — thought that to begin with two chapters on general interest would be more appealing to the public than something rather more technical.

I was surprised to learn that some Sacred Kingfishers migrate to New Zealand. This statement is made without any supporting evidence and certainly gives the impression that it is a factual rather than a purely hypothetical statement.

There is a distribution map for each species (a good idea which should be used more often by others) but the map for the Little Kingfisher seems at variance with the text.

Since only the Sacred Kingfisher and the Laughing Kookaburra occur in New Zealand, the book will probably have a limited appeal to ornithologists in this country; but it is worth reading and an example of the sort of thing that could be done — and done more comprehensively — for some families of New Zealand birds.

— G.R.W.

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1. Atkinson, I. A. E., 1964: Feeding stations and food of the North Island Saddleback in August. Notornis 11, 2, 93-97.

2. Buller, W. L., 1888: A History of the Birds of New Zealand (2nd ed.) 2 vols., the author, London.

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