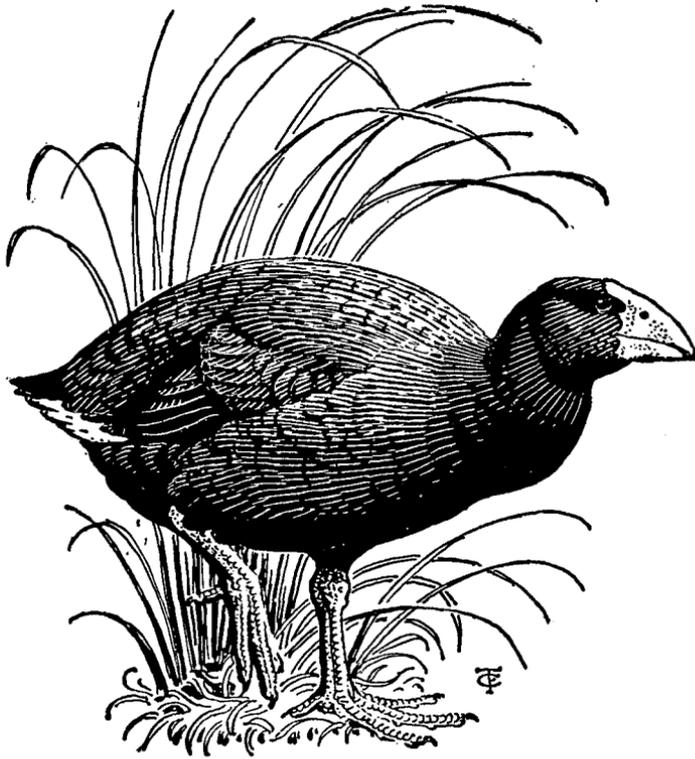


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KERMADEC ISLANDS EXPEDITION REPORTS

BIO-ACOUSTICS ON THE EXPEDITION

By WILLIAM V. WARD

Because it would afford an opportunity to tape previously-unrecorded birds of a little-explored portion of the South Pacific for Cornell's Laboratory of Ornithology, where I am a member and field collaborator, I applied for membership in the Expedition.

Many people have expressed interest in the sound-recording techniques used by the Laboratory. If I detail these, it will not only describe the bio-acoustics research done by the Expedition, but may also stimulate others to attempt similar work with their own tape recorders, thus encouraging a broader use of this valuable ornithological tool.

EQUIPMENT USED ON EXPEDITION

Tape Recorder

Magnemite 610-E, battery-operated, with spring motor to drive tape transport. Input is handled by two transistors, amplified by three valves. The machine operates at the high speed of 15 inches per second, and has a frequency response of from 50 to 15,000 cycles per second, flutter plus or minus 0.1%. It meets primary National Association of Radio & Television Broadcast Standards in U.S.A.

It has provision for monitoring headphones so that the birds may be heard as they are recorded. Tapes may be played back through headphones to ascertain quality. Tapes were edited in the field, unused portions erased and used over again.

Preamplifier

A *home-made* two-transistor, grounded-emitter, battery-operated preamplifier was used between the microphone and tape recorder. This gave clean amplification of 12 decibels. Frequency response was 45 to 120,000 cycles per second.

Microphones

Altec 688A omnidirectional professional dynamic with frequency range from 35 to 20,000 cycles. Response is flat from 45 to 18,000 cycles. It operates at high or low impedance, but generally was used at low impedance. This was the primary microphone.

Electro-Voice 647A omnidirectional dynamic lavalier-type with frequency range from 70 to 10,000 cycles per second. A small, secondary microphone to use down burrows, and as a standby in event of damage to the Altec.

Hydrophone. U.S. Navy Type Q-41. Frequency response from 500 to 4,500 cycles per second. Does not have flat response; has strong peak at 3,500 cps. This was taken in hopes of recording the voices of whales which frequent these seas. However, the length of time to launch a boat after sighting whales, and the usual unavailability of people to do this, precluded obtaining such tapes.

Parabola

A *parabolic reflector*, of spun aluminium 40" in diameter, with a focal length of 10", was used to focus sound upon the microphones. It provided magnification of 1200 times at the focal centre. Its 40"

diameter enabled it to amplify a sound wave as long as 80" (middle A) without distortion. Smaller parabolas would provide less magnification, and would distort low notes higher up the scale than middle A. Most bird voices are high enough so that a parabola does not distort them.

Miscellaneous

Two-conductor, shielded microphone cables with Amphenol connectors and telephone plugs. A 5-transistor amplifier and speaker to play back songs to birds and to people. A bulk tape eraser for 230-volt mains at the Station. A few tools and a multimeter for fault finding and repairs.

Upon landing on Raoul, we were all immediately impressed with the vociferous Tui and Song Thrushes; and as soon as some of us got ashore on Meyer Island, we realized that the strange and loud calls of seabirds, which most of us had never seen before, would be a valuable addition to the sound recordings we hoped to bring back to New Zealand.

What we did not appreciate at first was that the tremendous seas crashing against Raoul's and Meyer's rocky coasts created a background which our ears overlooked, but which the microphone dutifully recorded. On tape this sounded like strong wind through pine trees. While it did not spoil a tape for scientific use, it lowered the overall quality to a point below what is usually acceptable for gramophone discs. It was avoided only when the microphone was placed extremely close to the bird without using the parabola. This enabled the bird's voice to be recorded so many times louder than the surf that the surf was not heard. We could do this with many of the louder-voiced seabirds; but not on the Tui, Thrush, Blackbird, Yellowhammer and Starling on Raoul which would not permit an approach of much less than 25 feet and where, therefore, the parabola had to be used. Although the sound of the surf was heard from sea level to the peaks of the islands, we found a little rock-enclosed amphitheatre on Meyer, and the upper portion of Nightbell Gully on Raoul where trees and a forested ridge partially screened the surf. These places were used for recording studios whenever possible.

The following descriptions of the recordings list the birds taped, illustrate the mechanics used, and indicate the quality obtained:

Wedge-tailed Shearwater

7.20 p.m., 25/11/66. The lavalier microphone was placed four feet down a nesting burrow on Meyer Island. A loud and clear tape of the bird's moanings and caterwaulings was obtained. Calls of Sooty Terns and Black-winged Petrels flying overhead are heard in the background despite the microphone being underground. A very spectacular tape.

8.30 p.m., 27/11/66. Made with the parabola in the "amphitheatre" on Meyer. An excellent reproduction of the Wedge-tail chorus from birds within and outside their burrows. The rocky cliffs contributed an added dimension. While there is a great deal of individual variation in voice among these birds, no important distinction was noted between the Kermadec birds and those of the lighter-coloured race which I had previously recorded in Hawaii.

Kermadec Petrel

3.05 p.m., 25/11/66. About 2 p.m. these birds started flying up and down the coast of Meyer, yelling their warcry, "Yuk, keroouu, yuk, yuk." We have heard as many as four "yuks" at the end; and these, interestingly, stopped completely about the end of November. Recording was made in the "amphitheatre" using the parabola. It is an excellent reproduction.

6.40 p.m., 1/12/66. The microphone was laid in the grass beside a Kermadec Petrel nest on Meyer. The bird was calling while the other of the pair circled for a landing which was made while the recorded was running. "Conversations" from both were taped. This is an excellent tape, and shows differences from the flight calls.

3.55 p.m., 6/12/66. Made on Meyer with the parabola in the "amphitheatre" while the bird flew overhead. It illustrates the calls made, after the end of November, which have no terminal "yuks." Some ornithologists have written that these petrels omit terminal "yuks" in certain localities; but as these tapes indicate, it may be a matter of timing instead of, or in addition to, location.

Black-winged Petrel

8.00 p.m., 28/11/66. Made on Meyer with the parabola in the "amphitheatre" of birds in flight giving their "Peet, peet" flight calls, and also a puppy-like whine. These sounds are very typical of a Meyer evening, and the tape is a good rendition.

7.30 to 8.15 p.m., 2/12/66. The microphone was laid beside a hillside burrow on Meyer, but the bird was outside. Soft bubbling noises, static buzzes, puppy whines, and bouncing notes on a descending scale were obtained with good quality. These nest calls are much different from the flight calls and would hardly be recognised as coming from the same bird.

Red-tailed Tropic Bird

1.35 to 1.55 p.m., 4/12/66. Soon after noon each day, these birds started circling the chasm between North and South Meyer in whose cliff faces they were preparing to nest. When their paths crossed, a great honking of rasping voices, remindful of Canada Geese, was heard. The parabola was used to record these from birds well over 100 feet overhead. The tape was made in the "amphitheatre," but even so the surf noise could not be kept out.

Spotless Crake

7.20 p.m., 27/11/66. When editing tapes of Shearwaters and Black-wings made with the parabola in the Meyer "amphitheatre," these Crake recordings were noticed, although they were not recognized as such at the time. It is a clucking "Crake, crake," rather faint, with some surf background.

5.30 a.m., 2/12/66. This recording was obtained on Meyer by following a Crake as it picked its way along the edge of the Ngaio and Pohutukawa cover above our camp. It was again making a faint, clucking, "Crake, crake." We did not hear the high-pitched squeak or crooning noise mentioned in the Field Guide. This is a valuable tape because of its rareness; and while there is some surf background in it, it still is of good quality considering the faintness of the bird's call.

Sooty Tern

A series of 12 recordings was made, two of which were taped on Meyer, and the rest at the Denham Bay colony on Raoul. The latter varied from warning calls as people approached the colony, to communicative calls and warnings to each other recorded from a hide when the birds did not know humans were about. Communicative calls between parent and chick were obtained and strong peeps from an unhatched chick which had just chipped a hole in its shell.

Separate communicative calls were recorded as the birds flew overhead: (a) en route to their "nightclub," (b) over their "nightclub" area, and (c) flying overhead before a severe storm. We taped the uproar of a "panic flight" to the sea as the birds took off on the approach of people. The birds did not often use the "wideawake" call, although we made tapes of it; they more frequently used a rolling "Wide-ah, wide-ah, err-wide-ah." It was hoped that this broad coverage of communications, together with behaviour data concurrently recorded, might add a further dimension to John Peart's breeding biology of the colony. No parabola was used in making these tapes. The birds are loud-voiced, and the microphone could usually be placed near them. Tapes are of high quality.

White-capped Noddy

This tape was made up from several recordings made on 30/11/66 and 1/12/66 on Meyer. I carried the sound gear up and down the steep slopes under Pohutukawas where the birds nest and obtained the guttural squeaks and "quorks" they make on being disturbed. The tape also includes some exactly-similar calls made in the "amphitheatre" when the Noddies were unaware of human presence. The parabola was used and the tape includes the surf noise.

Grey Ternlet

2.45 p.m., 27/11/66. This recording was made on Meyer, using the parabola. These are the gentle, "Qu-orr, qu-orr" calls which ternlets give when a person is climbing about the coastline rocks which they frequent. This species is very tame and confiding. When an observer repeats their call, they take notice and come closer, often performing the "footlook" display by pointing the bill to the feet. This tape, made on the shoreline, has considerable surf background.

3.40 p.m., 28/11/66. This was obtained on Meyer in the "amphitheatre" using the parabola. The birds have an interesting display pattern, remindful of that of the Laysan Albatross, and this tape covers the entire sequence. Three birds gathered on a rock. First there was a short, "Qu-orr"; then "Chirr-rrup, chirr-rrup." Next, a bird pointed its bill in the air with a faint whistle; another momentarily put its bill beneath its wing. Then there were some loud "Eee-yah" calls. One bird then flew off, the two remaining sidled together and made quiet noises. We saw this display many times, with little variation. The tape has some surf background, but not as much as the previous, and provides new knowledge of the behaviour of a little-known bird.

Kermadec Parakeet

2.30 p.m., 30/11/66. Made on Meyer Island with the parabola, the tape reveals a rapid chattering and a 3-syllable "pretty dick." An immature bird's calls are also on the tape and can be identified by their higher frequency. There is considerable surf noise on this tape.

Kingfisher

9.35 a.m., 24/12/66. Nightbell Gully, Raoul. The birds would not allow an approach of much less than 50 feet, and the parabola was used. Many birds were taped and the tapes discarded because of surf noise. This tape was of a bird on the other side of a tree and it was unable to see me. Nightbell Gully gave some protection from the surf, but it still can be heard. Nevertheless, this tape gives the, "Kee, kee, kee" identification-of-the-territory call very well. By playing it back other Kingfishers could be brought close in.

Song Thrush

5.45 a.m., 17/11/66. Low Flat, Raoul Island. Six or eight singing birds were stalked before one was found with sufficient courage to continue singing while being taped. It is similar to the New Zealand bird, and is a very good tape but has a surf background.

Blackbird

4.35 a.m., 17/11/66. Low Flat, Raoul Island. This tape illustrates the "chip, chip, chip" warning call and a communicative "zeet" similar to that of the Yellowhammer. Though a few Blackbirds occasionally sang, their songs were not recorded. This tape has surf background.

Yellowhammer

4.20 a.m., 17/11/66. Low Flat, Raoul Island. This species was always difficult to approach, and the surf background remains. The tape illustrates a "Zeet, zeet, zeet" (similar to the Blackbird's) and a buzz.

6.20 a.m., 15/1/67. Bell's Flat, Raoul Island. There were always one or two yellowhammers around Bell's Flat, but they were difficult to approach. Although the singing season was over, this 3-syllable call was heard. The tape has surf background.

Tui

3.45 a.m., 17/11/66. Low Flat, Raoul Island. The morning chorus began at 2.45 a.m. in the Pohutukawas over our tents. I frequently slept away from camp under some trees where there were more birds and had the recording equipment beside my sleeping bag with the parabola lying flat on the ground pointing straight up in the air. The tui started with a few whistles, then some coughs and gurgles and wheezes, next going into some liquid notes. They were quite different from the New Zealand Tui I have recorded at Abel Tasman National Park, and the Bay of Islands, the latter being more like the Kermadec variety. I did not record or hear the deep "bong" bell notes; and the birds did not appear as raucous as the N.Z. Tui, except in their warning or distress calls.

When I returned from Meyer on 21/12/66 the dawn chorus had stopped, although the odd bird might be heard singing here and there. The 1964 Expedition commented on how silent the Tuis were, as had Iredale (Emu 1910, 10: 2-16). Iredale even thought the Kermadec Tui might be a separate race because of its silence. Apparently it has periods of relative silence, and these vary in timing from year to year. This is a good tape, but has surf background.

7.15 a.m., 22/12/66. Low Flat, Raoul Island. R. Veitch picked up a young Tui just able to flutter. I taped its high-pitched distress call. This brought its parents who started their loud, but lower-pitched distress calls, attracting still more Tuis who added their din. All of this was taped. As more Tui were wanted for banding and measurements, this tape was played back through a small loudspeaker near our mist nets. More Tui arrived in quite a frenzy; but they soon sensed something peculiar and quietened down. We did not get many birds in the nets this way. This tape is loud and clear with little surf background.

Starling

4.30 a.m., 17/11/66. Low Flat, Raoul. Some harsh squawk warnings were taped with the parabola while the bird was perched in a tree. The tape has a surf background.

Kermadec Cicada

8.55 a.m., 17/1/67. Low Flat, Raoul Island. After a heavy storm, this insect landed on a sunny spot on one of the tents to sing. The microphone was held 6 to 8 inches away. The cicada gave forth low-frequency buzzes heard only when the ear is close to it: otherwise only the high frequencies were heard. The microphone emphasized the low frequencies. In order to hear the high ones properly, the tape must be played through a high-fidelity playback, with bass control set at a minimum and the treble increased.

Dr. Charles Fleming reviewed this tape, and commented that this Cicada, *Melampsalta exulis*, has the same type of song as its mainland relative, *M. cutora* (which he recorded), except that *cutora* has long "snoring" notes alternating with more rapid passages. But what intrigued Dr. Fleming was the occurrence of faint clicks fairly regularly spaced in *exulis*' song. He asked if the insect flapped its wings while singing. It did not. A loud, clear tape; no surf.

Black Australian Cricket

6.30 p.m., 25/1/67. Bell's Flat, Raoul. This cricket is common, and sings the same song as in New Zealand. The tape has surf background, and was made with a parabola.

The above tapes are the ones which were kept; many others of course were made in order to be able to obtain this edited selection. Copies made at 15 inches per second were given to Cornell's Laboratory of Ornithology, and copies made at 7½ inches per second to the Dominion Museum and the Society. Some quality is lost in tapes copied at the slower speed, but in New Zealand the New Zealand Broadcasting Corporation is about the only place where 15-inch playback is available. Tapes I make in New Zealand as Cornell's Field

Collaborator theoretically belong to Cornell; however, Cornell granted permission to the Society to use the tapes commercially or in any way it might so desire.

Some of the tapes, especially the land songbirds, were copied through a 1.5 kilocycle high-pass filter. This reduced some of the background noise by cutting out all sounds below 1,500 cycles per second. This filter cannot be used on low-voiced birds like Shearwaters as it cuts out part of their sound, making their voices sound thin and reedy.

Interested persons wishing to try similar work with their own tape recorders might start by hanging a microphone out of a window to tape such loud-voiced songbirds as the Song Thrush, Tui and Blackbird. Playing the tapes back to the birds often will make them think there is a rival about, and they will come closer to the microphone. The closer the bird is, the louder its song will be in proportion to generally-always-present background noise. A mirror placed beside the playback loudspeaker sometimes causes the bird to fight his image with the possibility of aggression calls being obtained.

A longer cable on the microphone helps in getting closer to the bird. However, this causes electronic complications, as high impedance microphones, which come with most tape recorders, will not work properly with more than 12 or 15 feet of cable. A more expensive, low-impedance, dynamic microphone then will have to be obtained, plus a line transformer to step up the microphone's low impedance to the high impedance input of the recorder. These longer microphone cables must be two-wire, shielded cables or else hum and other noises will be picked up. Instead of a line transformer, I now use a home-made 2-transistor preamplifier which not only steps up the low-impedance microphone to high but also adds 12 decibels of clean amplification.

A parabolic reflector is the next piece of equipment an amateur recordist should acquire. As these are expensive and hard to find, perhaps the easiest way to get one is to make a fibre-glass copy of a parabola belonging to someone else. I understand that New Zealand Broadcasting Corporation makes parabolas at their Dunedin works. A 40-inch parabola gives very little distortion to bird songs, but smaller sizes do distort and do not have as much amplification. The trouble with a parabola is that it picks up all sounds behind the bird, such as wind in the trees and sounds like the surf in the Kermadecs. It is almost impossible to use one in town because it picks up traffic hum; but in the country on a windless day it works wonderfully well.

People making such tapes should not overlook the communicative calls of birds as well as their songs. Playing these back to the birds often causes reactions which enable us to learn more about their behaviour. Many birds vocalize differently in different parts of New Zealand. Playing one dialect back to another and noting

the reaction can sometimes be an important clue in helping to determine different races. The same applies to insects. Practically no underwater recording of cetaceans or fishes has yet been done in New Zealand.

Many New Zealand tape recorders run at $1\frac{1}{8}$ inches per second. People with these machines should not be discouraged about using them. Interesting tapes have been made with such instruments. They do have more hum and background noise in the machine itself than higher-speed models. After a person has worked with a slow-speed machine for a while, and has learned to like the study of animal sounds, he usually will want to acquire a more suitable recorder. The reason Cornell and the British Broadcasting Corporation prefer 15-inch tapes is because birds have such great volume at high frequencies that high speed is necessary to prevent distortion. One should remember that the presently-popular 4-track machines are bound to be noisier than dual track or full track ones.

Even an excellent tape, made at full track at 15 inches per second, is of little value to the scientist unless it is properly documented with date, time, weather, temperature, and a description of the behaviour of the animal while vocalizing. The scientist is also interested in a description of all the electronic equipment used in making the recording: parabola, microphone, preamplifier, line transformer, tape recorder, and type of tape used. This is so that he can ascertain the weakest link in the chain insofar as frequency response is concerned. For instance, if the sound fades out above 8,000 cycles per second, is it because of the bird or the microphone, or some part of the equipment? Figure 1 illustrates the type of documentation used by Cornell; this can be used by New Zealand recordists, or they can make adaptations from it.

Summarising, we brought back the major sounds of Kermadec wildlife, with high quality for the louder-voiced seabirds; but surf interfered with obtaining first-class tapes of land songbirds. Tapes proved that the Kermadec Tui sings differently from the New Zealand Tui. When we compared our notations with those of earlier observers we found that like Tui elsewhere in New Zealand it has periods of relative silence which may vary somewhat from year to year. In 1966 we found that the terminal "yuk" on the Kermadec Petrel's flight call ceased on Meyer Island about the end of November. This may be a seasonal variation instead of (or in addition to) a geographical variation.

We hope that the Expedition's bio-acoustical efforts may encourage other New Zealand ornithologists to contribute toward further development of this useful ornithological tool, especially in advancing our knowledge of bird behaviour and racial distinction, as well as increasing the library of songs and calls.

LIBRARY OF NATURAL SOUNDS

CORNELL UNIVERSITY

LABORATORY OF ORNITHOLOGY

FIELD AND EDITING NOTES

No. and Family PROCELLARIIDAE		Name Sci. <u>Puffinus pacificus</u> Com. Wedge-tailed shearwater		Ref. Falla Sibson Turbott	Cut No. 3	Date and Time November 25, 1966 7:20 p m	Recorded By: Expedition and Personnel Ornithological Society of N.Z. 1966-67 Kermadecs Expedition Ward, Crockett, Soper				
Locality North Meyer Islet Kermadec Islands		Lat. 29° 15' S Long 177° 52' W Alt. 20'	Habitat Widely distributed tropical Pacific & Indian Oceans. In NZ region, breeds only in Kermadecs.		Level of Recording +4db	Length of Cut 3 minutes 3 seconds	Quality A	Weather Clear, light breeze. Temp.: Air 77°F Water 68°F			
Recorder Original Magnemite 610-E 7050 ½ track	Tape Speed MMM 200 15"/Sec.	Microphone Electro- Voice 647-A	Parabola? Dia./ft. No	Dist. from Animal 10 inches	Identification By: Ward How? visual and aural		If Rerecording, Type of Original Catalog No. of Orig.		Specimen Collected Yes By D. V. Merton Dominion Where Located Museum		
Number of Animals Male or Female Immature Indeterminate			Physical Description of Sound; How Distinguished A moaning sound with rising inflection, often followed by a low growl. Could distinguish no important differences between this cut and cuts 1 & 2 made in Hawaii.								
1			Apparent Biological Purpose of Sound Not known.				What Behavior Accompanied Vocalization Sat in burrow.		What Did Animal Do When Not Vocalizing? Same.		
Response to Imitation, Playback, Decoy etc.; Equipment Used No playback.							2-transistor, grounded-emitter, battery-operated pre-amplifier.			Edited By: Ward	
Description of Exact Place From Which Sound Was Made; Special Set-up etc. A small, cavalier-type microphone was placed down the bird's burrow which was located on the western side of Meyer Islet. The cable was led about 30 feet to the main tent at the Meyer Islet camp on Boat Harbour. The bird was vocalizing loudly, and there was no problem in recording. At one point the bird fluttered its wings; at another, the voices of sooty terns and black-winged petrels could be heard as they flew overhead, despite the microphone being 2 or 3 feet underground. Meyer Islet is about 40 acres in size compared to neighboring (1 mile) Raoul's 7,200 acres. Raoul now has only a few remnant breeding populations of Procellariidae because of rats and feral cats, which do not exist on Meyer.								On Species Reel			
								Cataloged			
								Region KERMADEC ISLANDS			
Background Sounds (Underline Species To Be Cross-Indexed) How Are Other Species Distinguished?				Sooty terns and black-winged petrels.							

WARD

KERMADECS ISLANDS EXPEDITION REPORTS

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MORTALITY AND SURVIVAL OF BIRDS DURING AN UNSEASONABLE SNOW-STORM IN SOUTH CANTERBURY, NOVEMBER 1967

By P. C. BULL and D. G. DAWSON
*Animal Ecology Division, Department of Scientific and
Industrial Research, Lower Hutt*

ABSTRACT

A severe and unseasonable snow-storm in South Canterbury in November 1967 killed many Skylarks, Yellowhammers, Magpies, Thrushes and Blackbirds. A total of 810 dead birds, nearly all introduced passerines, were picked up in homestead gardens and around farm buildings during a three-day visit to the area two weeks after the storm began; no dead birds were found in native forest. Several runholders reported severe mortality to wild ducklings and goslings, though adult ducks and geese survived well. Most passerines resumed breeding soon after the snow melted, but Yellow-hammers and Fantails remained extremely rare.

INTRODUCTION

In 1967, inland Canterbury and North Otago suffered the heaviest late-spring snowfall ever recorded. It began on 16 November and, although the worst of the storm was over in two days, scattered snow and rain with occasional heavy falls continued, particularly in the high country, for the rest of the month. Up to five feet of snow fell in some areas, but many others had less and most cleared during the following week. A general account of meteorological conditions and of losses to property, stock and wildlife was provided by Hughes (1969).

On 29 November, nearly two weeks after the storm began, the authors accompanied Dr. Norman Adams (then Director of the Tussock Grasslands and Mountain Lands Institute) on a three-day inspection of the district, and collected information on the effects of the snow on birdlife. Lists of dead and living birds were made at each stop (Table I) and D.G.D. recorded all the birds seen en route from his side of the Land-Rover.

During the months following the storm, officers of the Tussock Grasslands and Mountain Lands Institute and of the Department of Agriculture interviewed many high country runholders between the Rakaia River in the north and Lindis Pass in the south and sought information on the effects of the storm on stock, property, communications and birdlife; the results were recorded on questionnaires. A total of 63 reports was obtained and all but three included some reference to birds.

RESULTS

A. The November-December Inspection

(i) *Dead Birds*

A total of 810 birds (13 species) were found dead (Table I), the most common being Skylarks (494), Yellow-hammers (131), Magpies (50), Song Thrushes (34) and Blackbirds (31).

Most corpses were in or about farm buildings (especially hay barns) and beneath shelter trees; none was found in native forest nor in open paddocks, though these were searched. The few birds, mainly Magpies, found along roadsides may have been killed by passing cars.

TABLE I — BIRDS FOUND DEAD

Species of Bird		Harrier	Skylark	Song Thrush	Blackbird	Hedge Sparrow	Greenfinch	Goldfinch	Redpoll	Chaffinch	Yellow Hammer	House Sparrow	Starling	Magpie	Total Birds
On Roadside	Chch.-Geraldine	-	-	1	3	-	-	-	-	-	1	5	1	6	17
	Geraldine-Fairlie	-	-	-	-	-	-	-	-	-	-	2	-	2	17
	Fairlie-Burke's Pass	1	-	-	-	-	-	-	-	-	-	-	-	2	23
	Burke's Pass-Pukaki	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Edwards Creek	-	11	-	-	-	-	-	-	-	1	1	-	-	13
Near Farm Buildings, Plantations etc.	Holbrook	-	318	5	-	2	-	4	1	6	17	-	1	3	357
	Sawdon	-	81	-	-	-	-	-	2	2	23	-	-	1	109
	Maryburn	-	54	-	1	-	1	1	-	-	6	-	-	-	63
	Dusky	-	3	-	1	-	1	-	-	-	5	-	-	-	10
	Hermitage	-	-	-	-	-	-	-	1	1	5	-	-	-	2
	Birch Hill	-	-	1	1	-	-	-	-	-	-	-	-	-	2
	Glentanner	-	2	26	22	11	-	-	1	12	53	2	2	2	133
	Pukaki	-	19	-	-	-	-	-	-	-	-	-	-	-	19
	Katherine Fields	-	6	-	-	-	3	-	-	-	1	-	1	-	11
	Blair Athol	-	-	-	-	-	2	1	-	-	16	-	-	-	19
	Nr. Burke's Pass	-	-	1	3	-	1	-	-	-	8	1	-	-	14
	(Two localities)														
	Totals		1	494	34	31	13	8	6	5	21	131	11	5	50

The birds had been dead for ten days or more (probably since 17 November) and every hay barn contained partly eaten birds; some had been dragged between hay bales or under stacks, probably by rats or mustelids. Obviously, the birds we found were only a fraction of those that died. At some huts near Pukaki we found 19 dead Skylarks whereas 40 were counted there by local residents immediately after the storm.

The species found dead varied markedly in different places (Table I). Most of the Skylarks, for instance, were at Holbrook, Sawdon and Maryburn where the homestead gardens and outbuildings provided the only shelter in miles of open tussock. Glentanner, on the other hand, had more trees and thickets of sweet briar; only two Skylarks were found here though there were comparatively large numbers of Blackbirds, Thrushes, Hedge Sparrows and Yellow-hammers. Nearly all the dead Yellow-hammers were in hay barns whereas Blackbirds, Thrushes and Hedge Sparrows were usually under trees and hedges. This suggests that the birds sought not only shelter but also suitable food. At Blair Athol, dead Yellow-hammers were found in a trough of oats inside an implement shed and these birds, at least, seemingly had plenty of food; the grain showed no obvious signs of chemical residues, nor was a complete lack of water likely.

Most of the dead Magpies, and many of the Blackbirds and Thrushes, listed in Table I, were young of the year. In addition, we saw some dead nestlings (Starlings, Thrushes and Blackbirds), and broken Starlings' eggs. Several empty nests of various kinds were seen on the ground or in bushes flattened by snow, but we found no occupied nests that would have contained eggs before the storm. Except for one Harrier, probably hit by a car, all the dead birds were introduced passerines.

(ii) *Surviving Birds*

Thirty-three species of birds were recorded alive in the Mackenzie Country (Table II). Despite heavy mortality, Skylarks remained quite common in all suitable places, whereas Yellow-hammers were virtually absent and, judging by the number dead, they must have been fairly numerous before the storm. The only Fantail seen was near Burke's Pass, but we were told several were present at Glentanner before the storm.

Redpolls, House Sparrows and Starlings seemed to have survived the storm quite well. Several Starlings' nests with fresh eggs were found in farm buildings and small flocks of Starlings were quite common in open country between Pukaki and the Hermitage. House Sparrows were carrying nesting material in several places; at Pukaki many of these birds had survived the storm by sheltering in a large Ministry of Works garage. Several patches of native bush between Pukaki and the Hermitage contained moderate numbers of Warblers, Tits, Riflemen, White-eyes, Hedge Sparrows, Chaffinches, Blackbirds and Song Thrushes, most of them singing vigorously. Starlings with fresh eggs, House Sparrows rebuilding, and the chorus of song from other species suggested that most of the surviving passerines had resumed breeding or were about to do so.

Gulls, terns, waders and waterfowl were seen in several places. Many probably lost their nests when melting snow raised river levels,

TABLE II — BIRDS SEEN ALIVE

SPECIES OF BIRD	Fairlie-Burke's Pass			Burke's Pass-Pukaki			Pukaki-Glentanner			Glentanner Hermitage		
	A*	B*	C*	A*	B*	C*	A*	B*	C*	A*	B*	C*
Shag (<u>Phalacrocorax</u> sp., <u>P. carbo</u> ?)	-	-	-	2	-	-	-	-	-	-	-	-
White-faced Heron (<u>Notophox novaehollandiae</u>)	-	-	-	-	-	-	1	1	1	-	-	-
Canada Goose (<u>Branta canadensis</u>)	-	-	-	-	-	-	-	-	-	-	-	-
Paradise Duck (<u>Tadorna variegata</u>)	-	-	-	(1)	-	-	2	4	2	4	7	2
Grey Duck (<u>Anas superciliosa</u>)	-	-	-	-	-	-	-	-	-	-	-	-
Mallard (<u>Anas platyrhynchos</u>)	-	-	-	-	-	-	-	2	2	-	-	-
Black Teal (<u>Anthya novaeseelandiae</u>)	-	-	-	-	-	-	(4)	6	1	-	-	-
Harrier (<u>Circus approximans</u>)	(1)	-	-	4	4	3	-	1	1	1	2	1
Pied Oystercatcher (<u>Haematopus ostralegus</u>)	-	-	2	-	-	2	-	-	-	-	-	-
Banded Dotterel (<u>Charadrius bicinctus</u>)	-	-	-	-	-	-	-	-	-	-	-	-
Wrybill (<u>Anarhynchus frontalis</u>)	-	-	-	-	-	-	-	-	-	-	-	-
Pied Stilt (<u>Himantopus himantopus</u>)	-	-	-	2	4	1	-	-	-	-	-	-
Black-backed Gull (<u>Larus dominicanus</u>)	-	-	1	-	-	-	-	-	-	-	-	-
Black-billed Gull (<u>Larus bulleri</u>)	(20)	-	1	-	-	2	2	2	1	4	1	1
Black-fronted Tern (<u>Chlidonias hybrida</u>)	-	-	-	2	-	-	-	-	-	-	-	-
Rifleman (<u>Acanthisitta chloris</u>)	-	-	-	-	-	-	-	6	-	-	-	-
Skylark (<u>Alauda arvensis</u>)	-	-	-	7	5	7	-	9	6	1	-	-
Kentail (<u>Rhipidura fuliginosa</u>)	-	-	1	-	-	-	-	-	-	-	-	-
Yellow-breasted Tit (<u>Petroica macrocephala</u>)	-	-	1	-	-	-	-	-	-	-	-	-
Grey Warbler (<u>Gerygone igata</u>)	-	-	1	-	-	-	-	-	-	-	-	-
Song Thrush (<u>Turdus ericetorum</u>)	3	2	2	-	-	-	-	6	16	3	3	3
Blackbird (<u>Turdus merula</u>)	-	-	2	-	-	-	-	-	-	-	-	-
Hedge Sparrow (<u>Prunella modularis</u>)	-	-	-	-	-	-	-	-	-	-	-	-
Pipit (<u>Anthus novaeseelandiae</u>)	-	-	-	-	-	-	-	-	-	-	-	-
White-eye (<u>Zosterops lateralis</u>)	-	-	1	1	1	1	1	1	1	1	1	1
Greenfinch (<u>Chloris chloris</u>)	-	-	-	-	-	-	-	-	-	-	-	-
Goldfinch (<u>Carduelis carduelis</u>)	-	-	1	1	1	1	1	1	1	1	1	1
Redpoll (<u>Carduelis flammea</u>)	-	-	1	1	1	1	1	1	1	1	1	1
Chaffinch (<u>Fringilla coelebs</u>)	1	-	2	2	2	2	2	2	2	2	2	2
Yellow Hammer (<u>Emberiza citrinella</u>)	1	(1)	1	-	-	-	-	-	-	-	-	-
House Sparrow (<u>Passer domesticus</u>)	11	30	1	2	-	-	7	8	3	2	1	1
Starling (<u>Sturnus vulgaris</u>)	23	32	1	21	34	7	33	66	5	108	2	2
White-backed Magpie (<u>Gymnorhina hypoleuca</u>)	10	6	1	5	1	4	4	4	4	4	4	4
Unidentified	6	6	-	1	1	2	1	19	12	1	-	-

* Columns A and B are road counts of the number of birds seen from the Land Rover by DGD on the left side of the road. Brackets indicate additional species seen to the right by other members of the party. A indicates outward journey and B the return. Column C lists birds seen during stops and the figures indicate the number of places at which the species was recorded.

Fairlie-Burke's Pass (17 miles)

A Outward journey 1308 to 1335 hrs on 29 November;

B Return journey 1213 to 1257 hrs on 1 December

Burke's Pass-Pukaki (41 miles)

A Outward journey 1325 to 1815 hrs on 29 November;

B Return journey 1100 to 1213 hrs on 1 December

Pukaki-Hermitage (37 miles)

A Outward journey 0921 to 1244 hrs on 30 November;

B Return journey 1505 to 1853 hrs on 30 November

but there were no obvious signs (nor reports) of mortality to adult birds. A Grey Duck and two pairs of Paradise Duck were accompanied by young that must have hatched just before the storm, and a Black-backed Gull was incubating eggs (perhaps laid before the storm) on a high shingle bank beside the river near the Hermitage.

B. The Questionnaires

Rough estimates, supplied by runholders, of the number of dead birds at 59 stations between the Rakaia River in the north and the Lindis Pass in the south are summarised in Table III and show that mortality was general throughout the whole district.

TABLE III — Severity of Bird Mortality

<i>No. Dead Birds Found</i>		<i>No. Stations Reporting</i>	
None	0
Less than 20 †	4
20 to 50	12
50 to 100	8
Over 100 *	35
Total		59

† includes one report of "a few."

* includes reports of "a lot" (1 report), "many" (2), "very many" (1), "283" (1), "hundreds" (11), "tremendous numbers" (1), "over 1000" (1), and "thousands" (9).

The mortality tended to be more severe, however, at higher altitudes (Table IV) though there were several exceptions.

TABLE IV — Mortality at Different Altitudes

<i>Altitude of homestead (ft.)</i>	<i>No. Stations Reporting</i>		<i>Percent reporting more than 100 dead birds</i>
	<i>Less than 100 dead birds</i>	<i>More than 100 dead birds</i>	
1100 - 1400	2	0	—
1400 - 1700	10	6	38%
1700 - 2000	8	15	65%
2000 - 2300	2	5	78%
2300 - 2500	2	9	
Total	24	35	59%

Although mortality seemed higher where the snow was deeper (Table V), the correlation was less striking than with altitude. Possibly the homesteads at higher altitude had fewer suitable trees to shelter birds from the storm.

TABLE V — Mortality in Relation to Depth of Snow

<i>Approx. depth of snow at homestead (ft.)</i>	<i>No. Stations Reporting</i>		<i>Percent reporting more than 100 dead birds</i>
	<i>Less than 100 dead birds</i>	<i>More than 100 dead birds</i>	
Under 2	6	6	50%
2 to 3	7	10	59%
3 to 4	6	11	65%
Over 4	5	8	62%
Total	24	35	59%

Table VI lists the species of birds found dead by runholders and also those thought to have survived reasonably well. These reports must be accepted with caution because some runholders were probably unable to identify all the birds they found, particularly the smaller kinds, and a few people have used unconventional names. Except for Yellow-hammers, House Sparrows have the greatest number of reports of mortality and also of survival (Table VI), and Magpies come next, again in both categories. Probably these species were mentioned frequently because they are easily identified. During and immediately after the storm, runholders were preoccupied with saving stock and could take no more than a passing interest in the effects

TABLE VI — Mortality and Survival of Different Species

<i>Kind of Bird</i>	<i>No. of Stations Reporting Mortality</i>	<i>Reporting Survival</i>
Yellow-hammer †	21	0
" Sparrow "	17	12
Magpie	12	11
Skylark	12	1
Blackbird	9	4
" Gosling "	8	0
" Duckling "	7	0
Thrush	7	1
" Finches " ‡	7	0
Redpoll *	6	0
Chaffinch	6	0
White-eye	4	0
Starling	3	4
Goldfinch	2	0
Fantail	1	0
Warbler	1	0
Adult Duck	0	1
Native Pigeon	0	1
Kea	0	1
Pipit	0	1

† includes single reports of " yellow hammer heads," " yellow fellows," " yellow-heads " and " birds with yellow on them."

* includes single reports of " robins," " red robins " and " red-breasted robins."

‡ May include some skylarks.

of the storm on birds. For this reason, the data in Tables I and II are probably more reliable than those in Table VI; for instance, Hedge Sparrows are not mentioned in Table VI though we found 13 dead ones (Table I). On the other hand, Canada Geese and ducks (Paradise, Grey and Mallard) are much better known, and the 15 reports of severe mortality to their young are probably well founded and a most useful addition to the very limited data collected on these species in late November. Adult ducks and geese were reported to have survived reasonably well.

The reports from runholders confirmed that small birds often died even in the presence of food and that survivors resumed breeding after the thaw. On the other hand, Canada Geese (and perhaps some other non passerines) did not breed again. Two reports noted that a few small birds died well after the thaw "right up to Christmas time and afterwards."

Many runholders noted that fewer birds were present after the storm, though this was less apparent by the end of December. Species reported to have declined, some almost to extinction, were: "finches," Yellow-hammers, White-eyes, Tomtits, Riflemen, Fantails, Blackbirds, Magpies, Goldfinches, "larks," Chaffinches and Chukor. Most of these, however, were mentioned in only one or two reports.

DISCUSSION

According to De Lisle (1969), snow usually lies on the higher foothills of Canterbury for over 30 days a year, but the frequency and amount of snow vary a lot from year to year; there have been 12 severe snow storms on the foothills and plains since 1862. The recent fall was unusual, however, in coming so late in the year and this may explain its severe effect on birds: in winter, many probably move to lower altitudes and can draw on fat reserves which are largely lacking during the breeding season.

Although mortality was obviously severe, it was largely confined to passerines as Jehl and Hussell (1966) found in birds breeding in very cold and wet weather in Northern Canada. In Canterbury, however, there was also considerable mortality among newly hatched ducklings and goslings.

Many surviving passerines resumed breeding as soon as conditions improved and the storm is unlikely to have caused more than a temporary reduction in their numbers. In general, this was confirmed by subsequent reports from runholders. Yellow-hammers and Fantails, however, were almost exterminated over much of the district and may take more than a year to regain their former numbers.

In May 1965, R. H. Taylor (pers. comm.) recorded 11 Fantails during a trip from Geraldine to Mount Cook compared with only one seen by us, during three days, a fortnight after the storm. Stead (1927) remarked that a severe snow-storm in 1922 killed "practically every Fantail in Canterbury except those in the native bush, where they were apparently safe, and whence, in a few years they quickly repopulated the whole Province." Survival of small birds in native forest was also demonstrated by the numbers we saw and heard in several patches of bush between Pukaki and the

Hermitage on 30 November, but no Fantails were seen. On the other hand, a report from Mount Algidus claimed that there were many fewer Tomtits, Fantails and Riflemen since the storm.

ACKNOWLEDGEMENTS

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SHORT NOTE

PUMICE COLLECTING BY A BANDED DOTTEREL

While staying at Port Waikato for ten days in November 1968, I discovered a nest of a Banded Dotterel (*Charadrius bicinctus*) early on the morning of 14/11/68. During that day a hide was moved in stages to a final position of some 10 feet from the nest. When my companion had left, the female immediately returned and settled onto the eggs. She seemed restless though, and after some minutes stood up and moved slowly away picking up chips of pumice and 'throwing them over her shoulder' as it were, in the direction of the nest. She went for a distance of some 6-9 feet and then immediately returned to the nest where she sat; and stretching out, picked up all the chips that had fallen near the nest. These she tucked under her. When she had collected all she could reach without actually getting up, she then repeated the process. At no time did she pick up pumice chips on her way back but would collect only those within reach from a sitting position. The nest at this stage had only two eggs and a third had been added by 16/11/68.

During my stay at Port Waikato I also observed a Red-necked Stint (*Calidris ruficollis*) feeding on the estuary near two Banded Dotterels. From a perusal of the literature it would appear that this is the first record for Port Waikato.

— DON. W. HADDEN

THE DISTRIBUTION OF BREEDING RED-BILLED GULL COLONIES IN NEW ZEALAND IN RELATION TO AREAS OF PLANKTON ENRICHMENT

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INTRODUCTION

In New Zealand the Red-billed Gull (*Larus novaehollandiae scopulinus*) is predominantly a coastal breeding species; 82 colonies are known to occur on the coastline or offshore islands and only two inland (Fig. 1). The latter are at Lake Rotorua (Gurr and Kinsky, 1965) and at Kohukohu (Cowan 1967).

Records suggest that crustacea are the main food of the coastal colonies during the breeding season and that the euphausiid *Nyctiphanes australis* is especially important. Turbott and Bull (1954) found chicks regurgitated *N. australis* at the Three Kings Islands colonies; Buddle (quoted by Wheeler and Watson 1963) noted they were fed "shrimp" at Mokohinau Island; Gurr and Kinsky noted chicks were fed extensively on small crustacea at the Lake Grassmere and Kapiti Island colonies but small fish in the Nelson colonies. The adults and chicks in the large Kaikoura colonies feed almost exclusively on *N. australis* (Mills 1967).

According to Sheard (1953) euphausiids usually live in the water layers near the bottom of the shelf; feeding on copepod faecal pellets and diatoms. At Kaikoura Grieve (1966) found the maximum concentrations of all euphausiid stages were between 100 and 22 metres below the surface. However, both these authors note that *N. australis* swarms at the surface during breeding.

At Kaikoura these swarms are usually attended by sprats (*Maugeclupea antipodum*) kawahai (*Arripis trutta*) and Red-billed Gulls. Stonehouse (1965) recorded flocks of 2,000 gulls associated with such swarms; smaller flocks totalling several thousand birds occurred simultaneously along many miles of coast. Turbott and Bull observed similar feeding flocks at varying distances offshore near Three Kings Islands.

The Red-billed Gull colonies in New Zealand are situated predominantly on the east coast (Fig. 1). Gurr and Kinsky have suggested that there are few colonies on the west coast because the gulls require relatively calm conditions for feeding at sea and thus feeding is restricted to lee shores. They further considered that except for local areas of sheltered water about New Plymouth, Kapiti Island, Mana Island, Fiordland, and opposite Muriwai and Okarito, the open and exposed western coastlines are unsuitable for foraging.

If sheltered water is the sole factor determining the location of colonies it is difficult to see how colonies flourish at Three Kings Islands. These colonies are in an exposed situation 35 miles to the north of the mainland of New Zealand, yet are among the

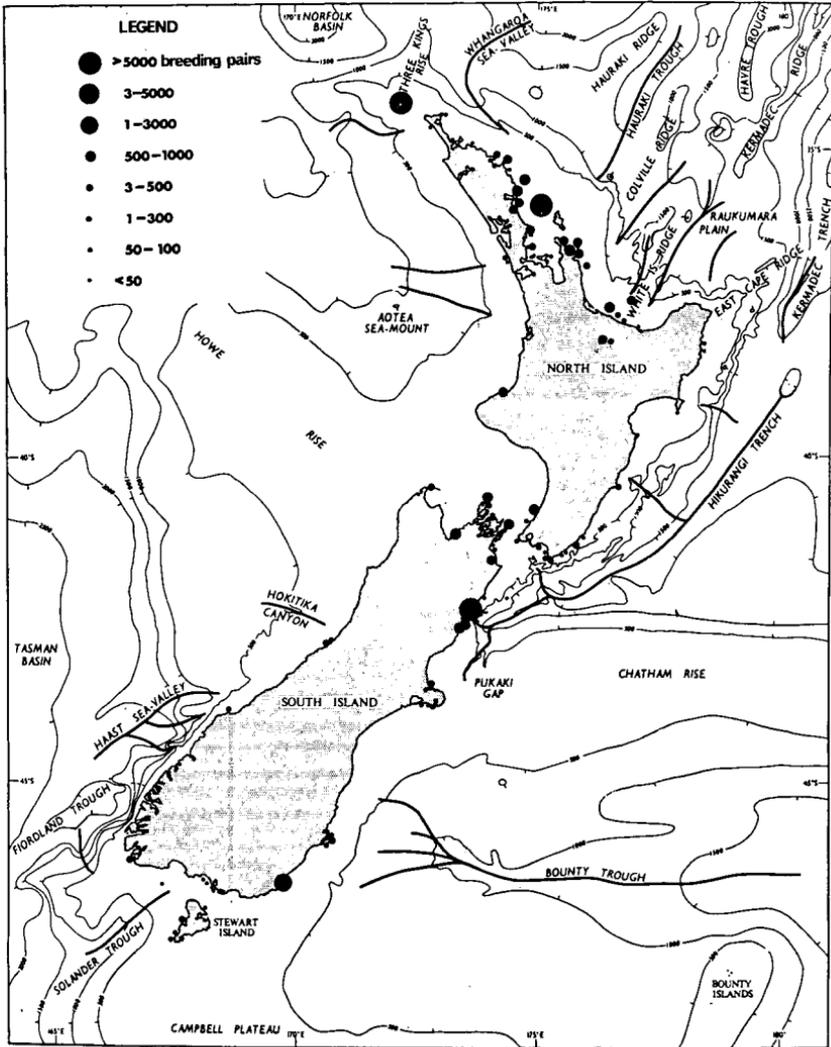


FIGURE 1 — Distribution of Red-billed Gull (*Larus novaehollandiae scopulinus*) Breeding Colonies and the Major Canyon Connections Between the New Zealand Shelf and Abyssal Areas. (After Brodie, 1964; Gurr and Kinsky, 1965)

largest in New Zealand. The distribution of colonies on the east coast is very irregular and perhaps factors other than, or additional to, that of sheltered water, determine the distribution of gull colonies in New Zealand.

To support large numbers of breeding birds an abundant and continuous food supply in close proximity to the colony is essential. As noted earlier, planktonic crustacea, especially euphausiids, are utilised by breeding Red-billed Gulls. The amount of plankton in the surface layers of the ocean depends to a large extent on the availability of nutrient salts and sunlight. Nutrient salts are most abundant in areas where there is extensive, free, vertical circulation of water from the lower levels to the euphotic zone. Bourne (1963) lists the following phenomena which promote mixing between the surface and deeper layers of the ocean: turbulence in ocean currents along irregular coastlines and around islands, wind movement of surface water away from a coast and diverging currents which cause upwelling at sea.

Murphy and Shomura (unpublished manuscript) quoted by Ashmole and Ashmole (1967) emphasise the importance of "fronts" in concentrating plankton into small areas. According to Voorhis and Hersey (1964) a front is detected by abrupt changes in the surface temperature. Many of the fronts which develop are associated with convergence and sinking (Uda 1938, Cromwell and Reid 1956, Knauss 1957). Ashmole and Ashmole pointed out that the biological significance of such fronts is that: "they tend to concentrate plankton species which are capable of resisting the downward currents." King and Demond (1953) emphasise that where a strong convergence develops for a sufficient length of time, an area of high plankton abundance should result. Murphy and Shomura quoted by Ashmole and Ashmole pointed out that "front like" circulation cells and eddies also develop near islands especially on the leeward sides. Ashmole and Ashmole explain that whereas upwelling and vertical mixing of nutrient rich water produces a broad zone of enrichment tens or hundreds of miles wide, the concentration of organisms at a convergent front may be only a few yards wide.

In the following section the distribution of Red-billed Gull breeding colonies is considered in relation to hydrological features which could promote plankton enrichment near the colonies.

DISTRIBUTION OF GULL COLONIES IN RELATION TO PLANKTONIC ENRICHMENT

Upwelling of subsurface water close to New Zealand has so far been detected at Cape Reinga, East Cape, Cape Farewell, Kaikoura and in Cook Strait (Table 1). With the exception of East Cape, these are comparatively large gull colonies with a long history of occupancy.

The East Cape upwelling is apparently variable as Garner (1961 p. 21) found no sign of it in 1953. This variability may account for the absence of breeding colonies in the vicinity. As the upwellings at Kaikoura, Cape Reinga and Cook Strait occur near the head of submarine canyon systems, the distribution of colonies shown by Gurr and Kinsky has been superimposed upon the bathymetric chart of the New Zealand Shelf (Brodie 1964) Fig. 1.

TABLE 1 — Red-billed Gull (*Larus novaehollandiae scopulinus*)
Colonies in Vicinity of Known Areas of Upwelling of
Subsurface Water

<i>Areas of Upwelling</i>	<i>Colony</i>	<i>Size (Pairs)</i>	<i>Authority of Upwelling</i>
Cape Reinga	Three Kings Islands	6000	Garner 1954 pp 295 & 299 1959 p 326 1961 p 17
East Cape	—	—	Garner 1959 p 334
Cape Farewell	Farewell Spit	c175	Garner 1954 pp 297 & 299
Cook Strait	Large No. in Vicinity	c6000	Garner 1961 pp 15, 51 & 52
Kaikoura	Kaikoura Peninsula	6000	Garner 1961 pp 15, 51 & 52

Colonies Associated with Submarine Canyons

The hydrological phenomena off the Kaikoura coast are complex (Grieve 1966). Periodic upwelling of subtropical water throughout the year has been detected by Garner (1961), Houtman (1965) and Grieve (loc. cit.). Grieve considers that the bottom configuration in conjunction with the current and wind systems off the east coast produce the upwelling phenomena. Stonehouse (1965) has shown that the enrichment from the Kaikoura Canyon is carried northward by the Canterbury Current (Fig. 2) and possibly southward by northerly and northwesterly winds.

In addition to those noted earlier (Kaikoura, Cook Strait and Cape Reinga), Fig. 1 shows that many of the troughs coming close to the shoreline have gull colonies near them or at least within the flying range of 30-40 miles. (Stonehouse (loc. cit.) has shown that the feeding range of the Red-billed Gull at Kaikoura extends 50-60 miles north and south of the colonies.)

Although Mōkohinau Island is approximately 60 miles from the head of the Hauraki Trough, enrichment could be carried closer to it by the South Auckland Current (Fig. 2) and southeasterly and easterly winds. In the Hauraki Gulf, seasonal intrusions of oceanic water and plankton occur nearly every summer (Dr. J. B. Jillett, pers. comm.). The plankton brought in is frequently characterised by swarms of salps, doliolids, and large numbers of euphausiids and chaetognaths. Cassie (1960) also gives a general account of such intrusions.

Colonies Associated with Turbulent Water

Tidal currents about Cook Strait produce turbulent and rapid fluctuations in speed and direction of the water at and below the surface (Gilmore 1960). This movement could promote the production of "fronts" and could also provide renewal of nutrients to the surface layers for the 13 colonies in this region.

Similarly the large number of small colonies on islands in the Hauraki and Bay of Plenty areas may depend on feeding areas

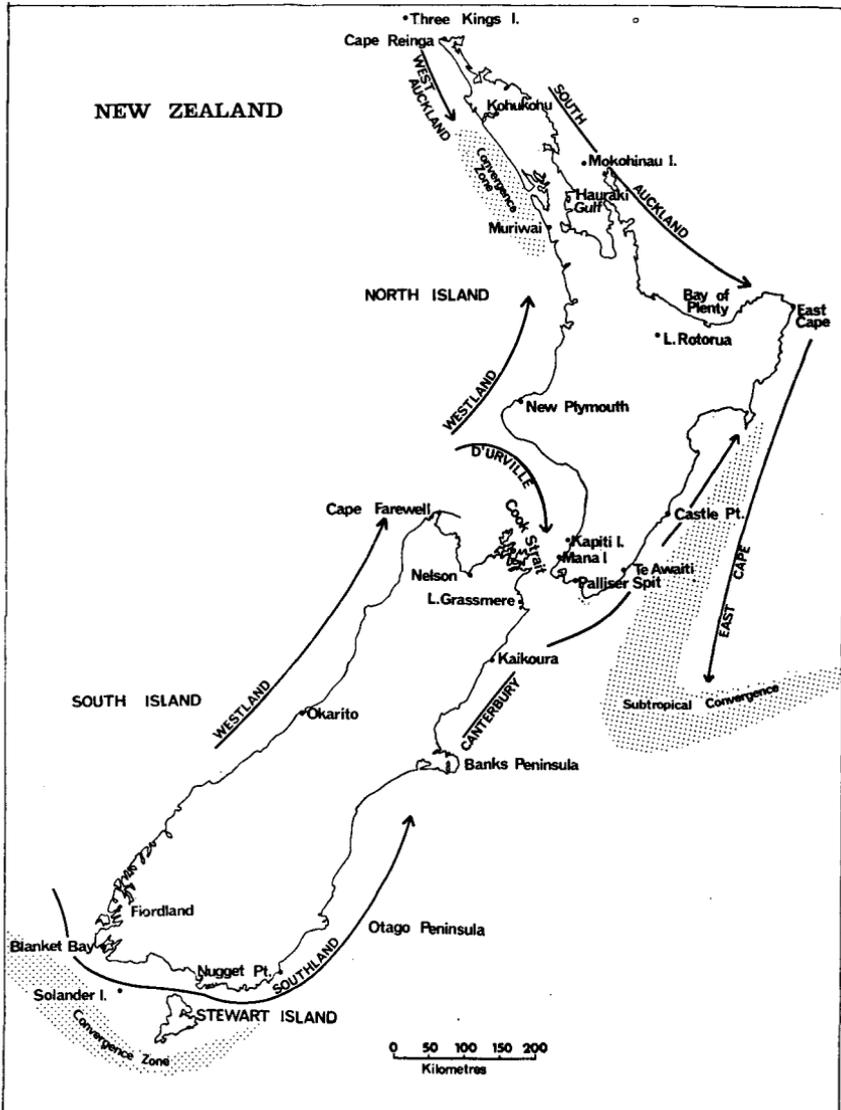


FIGURE 2 — New Zealand Coastal Currents. (After Knox, 1963)

supported by turbulence developing "front like" circulation cells and eddies around the islands, and those on Banks Peninsula and the Otago Peninsula on the turbulence developing along the irregular coastline.

Colonies Associated with the Wind Drift Upwelling

The colonies at Muriwai, New Plymouth, Kapiti Island and Mana Island (along the west coast of the North Island) lie in the same zone as the beds of the toheroa (*Amphidesma ventricosum*) (Cassie 1955). As these species utilise zooplankton and phytoplankton respectively, Cassie's account of factors affecting toheroa distribution is relevant. He suggests that an upwelling of deeper water off the west coast of the North Island may be induced by prevailing winds which tend to move surface water away from the coast. During the summer and autumn (December to May) the North Island lies within the influence of the subtropical anticyclone and any easterly to southeasterly winds experienced during this period would tend to induce upwellings of colder water near to the coast (Garner 1954).

Colonies Associated with "Fronts"

The Sub-Tropical Convergence could produce conditions favourable for the increased production of plankton at Te Awaiti, Castlepoint and Palliser Spit. Similarly localised plankton enrichment could be produced at Muriwai at the convergence zone of the West Auckland Current and the Westland Current.

DISCUSSION

Other things, such as nesting area and distance from the feeding area being equal, the size of the breeding colonies is probably indicative of the availability of plankton, especially *N. australis*, which in itself depends on the extent of the water enrichment.

ACKNOWLEDGEMENTS

I have benefited from discussion with many of the staff and students of the Department of Zoology of the University of Canterbury; to all I am grateful. In particular I would like to thank Professor G. A. Knox, Dr. E. C. Young, Dr. G. V. Orange and Dr. B. Wisely for reading a draft of this paper and for providing helpful comments.

SUMMARY

The main food of breeding Red-billed Gulls *Larus novae-hollandiae scopulinus* in New Zealand appears to be the planktonic euphausiid *Nyctiphanes australis*. The distribution of the breeding colonies is discussed in relation to offshore hydrological features which could result in plankton enrichment near the colonies.

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SHORT NOTE

OYSTERCATCHERS AND BANDED DOTTERELS NESTING HIGH IN CENTRAL OTAGO

SOUTH ISLAND PIED OYSTERCATCHER (*Haematopus ostralegus finschi*)

Pairs assemble below the retreating snows (about 4000ft.) during November on the unforested inland ranges where suitable swampy meltwater basins, cirques and subalpine tarns and swamps occur e.g. Old Man, Dunstan, Pisa, Carrick Ranges. (It is interesting to note that in the ranges further to the north and northeast of the area, where the Otago green schists grade into less metamorphosed 'grey-wackes,' the summit slopes are steeper and suitable habitat of the type mentioned above is lacking, e.g. Kakanuis, Hawkduns and St. Bathans Ranges.)

Nest-sites range from ca. 4000ft. to 6000ft. close to the wet habitats mentioned, the nests themselves being invariably situated on top of a dry, well-drained frost hummock in the subalpine tundra zone, which usually is a *Dracophyllum muscoides*-*Raoulia hectori* community.



BANDED DOTTEREL (*Charadrius bicinctus*)

Preferring the drier type of habitat, with short vegetation, these dotterels are to be found both on the subalpine tundra zone as above, and on suitable neighbouring zones both below and above that altitude, e.g. among Blue Tussock (*Poa colensoi*), among the mixed subalpine herbfield, and at the top of the ranges on the fellfield. Altitudinal distribution is thus about 4500ft. to 6200ft., varying somewhat on each range.

An unusual extension of their normal lowland distribution occurs on the semi-arid northern slopes of the Old Man Range towards the Fraser Dam, where they are to be found in small numbers on the short turf-scabweed areas up to ca. 3000ft.

— PETER CHILD

ROOF-NESTING BLACK-BACKED GULLS

By E. G. TURBOTT, Auckland Museum

Reports of nesting by Black-backed Gulls (*Larus dominicanus*) on roof-tops at six separate points in the central Auckland city area were received in the 1968-69 season by the Museum, chicks reared by four pairs being observed up to their successful departure from the breeding site. So far as is known to the writer this is the most extensive occupation of such sites in the area, and since this constantly-increasing species may well extend further on to roof-tops in the city the records received are given in some detail. It may be added that press publicity was given to three of the nests, so that it seems likely that if any further sites in the city area had been under observation they would have been reported; however, it is hoped that should any additional records of breeding in the area be known they will now be recorded.

(a) *Old Oxford Theatre, Queen Street.* This pair was first observed in occupation of the site in early November, 1968, by Mr. J. H. Hall, of the staff of the Chief Post Office (on opposite side of the street), a bulky nest having been completed on the roof ridge by this stage; a photograph showing the pair at the nest appeared in the *New Zealand Herald* of 13th November, 1968. Two chicks were subsequently hatched; they were observed at intervals by Mr. Hall, ultimately becoming fully feathered, and are believed finally to have flown.

A photograph showing the two chicks (then approximately 10 days old) appeared in the *Weekly News* for 6th January, 1969; I am indebted to the Photographic Section of the *Weekly News* for the information that this was taken on 12 December. The photograph shows the chicks away from the nest and crouching in an angle of the brick parapet.

Mr. Hall also informed me that a pair nested on the same site in the 1967-68 season: eggs were laid but, although the birds sat for a lengthy period, evidently did not hatch. Nesting had not been recorded on the roof in earlier years.

(b) *Chief Post Office, Queen Street.* Information was supplied by Mr. J. Douglas, Chief Post Office staff, who had watched a pair regularly on the roof from approximately July, 1968, and noted that they appeared interested in various sites — they finally chose the flat roof of a metal shelter built to house a hot-water tank, the top being about seven feet above the flat main roof and accessible only by ladder. Nest construction was begun in early November, and the birds brought in much material, including grass, fragments of paper, etc. Only one egg was laid; a chick hatched towards mid-December, but died towards Christmas and was found by Mr. Douglas dead in the nest.

According to Mr. Douglas' observations there has been an interest in the roof as a nest site over the past three seasons, and a pair built a nest, but did not lay, in the 1966-67 season; this was on the upper level portion of the roof a little away from the main flat roof.

(c) *Buckland Building, Customs Street.* This pair could also be observed by Mr. Douglas from the Post Office roof: the site was on the corrugated iron roof of the Building (situated at corner of Customs and Gore Streets), and against a skylight. Mr. Douglas saw the two chicks from their first few days onwards; they hatched in mid-December and he saw their departure with the parents in February.

(d) *Lower Albert Street area.* This record is also due to Mr. Douglas who could from the Post Office see a pair, obviously in occupation of a roof-top site, in this general area. Nesting was at about the same time as the two other pairs observed.

(e) *Magistrate's Court, Kitchener Street.* The observations at this site extend over a full three seasons, and I am much indebted to Mr. M. M. Fisher, of the Court staff, for the information on his records throughout this period. The birds — doubtless the same pair throughout — have used the same site in 1966-67, 1967-68 and 1968-69 seasons: the nest was on an upper flat roof, inaccessible from a lower roof level from which the observations were made; unfortunately, the whole of the nesting portion is not visible, and it has thus been difficult to be sure of the number of chicks hatched each year. However, young were seen each season, and it is believed that they fledged and left the roof successfully each year. Departure time was approximately mid-January.

(f) *24 Cook Street.* This nest was probably the most regularly and fully observed of the six recorded this season, the site being on the roof of the three-storey building at the above address, and thus visible to many members of the Auckland City Council staff from the adjacent towering City Administration Building: I am indebted for much of the following information to Miss J. Walker, who kept a constant watch from the Building on this nest. On 23rd December, 1968, when Miss Walker first rang, a single egg was being incubated; there had been two eggs in the nest on about 20th November, but these must have been destroyed and the single egg then laid. It had been difficult to see the eggs for the past month while the birds had been more or less constantly on the nest.

The nest was situated in the gutter at the edge of the main slope of the roof, and supported partly by a projecting dormer window; Miss Walker suggested that the loss of the first clutch may have been due to flooding of the nest, water being seen to pour through the site when it rained.

On 6th January Miss Walker reported a chick; I visited the Administration Building and saw the chick, which was in the nest and accompanied by one of the parents, the other being on the adjacent roof ridge. According to reports from several members of the Council staff, hatching was on either 25th or 26th December, so that the chick was now some 12 days old. By 7th January the chick was moving freely about the roof: a photograph showing an adult with the chick appeared in the *Auckland Star*, 9th January, 1969.

Miss Walker continued to watch the progress of the chick, and regularly saw it fed by the parents; she also noticed that a third adult hovered about the area constantly, and was seen frequently when the chick was being fed.

On 7th February i.e. approximately six weeks after hatching, the young bird now fully fledged took off from the roof in company with both parents.

Nesting in city area: earlier records. Mr. J. Douglas, whose observations from the Chief Post Office are recorded above, also informed me that nesting on the wharf-shed roofs has been recorded from time to time in past years. Nesting has also been recorded, according to various reports sent to the Museum, on secluded waste land adjacent to the waterfront; however, the success of such nests is not known.

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[Auckland Star

NOTES ON SOME MACQUARIE ISLAND BIRDS

By JOHN WARHAM

These observations were made between 29 December 1959 and 12 March 1961 while I was a member of the Australian National Antarctic Research Expedition (A.N.A.R.E.) stationed at Macquarie Island. The main lines of bird research undertaken then have already been published and the present paper brings together other observations during that 15 months, when over a hundred ascents to the plateau were made.

The island is about 21 miles long and two to three miles wide with its long axis lying roughly north and south. It is about 800 miles S.S.E. of Tasmania and 900 miles N. of Antarctica. A wide moss-clad raised beach terrace extends down much of the western coast but elsewhere the terrace is narrow or absent and from this the ground rises steeply to an undulating plateau averaging about 800 feet above sea level. The slopes are dominated by tussock grasses, the tops mainly bare wind-swept gravel with scattered cushion and mat plants. The outfalls of numerous large lakes on the plateau cut their way through the peaty ground of the terraces on their way to the sea. The climate is windy and wet but heavy rain is exceptional. For an account of the island's history, geology and natural history see Law and Burstall (1956) and for the flora that of Taylor (1955). The island is politically part of Tasmania but the Antarctic Division of the Commonwealth Department of External Affairs (now of the Department of Supply) has maintained a party, changed annually, since 1948 and in recent years this has usually included at least one biologist.

I. NEW SPECIES

Short-tailed Shearwater *Puffinus tenuirostris*

A recently killed specimen only slightly damaged on the breast, presumably by Southern Skuas *Stercorarius skua*, was picked up near Flat Creek on 19 November. It had the following dimensions (in mm) when measured while still fresh: wing 274; tail 79; tarsus 52; culmen 31; mid toe and claw 63.

Spine-tailed Swift *Chaetura caudacuta*

A single bird was shot on 11 January 1960. This record has already been published (Warham, 1961).

Blackbird *Turdus merula*

Unconfirmed reports by members of previous parties as far back as 1951 refer to Blackbirds at Macquarie Island. If those previously encountered were as timid as those seen by me it is not surprising that adequate descriptions have not been available hitherto. The first proper view gained was of a male momentarily glimpsed on 31 March. The bird was flushed from a small gully on the south side of Bauer Bay but shot round a corner and vanished. It had been glimpsed previously in this area but never for long enough for certain identification. Better sightings were gained at the same place on several occasions during September but only once did the bird utter a sound — a muted alarm. At various times and places probable

female Blackbirds were seen but never long enough for positive identification. The species shows a similar timidity on some of the other southern islands to which it has spread and where it seldom encounters man (Warham, 1967a).

II. RARE SPECIES

Keith and Hines (1958) listed a number of new and rare species of birds for the island additional to those given in the list of Law and Burstall (1956). The former's notes included four penguins and seven petrels. They were able to entice five species of petrel within range on foggy nights using a strong light. Although I had a more powerful light than theirs it proved ineffective: very few petrels were seen in the beam and none came down it. No examples of Fairy Prions *Pachyptila turtur*, Blue Petrels *Halobaena caerulea* or Grey-backed Storm petrels *Garrodia nereis* were handled by me. The only storm petrel sighting was of an unidentified bird seen at long range from the edge of the plateau on 30 August. It was fluttering over an oil-slick originating from a dead Elephant Seal.

The apparent absence of these small petrels during my 15 months stay is difficult to explain considering the amount of time I spent on the high ground after dark working on other petrel species. Small holes that might originally have been dug by small petrels were seen at various places but occupants, apart from Antarctic Prions *Pachyptila desolata*, were absent.

The only unusual penguin noted apart from occasional "Macaroni" type Royal Penguins *Eudyptes chrysolophus schlegeli* with black throats, was the following:

Erect-crested Penguin *Eudyptes pachyrhynchus sclateri*

All my records, totalling 11 birds (8 adults and 3 yearlings) were made in February 1961, this being the time of moult for the species. Previous sightings have also been during this period except for one on 22 November 1955 (Keith and Hines, *loc.cit.*). Five birds at Flat Creek on 5 February were about to start or had started to moult and one had completed its body moult five days later. An adult at Aerial Cove on 24 February was in completely new feather but another bird 4 days later still had some old contour feathers to shed.

Blue Petrel *Halobaena caerulea*

Although Keith and Hines reported this species as being very numerous at night during September and October it was not seen by me over land although sought for. A single bird at sea on 22 December 1959 was the only sighting. Two wings found on 10 September on the moss near Mawson Point and measuring 215 and 220 mm. may also have been of this species.

Grey Petrel *Procellaria cinerea*

This is a winter breeder and four birds were seen under rather perplexing circumstances between 25 March and 27 July 1960 and again in March 1961.

The first sighting was in the late afternoon of 25 March when a bird flew repeatedly over the isthmus at Buckles Bay, coming in to the teeth of a strong westerly and following a course that took



Plate XXX — Grey Petrels above the Isthmus, Macquarie Island.

it over the engine shed of the A.N.A.R.E. station. While over the engine shed it tended to hover and "back pedal" as if to alight there. There was time to film this activity and to record the characteristic duck-like wing action well described by Murphy (1936). Presently, and still in daylight, the bird did alight, settling quietly down about a metre from the shed and directly below the exhaust pipe protruding through the wall. The engines were running and the spot was very noisy. The bird was captured, measured, colour banded and held indoors during the night and the following day. It had no brood patch and the cloaca was not distended. When presented with grasses it placed them to one flank as petrels often do when nesting but otherwise did nothing but rest during its time in captivity and uttered no calls. It was very tame.

Another bird was also seen that evening near the engine shed and on the following evening after dark I found a second Grey Petrel sitting about 4 metres from where the first had alighted. This bird was also caught, banded and measured and turned loose with the first. There was no reaction between the two and both were released the following evening to be re-sighted at the same place on seven occasions up to 21 April. On the evening of 8 April these two sat quietly below the engine exhaust for about five hours, apparently without reacting to one another's proximity. On 21 April four Grey Petrels were found near the shed, including two newcomers. One settled on the iron roof above the exhaust pipe. The newcomers were caught, measured and banded and at that date none had brood patches.

Thereafter one or more of this quartet continued to appear in the late afternoon by the engine shed and occasionally a bird was reported by other members of the A.N.A.R.E. team as flying over in the morning. By 28 May all had acquired brood patches. Sightings now began to be less frequent and tailed off during July when the birds tended to circle or make a single run over the isthmus without alighting. The following year the first and only sighting before I left the island was on 4 March. The bird concerned was the first one to have appeared the previous year and it had no brood patch.



[John Warham

Why these four birds should so persistently re-appear by the engine shed was a mystery. It still is. Were they attracted to the noise or rhythm of the exhaust, by the heat radiating from it and from the shed roof, or were these birds that had been born in burrows located here and no longer available? The shed was not a new innovation and was set on a concrete pad. Although there were places where the petrels could have worked their way underneath, the fitting of a loose fence of vertical wires established that the birds did not do this. Nor were they attracted to an artificial burrow which I constructed by the shed. Furthermore, while their circuits often took them out of sight round the slopes of North Head, repeated attempts to see where they went failed and very few burrows large enough to house this species were found in the area.

Grey Petrels are conspicuous when sailing along in late afternoon and an unsuccessful lookout was kept for them during winter trips down the island. Grey Petrels are also conspicuous at sea and single birds were noted out in Buckles Bay on several occasions. Whenever this happened at least one petrel would be overland or on shore that evening.

The dimensions of the four birds in mm. were:

Band No.	Wing	Tail	Culmen	Tarsus	Mid Toe & Claw	Weight (g)
160-						
11121	344	129	45	61	76	510
11122	338	114	45	65	79	600
11123	342	113	47	64	77	450
11124	336	122	48	64	79	540

Cape Pigeon *Daption capensis*

Present in small numbers around the coasts and offshore particularly in spring and summer. They were seen to alight at various places around North Head and have been reported as probably nesting on Anchor Rock on the western side of North Head. However, a flight by helicopter on 12 March 1961, that enabled me to look down into the crevices on Anchor Rock and on Gorilla Rock not far away, showed that no birds or chicks were present. If breeding had occurred some chicks should still have been evident on that date. A likely nesting place would seem to be the Bishop and Clerks Islets 23 miles off the southern end of the island but in a brief visit on 25 February 1965 (MacKenzie, 1968), this species was not seen.

Common Diving Petrel *Pelecanoides urinatrix*

Much effort was expended trying to locate burrows of this and of *P. georgicus* to no avail. The only bird handled was an adult with a brood patch which was killed by hitting one of the station radio aerials on 14 October. The position of the nasal septum established its identity as *urinatrix*.

III. SOME COMMON SPECIES

Antarctic Prion *Pachyptila desolata*

These petrels seemed to suffer heavy predation by cats which patrolled the colonies after dark. This, and rabbit-induced erosion of some of the hillside nesting areas together with normal skua predation, seems to be causing a population decline (Warham, 1967b).

Some birds had returned by 2 November and eggs were laid during December. There were chipping eggs and small chicks in nests examined on 24 January and some unhatched eggs on 28 January. One marked chick had left by the end of March and all the birds seemed to be absent from land and from the surrounding seas after that time. Thus the breeding cycle seems to parallel that at Signy Island described by Tickell (1962).

From about mid-November to mid-February prions were often seen at sea, usually flying but occasionally settled, but seldom in large numbers. During this period small parties sometimes flew overland by day. Only once was a prion (at sea) seen chased by a skua which failed to catch the petrel. This was on 23 January 1960. Six days later a prion was seen in the reverse role — chasing a skua.

Marked birds were examined on the colony on the slopes of Mt. Elder just below its summit. The dry gravelly peak of this mountain was the nightly resting place for small aggregations of prions which quickly disappeared into the night whenever a torch beam was directed onto them.

Grey Duck *Anas superciliosa*

These birds were common at the small lakes and coastal mosses, the largest numbers being found at the brackish Duck Lagoon south of Mawson Point. Here the numbers reached a post-nuptial peak during June and July when at least 54 birds were counted some days. Numbers declined to one or two during November and December when breeding was in progress. Small broods of ducklings were then seen around the pools and streams south of Mawson Point and a clutch of 7 eggs on North Head on 1 December. These figures do not suggest any movement away from the island during the winter.

No Grey Teal *Anas gibberifrons* were seen during my stay although sought for: I doubt whether they would have been overlooked if present.

Australian Harrier *Circus approximans*

One was present in the area between Mawson and Aurora Points (usually near Duck Lagoon) between 26 June and 6 July. What was believed to be a different animal — it was darker than the first — was flushed near Mawson Point on 16 September sending a mob of Dominican Gulls *Larus dominicanus* swirling to the air. The harrier escaped the attentions of a pair of skuas by soaring upwards until lost to sight.

Southern Skua *Stercorarius lomnbergi*

Skuas breed plentifully on the coastal mosses and less plentifully on higher ground. Frequent trips down the centre of the island throughout the year enabled me to keep a note of variations in numbers at an assembling and bathing area at the southern end of Island Lake. Changes in numbers before and after the winter of 1960 are shown in Figure 1. The last sighting of the species in the autumn was on 11 May, the first sighting of the subsequent season on 25 July so that skuas were absent from the island for not more than about 75 days. The decline in numbers after 23 September appears to reflect the dispersal of birds to the breeding territories.

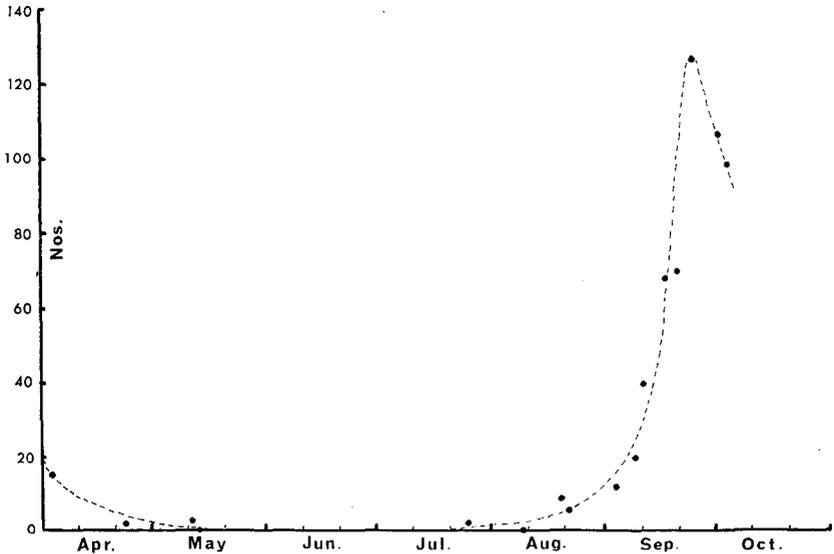


Figure 1 — Southern Skua counts at Island Lake, Macquarie Island, autumn to spring 1960

Terns *Sterna* spp.

Antarctic Terns *Sterna vittata* breed in spring and summer at various points around the coast, laying clutches of one, or more rarely, two eggs in hollows among moss and *Cotula* on offshore stacks. Breeding birds were black capped but progressively lost these caps in the winter. Thus in summer, terns with white foreheads could be easily confused with migrant Arctic Terns *Sterna paradisaea* from the northern hemisphere in eclipse plumage. None was positively identified during my stay and I was unable to follow the matter up by collecting specimens. Nevertheless two sightings seemed suggestive. The first was a group of 16 terns seen on 9 September flying as a close-knit group in a straight line and on a southerly course. Purposeful-appearing movements such as this were never seen from birds known to be Antarctic Terns and these may have been Arctics during their southerly migration. The second was a larger group of some 50 terns, many with white foreheads, seen at Eagle Point on 10 March 1961. These were circling around and resting and may have been Arctics on their way north.

IV. INTRODUCED SPECIES

It seems that the sub-Antarctic islands afford only marginally tolerable conditions for self-introduced species such as the Goldfinch *Carduelis carduelis* and Eastern Silvereye *Zosterops lateralis* recorded at Macquarie previously but never sighted during my stay. However, the Redpoll *Carduelis flammea* with its Arctic affinities, and the Starling *Sturnus vulgaris* with its great adaptability, are able to breed and perhaps maintain themselves without further immigrants.

Starling *Sturnus vulgaris*

Pairs bred in crevices and caves at many points around the island from rocks at the extreme southern tip to those round North Head. Young birds were heard calling from these nests mainly during November. Feeding was chiefly on the coastal mosses particularly south of Mawson Point on the west coast and between Green Gorge and Lusitania Bay on the east coast. The birds also probed the kelp jetsam on the beaches apparently to catch kelp flies. Flocks of about 100 birds were commonly seen from January onwards through the winter. The largest flock noted contained about 250 birds. This was south of Green Gorge on 16 January 1961 where another flock of about 150 was also present on the same occasion. A well known roosting place was on the rocks flanking Green Gorge beach. Starlings were very shy and fled with noisy alarms when anyone appeared on the mosses where they were feeding.

Redpoll *Carduelis flammea*

These birds were seen in small numbers at many points. During autumn and winter small flocks formed and the birds were seen to feed on *Cotula* and *Pleurophyllum* seed heads. At this season the birds were often encountered on the arid plateau apparently searching for seeds of cushion plants but in spring and summer they seemed to feed at lower altitudes. Flocking continued to mid-September but towards the end of that month pairs were formed and in early October song was heard. Aerial display flights were noted in early December but no direct evidence of breeding was obtained. An old nest, almost certainly of this species, was found in a clump of tussock at Bauer Bay on 19 March.

It is interesting to note the species recorded previously that were not seen during my stay. The Grey Teal, White-faced Heron *Ardea novaehollandiae*, White Egret *Egretta alba* and Coots *Fulica atra* reported by Keith and Hines were missing as were Fork-tailed Swifts *Apus pacificus* seen by Gibson (1959). Presumably all these had reached their points of no return on attaining their Macquarie landfalls and have been unable to sustain themselves there. Waders were completely absent except for one probable sighting of a Hardwick's Snipe *Gallinago hardwickii* which rocketed up from the grass at North Head on November 17, called a clear soft "wheet" once per second as it departed, but gave no proper view. This species was tentatively identified at the island, also in November, by Gwynne (1953).

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WELCOME SWALLOWS IN WHANGAREI COUNTY, 1962/68

By *MURRAY MUNRO*

Until 1965 the only swallow nests reported in Whangarei County were along No. 1 Highway at Hukerenui, Whakapara, Hikurangi, and four miles north of Kamo; and birds had been sighted at Riponui and Awaroa River between Whangarei and Onerahi (Edgar 1966, *Notornis* 13; 54-55). In 1968/69 season I made a survey of the County, searching for nests along all main roads and most of the by-roads. About 150 breeding pairs were located, but the total population must be considerably larger as many pairs undoubtedly nest away from public roads, under farm-bridges and culverts.

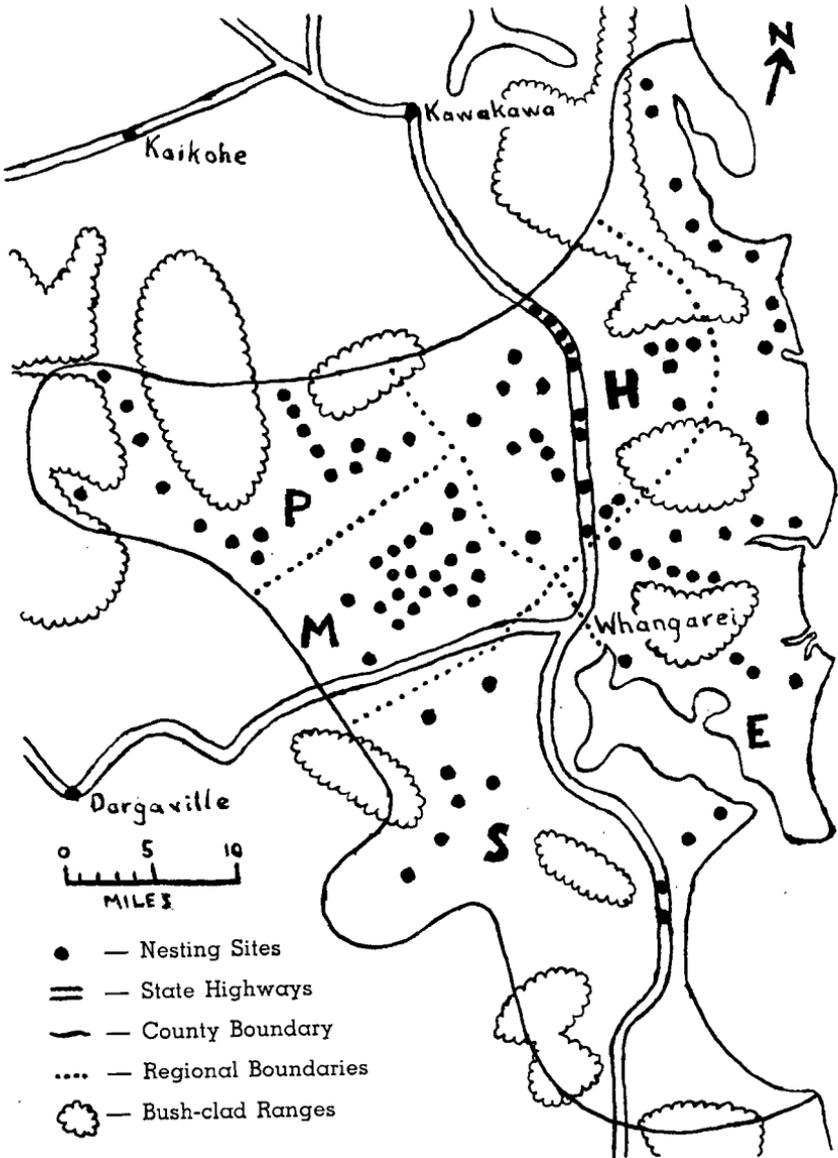
Distribution of nests is shown on the map, on which I have divided the County into five regions, indicated by dotted lines and lettered as below:

H — Hikurangi Swamp	E — East Coast
P — Parakao - Pipiwai	M — Maungatapere
S — Southern Area	

Hikurangi Swamp is the large area of low-lying land north of Whangarei, to which swallows apparently spread southwards from Waiomio (Bay of Islands) and were first recorded nesting in 1962.

East Coast covers the area from about 7 miles south of Cape Brett to Bream Head and Whangarei. In the northern part of this region the coastal strip is backed by high bush-clad ranges. Birds found in 1966 and 1967 at Ngaiotonga, Whangaruru, Mokau, Helena and Teal Bays, Mimiwhangata, and possibly those seen at Whananaki in March 1968, may have reached these localities by southward spread along the coast. A. T. Edgar (in litt.) informs me that in Whangaroa County swallows occupied Taupo, Tauranga, Wainui and Matauri Bays in 1966 and 1967, and that Purerua peninsula (north head of the Bay of Islands) now carries a swallow population. Up to 1965 no swallows had been reported from these areas; this may indicate that movement along the coast in the non-breeding season could be partly responsible for extension of breeding range. The birds in the southern portion of the region have probably spread out from the Hikurangi swamp. Population increase on the north side of Whangarei harbour has been relatively slow since C. W. Devonshire saw two birds on the Whangarei-Onerahi road in August 1964, but there have been sightings at the Town Basin and at Tamaterau (C. W. Devonshire) and a nest was found in the Parua Bay area by Alan Wagener in 1965/66.

Parakao-Piwai covers the north-western corner of the county and mainly comprises high bush-clad ranges with large river valleys. The swallow population is only in the river valleys. In the western valley Malcolm Ross reported a sighting in the Mangakahia area in December 1962 and breeding was recorded north of Pakotai in 1965/66 season; nine nest sites were located in my 1968 survey. The birds in this valley have probably spread down from the Kaikohe district. In the eastern portion of this region nine nest sites were located in



Map Showing the Distribution of Welcome Swallows in Whangarei County in the 1968/69 Season

my 1968 survey. The birds in this area may have their origin in southward spread from Motatau and Matawaia, or in westerly spread from the Hikurangi swamp.

Maungatapere region, west of Whangarei, is mainly well-watered farmland with plenty of bridges. I first saw swallows near Maungatapere in winter 1966; in 1966/67 season breeding was recorded at Kara and Poroti and at Titoki (J. R. McKenzie) and by 1968 swallows were plentiful in this region, winter flocks of up to twenty birds being reported on a number of occasions. One farmer at Ruatangata West in the northern corner of the region reported that this season he had at least 15 swallow nests under culverts on his farm, and that some of the culverts had three or four nests. The birds in this region may have their origin in spread from both the Hikurangi swamp and the Parakao-Pipiwai region.

The western portion of the southern region is mainly undulating farmland with very few bridges. Although there are very few swallows in this area they are very widespread and are nesting under most of the bridges. Two birds seen at Mareretu (Otamatea County) in February 1969 may have spread down from this area. Swallows are still very scarce in the Ruakaka-Waipu area and although I have searched most of the roads in this area only four breeding pairs were located.

NEST SITES, NEST CONSTRUCTION, MULTIPLE NESTING

Welcome Swallows in Whangarei County nest mostly under bridges and culverts but I know of six records of nesting in buildings, including one of a nest attached to the inside wall of a car shed.

Of bridge nests 45% were under concrete bridges and 55% under wooden bridges, but this is probably only because there are more wooden than concrete bridges in areas away from the main highways. One nest was under a small wooden bridge used as a cow track. Eight nests were found in culverts; two in large box culverts about six feet high, two in small box culverts about three feet high, and four in round culverts: In one round culvert which normally has only an inch or two of water a September nest was built only a few inches above water level and would not have survived even a small flood. At another, the nest was built not in the pipes themselves but on the concrete extension at the end of the culvert — a much safer situation. A pair which nested in a small box culvert with only about 12 inches between the water and the top of the culvert lost three nests by flood and only reared two chicks.

Most nests examined were of the "unsupported" type, attached to a vertical surface, only seven being "flat" nests placed on a horizontal support — one on top of a sagging log girder under a wooden bridge, one on top of a pipe, one on the malthoid layer between a wooden beam and steel girder, the others on steel girders. One nest was built so that it was partially supported by two large nails projecting from a wooden girder; eight nests were built on top of bolts projecting from concrete girders, seven of them in one district where the concrete bridges were so constructed. Some of these nests had come unstuck from the concrete girder but were still firmly attached to the bolt. Another of these nests consisted of a new nest built on top of an old one; this is the only record in my experience of this type of building which is said to be common in Australia but apparently rare in New Zealand.

Six bridges in Hikurangi swamp had more than one nest — one two-nest bridge at Kauri and two at Opuawhanga, and three-nest bridges at Opuawhanga, Otonga and Riponui. In the Parakao-Pipiwai region there were three two-nest bridges — one at Parakao and two at Pipiwai. In the Maungatapere region there was a five-nest bridge at Ruatangata West and the multi-nest culverts on a farm in the same district, which have already been mentioned. In the southern region there were two two-nest bridges near Tauraroa.

ACKNOWLEDGEMENTS

I am grateful for information about swallows passed on to me by local residents throughout Whangarei County; to Mr. A. T. Edgar for records from O.S.N.Z. Recording Scheme, for providing transport to areas beyond cycling range of my home, and for help in compiling this paper; and to Mr. E. G. Turbott for helpful discussion and advice.



SHORT NOTE

AN EARLY RECORD OF THE ORIENTAL CUCKOO IN NEW ZEALAND

Hamilton (1889) has described a specimen received by the Hawkes Bay Museum in the following terms: "Amongst a collection of New Zealand bird-skins sent to the Museum, I found a skin of what appeared to be *Eudynamis* with the long tail-feathers imperfect, some not fully grown. On taking up the bird to ticket it, I saw that the breast, instead of the usual brown marks, was distinctly transversely barred with black metallic bars, as in the Bronze Cuckoo (*Chrysococcyx*). These bars extend from the beak to the vent. The bill is less robust than *Eudynamis*. The feet are light in colour, like those of an albino specimen. It has certainly the character of *Eudynamis* when seen from the back; but from the under side it suggests a cross between *Eudynamis* and *Chrysococcyx*."

The suggestion of a hybrid origin can be safely dismissed, the description fitting in all essentials one of the rufous phases of the Oriental Cuckoo, referred to by Grant (1964) in his account of the bird seen at Kaihinu. Pough (1957, p. 134) remarks that, "There are two types of juvenile plumage. In one the birds are grey brown above and weakly barred, in the other they are bright rufous brown and strongly barred. Some females called 'hepatic' wear the latter plumage all their lives."

Oliver (1955) gives the measurements of the Long-tailed Cuckoo (*Eudynamis taitensis*) as Wing 188-195 mm., Bill 23-25 mm., Tail 230-250 mm., and those of the Oriental Cuckoo as Wing 188, Bill 23, and Tail 160. Pough (l.c., Pl.16) illustrates the hepatic female of the Oriental Cuckoo. The above specimen would be the first Oriental Cuckoo recorded in New Zealand, so that Hamilton's failure to recognize it is understandable. The similarity of the two species in size, except for the tail length would account for his confusion.

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COMMON SANDPIPER IN NORTHLAND

By A. T. EDGAR

A Common Sandpiper (*Tringa hypoleucos*) visited a shellbank on the southern shore of Kerikeri Inlet on 20/3/69. The shellbank is a high tide roost, and when the sandpiper was first noticed about 1½ hours after high tide Pied Stilts, New Zealand Dotterel and Caspian Terns were also present — the terns in small parties on the outer edge of the shellbank near the tideline, dotterels resting on the dry shell, stilts scattered on the tideline, shellbank and around pools of brackish water. The sandpiper did not associate with the other waders but moved among them as it fed round the rim of the pools, on the edges of a small runnel between pools and along the edge of the tide. At one time it paused for a few minutes to preen on a mound of dry shell. It was under observation by me in good light, using x 10 binoculars at ranges of from 40 to 20 yards, for about an hour. It did not appear at all shy and even closer observation would probably have been possible but for the presence of the stilts. Eventually something disturbed the stilts and terns; the sandpiper rose when they flew, and did not return to the shellbank. The following is a summary of my field notes.

Size, about that of a Banded Dotterel, but the sandpiper is a slim graceful bird with rather a small head; bill straight, rather fine, about one inch long, dark brown with a suggestion of lighter colour at the base of the lower mandible. Tarsus about the same length as bill, greenish grey; iris brown. Upper parts olive brown, edges of quills on the closed wing darker brown and primary coverts slightly browner than the rest of the upper surface. A whitish line over the eye; dark eye stripe. Ear coverts, sides of face and neck and sides of breast pale greyish brown, the brown on the sides of the breast extending to just below the angle of the wing, but separated from it by a narrow vertical white line. Rest of underparts white. A broad conspicuous white wing bar shows in flight, when the centre of rump and tail are seen to be brown, with white edges to the rump and outer tail feathers white, lightly barred. Flight quite distinctive; low over the water, rapid shallow wing beats alternating with short glides during which the wings are held motionless in a bowed position. Food was obtained by picking, not probing. The bird fed along the edge, just in the water or just above it, progressing with an active walk which sometimes quickened to a run. Frequent head bobbing, and continual wagtail-like up and down movement of the tail. When at rest it did not adopt an erect stance. The body was held at a slight angle to the horizontal so that the tip of the tail was about the same level as the head.

This appears to be the second record of a Common Sandpiper in New Zealand. The first suspected sighting was near New Plymouth in October 1964 (*Notornis* XII, 107-8). Young birds and adults of the Spotted Sandpiper (*A. macularia*) in winter are said to be indistinguishable from *T. hypoleucos* in the field, but *A. macularia* breeds

in North America and in winter it is stated to range southwards to areas east of the Andes, with stragglers reaching Europe. *T. hypoleucos* is a palaeartic breeder, wintering birds on our side of the globe ranging south through S.E. Asia to Australia. In Malaya, where I lived for many years, it was a familiar migrant, arriving about August and last birds leaving about April/May. The call is a high-pitched "twee-dee-dee," uttered when the bird takes wing. I heard no call from the Kerikeri bird — the sound may have been lost in the clamour from terns and stilts as they rose from the shellbank.

The line of white between the angle of the wing and the brown patch on the side of the upper breast may be a variable field character. It is not specifically mentioned or illustrated in the Handbook of British Birds (Witherby) or mentioned in Birds of Western Australia (Serventy and Whittell) but is shown in the illustrations facing page 119 of Field Guide to the Birds of Britain and Europe (Peterson, Mountfort and Hollom) and on page 21 of Field Guide to the Waders (Condon and McGill, 1965). A Guide to the Birds of Ceylon (G. M. Henry, 1955) mentions it as a good recognition character in the field.

The habit of frequently moving its tail up and down (as distinct from mere "bobbing") is said to be shared by the Spotted Sandpiper and by the Green and Wood Sandpipers, both of which have a white rump; the Wood Sandpiper reaches Australia and the Green Sandpiper comes as far south as Borneo.

As further examples of the Common Sandpiper may turn up in New Zealand, a note on its habits in Malaya may be useful. It is commonly found on the banks and beds of clear running streams in the lowlands, but also up to 4000 ft. a.s.l. Less frequently but quite often around mining pools, on rice fields, on mudflats and on the sea shore. On the coast it seems to have a preference for stretches which include rocks as well as sandy beaches, and for the edges of stream mouths and lagoons. Birds frequently perch on stones in rivers and rocks on the coast, sometimes on snags, fallen tree trunks, jetties and boats. Food is normally obtained by picking along the water edge; I once saw a bird jump upwards and pirouette in the air as if in pursuit of a flying insect. Most books emphasise the solitary nature of the species outside its breeding season and state that it does not flock, though several birds may at times be seen together. In Britain, Witherby mentions as exceptional a compact flock of 20 in April and 30-40 seen together in August. In Malaya, from the time of its arrival about August until the end of the year it is usually seen in ones and twos, but parties of 5-6 or even more may be seen flying up or down a river, particularly in the evening. On an unfrequented stretch of coastline in late December I found 18 together in the early morning on a sandspit by a lagoon; during the day they scattered in ones and twos along several miles of coast and at dusk a party of c. 30 had collected on some rocks further along the beach.

SWIFT ON MOTUNAU ISLAND

By J. A. GIBB and G. M. DUNNET
Animal Ecology Division, D.S.I.R., Lower Hutt

From about 1930 to 2000 hours on the evening of 4 December 1968 we watched a swift flying around the western tip of Motunau Island, off the north Canterbury coast. We were on the shore and for most of the time the swift was flying around the cliff-tops about 100 ft. above us, though occasionally it flew about 150 yards out to sea. The bird was almost continuously in sight in this one area until it disappeared at dusk. Initially the light was quite good and we obtained many prolonged and satisfactory views of it through binoculars as it twisted and turned. We did not hear it call.

The bird was an obvious swift which we judged to be about as large but probably no larger than *Apus apus*, which we both know well in Europe, but Starlings were the only other birds of similar size available for comparison. It had long scimitar wings and flew fast, and the tail was seen to be quite deeply forked when occasionally it was fanned. Although always more or less overhead, the bird frequently wheeled steeply or hesitated in flight, showing its upper surfaces. We looked particularly for white or paler areas on the rump and throat but the bird appeared uniformly dark. Certainly neither the rump nor the throat was white, but either could have been slightly paler than the rest of the body; the pale throat of *Apus a. apus*, for instance, is hard to see even in a good light.

The New Zealand Checklist (Fleming 1953) includes only two species of swift, namely the Spine-tailed Swift (*Chaetura caudacuta*) which has occurred irregularly, and the Fork-tailed (or white-rumped) Swift (*Apus pacificus*) of which there are but three records (Oliver 1955, Falla *et al.* 1966); both "winter" in Australia.

The Motunau bird was obviously not *Chaetura*, and was almost certainly a species of *Apus*; indeed, in size, silhouette, colour and flight it looked identical to *Apus a. apus*. Other genera such as *Cypsiurus*, *Cypseloides* and *Collocalia* can be discounted on the grounds of size, shape of tail, colour, habit or flight (see Smythies 1953, 1960, La Touche 1931-34, Whistler 1941).

Lack (1956) reviewed the species of *Apus*. *Apus pacificus* winters in Australia, but all its races have white rumps — except for *A. p. acuticaudus*. This race, known only from Cherrapoongi in the Khasia Hills of Assam, has a dark rump and a streaky white throat. Highly unlikely as it may seem that this apparently very localised race should occur in New Zealand, it cannot be ruled out altogether. Its description seems to fit the Motunau bird, but we do not know how to distinguish between it and *Apus apus* in the field.

Of the other species of *Apus*, only *Apus apus* seems possible — and it "winters" in Africa. The eastern race *A. a. pekinensis* would seem the least unlikely to reach New Zealand, but it has a whiter throat than the nominate form and we failed to see this. Nonetheless, on balance, we are inclined to believe that the Motunau bird was *Apus apus* ? subsp., though *Apus pacificus acuticaudus* remains a possibility.

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SHORT NOTES

NIGHT FLIGHT OF THE WHITE-FRONTED TERN

During 1968 I spent eight months running between Auckland and South Island ports, the complete voyage Auckland to Auckland being made each week. It was noticed early in the year that a regular feature of the voyage was a night flight of White-fronted Terns. This flight was then looked for, and seen, throughout the year.

There is a large and definite movement of these terns away from the coast in the evening, with a return flight at first light. As a rule the birds proceed at right angles to the coast, in a fairly high and direct flight. How far they fly out is not known but with the ship ten miles off the Wairarapa Coast, the terns fly over still intent on getting seaward. It is suggested that this could be a feeding flight since it must be safer for the birds to roost on small off-shore islets than to raft at night in the open sea. Another factor supporting the feeding flight hypothesis is that on a number of occasions both Pomarine and Arctic Skuas have been seen flying out with the terns. There is very little hawking by the skuas on these occasions; it seems rather that they are heading for the same point off-shore. The skuas have never been seen returning with the terns in the morning.

— JOHN JENKINS



CATTLE EGRETS IN WESTLAND

On 26/4/69 Mr. A. J. Ure, Westland National Park, reported sighting two Cattle Egrets (*Ardeola ibis*) on the Waiho Flats a few miles south of Franz Josef. This sighting was confirmed by Mr. P. Grant, Regional Organiser, O.S.N.Z., on 4 May when he observed the two birds feeding amongst cattle. On 25 May Mr. Ure could not find the birds.

On 8 June I saw two Cattle Egrets feeding with 7 White-faced Herons (*Ardea novaeollandiae*) near a mob of calves in farmland at Kowhitirangi, inland from Hokitika.

— C. R. VEITCH

THE FUTURE OF ORNITHOLOGY IN NEW ZEALAND

By JILL HAMEL

Attitudes to Basic Theory

Eighty years ago when comparative anatomy and taxonomy were young and exciting disciplines, the study of birds in pursuit of these subjects was a most respectable academic activity. Ornithologists produced ideas that excited large sectors of the scientific world. Today the limelight is on such studies as primate behaviour, cell structure and the chemistry of genes, and bird studies are something of a biological backwater. Tinbergen however is optimistic. When discussing Lack's work on adaptations in seabirds he remarks, "I feel that this field of research may well become one of the real 'growing points' of ornithology in which our science will once more make a contribution to Biology in general." (Tinbergen 1967:53.)

Though ornithological journals flourish and like all aspects of the paper war increase in fire power, it has seemed to me that ornithological research generally has been plodding along accumulating vast quantities of empirical data with few attempts at syntheses, little evaluation of ornithological data in the light of other biological advances, and in particular with an uncritical attitude to basic theory. There is little point in fussing over our lack of prominence at the moment but when a science is in a state of quiet progress with no great theoretical advances appearing, I think there is a tendency for basic theories to be taken for granted until they sink into the background of thought where they take on the character of unexamined preconceptions.

Why should we worry about basic theory at all? Why not just get on with collecting 'the facts'? Studies of human behaviour are showing more and more conclusively that we see what we expect to see, that all perception is influenced by preconception! Consequently it becomes imperative that we should be very aware and critical of those preconceptions, those basic assumptions which affect even the simplest observational work. But moderation in all things. To be aware and critical of an assumption does not imply rejection. We must use basic theories to interpret and order our data or else the results would be chaotic and we would be unable to communicate what we have seen and heard to other people.

Ornithological Theorists

Three men whose theoretical papers have been of considerable interest in the past decade are Dr. David Lack as a synthesizer, and Dr. Ernst Mayr and Dr. N. Tinbergen as men who each work between two disciplines. Dr. Mayr's work on avian systematics has contributed considerably to general concepts of evolution, and Dr. Tinbergen's work has added much to behavioural concepts. I would like to discuss two papers of Lack's and Tinbergen's which were read at the last International Ornithological Congress and which have just been published. They are "Interrelationships in breeding adaptations as shown by marine birds" by D. Lack, and "Adaptive features of the Black-headed Gull" by N. Tinbergen.

'Description of Undisturbed Nature' versus 'The Experiment'

In his paper Tinbergen makes a very nice point about the relationship between experimental methods and methods involving observation, description and simple measurement. He is commenting on Lack's procedure in his paper on marine birds, in which Lack sets certain properties of birds against other aspects of their ecology with a view to finding correlations between them. "These correlations are then interpreted in terms of function, or survival value. For instance nesting on cliffs or islands is correlated with the relative inaccessibility of such places to mammalian predators, and therefore interpreted as a defence against such predators. . . . The net result of this procedure is a set of hypotheses of the following type. 'If this species did not possess this particular feature it would be less successful than it is.' To Tinbergen experiments should test such hypotheses, but the result of the experiment "amounts to no more (and no less) than finding out whether a deviation from the norm is penalized." (Tinbergen 1967:43). This seems a very limiting view of the usefulness of experimentation, but Tinbergen does concede that if the experiments are well done they will provide information about the environmental pressure which is doing the penalizing i.e. which predator, and how it is exerting pressure.

Considering the academic respectability that usually accrues to experimental studies in Biology generally, Tinbergen's comments on descriptive methods are interesting. "First it is the descriptive interpretive method which provides the ideas" and the experiment only confirms or causes us to reject the idea. The next step is to "return to the interpretive method for new inspiration. *The interpretive method requires a great deal of sound intuition and imaginativeness.*" (my italics). Secondly he emphasises that there are many observations whose effects are so obvious that they do not need experimental verification. It would be pedantic to test experimentally the assumption that when a gannet throws an intruder off its nest, this is an effective nest defense activity. Thirdly experimental evidence has to be interpreted in the wider context of the animal as a whole and the environment as a whole. (Tinbergen 1967:44).

Description and interpretation is virtually the only procedure used in New Zealand ornithology. Tinbergen does not place much emphasis on *the* big problem of using descriptive methods though he does mention it when discussing an experiment done by Kruijt on the eggs of Herring Gulls. This experiment showed that plain coloured eggs put under gulls suffered heavier predation than cryptically-coloured, spotted eggs, but Kruijt was also able to show that the gulls did not sit so tightly on plain coloured eggs and left them exposed to potential predation for longer periods than they did their ordinary spotted eggs. This was a disturbing variable which was discovered "but with this type of experiment one can never be sure that one knows or even suspects all possible variables." (Tinbergen 1967:46). This conclusion applies even more strongly to the undisturbed environment which is simply observed than it does to the above experiment where a natural situation was altered. But if we set up a totally artificial environment and control as many variables as we can, what do the results mean? The more artificial we make the environment, the more difficult it becomes to interpret

the results. We are caught between two unsatisfactory extremes. Lack's version of a multivariate analysis in his paper on seabird adaptations suggests an additional method which though it has its pitfalls is producing interesting results in many fields of research. The undisturbed environment is observed in great detail and a large number of variables are considered in conjunction.

Breeding Adaptations in Marine Birds

In his paper to the Ornithological Congress Lack takes into consideration data from 270 species belonging to 20 families. Of these families 12 are exclusively marine, 3 mostly marine and 5 contain some marine species. He subdivides the species into:—

- (a) intertidal feeders — oystercatchers, shore plovers.
- (b) inshore feeders who obtain their food on or under the water in sight of land — most gulls.
- (c) offshore feeders — albatrosses.

This division in feeding habits Lack considers has profound effects on such things as the sizes of breeding colonies, on incubation and fledgling periods, clutch size and the age at which the birds first breed. At the same time he notes a strong correlation between the behaviour of the young (whether they leave the nest on hatching or remain in the nest), whether or not eggs and young are cryptically coloured and the nesting dispersion (solitary or colonial); the major controlling factor being predation, with feeding habits having some effect also. This method of considering many factors at once and comparing them over a large number of species creates logical patterns in the data and occasionally shows apparently non-adaptive behaviour to be the result of some compromise. As an illustration of the latter point Lack notes that the earliest layers in *Puffinus puffinus* raise the most young. Why do not all pairs breed earlier? Shearwaters lay relatively large eggs and presumably each female lays as soon as she can obtain enough food to produce her egg. Large eggs produce large chicks which are easier to pass food to and keep warm, and Lack presumes that this advantage outweighs the advantages that would be gained from laying smaller eggs and hatching smaller and more vulnerable chicks at an earlier date when the cycle of food supply would be better geared to chick feeding.

The Future

What sort of empirical data is required to produce deductions such as these? Obviously the first thing required is a wide knowledge of a given species' activities, combined with an acute awareness of basic assumptions which may have become built into the data. Feeding studies, breeding studies, behavioural work and the general physiological requirements of the species being studied should be considered in toto, not forgetting Tinbergen's plea for a leaven of imaginativeness. Though Lack does not make any use of statistical analyses, his method is a multivariate analysis without using measurements. It seems an obvious step to collect metric data on such things as clutch size, incubation and fledgling periods, on distances travelled to feeding grounds and so on, and to submit this data to the various multivariate analyses of the statistician. Yet a metrical test, like an experiment, is generally used to test the validity of an idea which has sprung from some general observations. From this it appears that the most productive part of the whole process of

research is the initial mass of observations and interpretations of what the birds are doing. I am not decrying the use of metrical methods. Measuring, graphing and the use of statistical analyses are necessary but I would like to suggest a priority system. There is no need to reject a course of action or a body of data because it does not lend itself to precise description or measurement. It is desirable to aim at a means of measuring some variable that may be affecting an aspect of the research in hand, but if it is data such as the distance to the feeding ground of a marine bird which can be only roughly evaluated, this is no cause for despair or the rejection of the imprecise data that are available. There is also the danger of distorting data through being too precise. The human love of naming and classifying may result in the setting up of discrete categories when a better interpretation would be to allow the data to lie in a somewhat amorphous and imprecisely defined continuum.

At the same time there are numerous aspects of bird study where there is an obvious need for the collection of precise and comparable data from different species of birds so that valid comparisons can be made between species and across families. The work done in the North Island on the identification of feeding stations in bush birds and the use of this technique in the study of Saddlebacks is an excellent example of what can be done to standardize a technique and enable several observers to produce complex but unified data. (Atkinson, 1966:12-17). Field study courses allow ornithologists to discuss and, we hope, agree on optimum field methods (and to produce some of those ideas that they have no 'good' evidence for). In Otago we have produced a cyclostyled sheet for recording plumage variations in Pied and Black Stilts which will help give uniformity to observations by a large number of observers. A similar format could be designed for recording plumages of other variable species.

Conclusion

I would like to suggest that the following lines of attack would result in interesting and productive ornithological research in New Zealand.

1. Studies in depth of given species rather than regional studies,
2. The seeking of interrelationships between the various adaptive characteristics of groups of birds in similar habitats,
3. Even more concentration than at present on the collecting of uniform and comparable data,
4. More discussion of theoretical matters.

This paper has had its origin in three main sources; the International Ornithological Congress papers, the problems encountered in encouraging ornithological activity in Otago while I was O.S.N.Z. Regional Representative, and some discussions of problems in fieldwork in another discipline altogether, that of archaeology.

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RATS AND MOA EXTINCTION

By C. A. FLEMING

A number of hypotheses have been put forward to explain the extinction of some 27 species (7 genera) of moa (*Dinornithiformes*) and a number of carinate birds during the late Holocene. The writer has emphasized (1951, 1962) that these extinctions must be attributed to the great ecological changes brought about by the coming of man with fire, rats and dogs within the last two thousand years. But the problem remains mysterious because the early Polynesian colonists were apparently neither populous nor sophisticated, their fires were not universal, their dogs reputedly were not feral, and the Polynesian Rat (*Rattus exulans*) seemed unlikely to have been effective as a predator on large birds with strong eggs. So in 1951 I suggested that dogs, contrary to tradition, might have become wild and hunted in packs. Recently, however, observations at Kure Atoll (Hawaiian Islands) have revealed an unsuspected behaviour trait in at least some populations of Polynesian Rats that is relevant to our speculations on moa extinction.

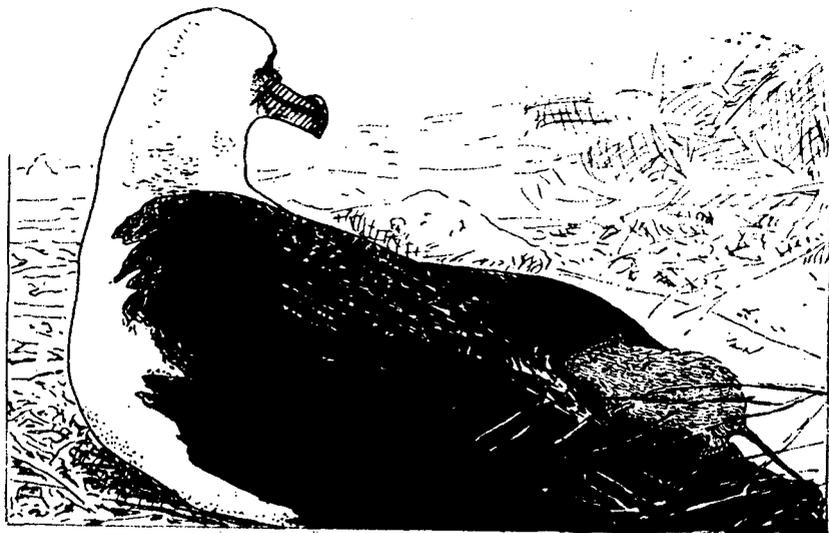


FIGURE 1 — Polynesian Rat approaching an open wound on the back of a Laysan Albatross. The bird's bill is blood-stained from his probing into the wound. Traced from photograph reproduced by Kepler (1967, Fig. 2).

C. B. Kepler (1967) has recorded rat predation on nesting Laysan Albatrosses at Kure Atoll, the only place where Polynesian Rats and albatrosses are sympatric. Injured, dying and dead adult albatrosses found with large gaping wounds in their backs led to observation at night. Rats approach sitting albatrosses, climb up over the tail and up their backs, first clipping off rump feathers, and then opening a hole in the skin to feed on exposed flesh and subcutaneous fat (Fig. 1). Many rats scampered off an albatross back when disturbed by torchlight, and over 20 fed on one bird. The albatross may turn and seize a rat, throwing it aside, but others take its place. The wounds are enlarged to 5 or 7 inches diameter, often exposing the thoracic cavity, ribs or lungs, and may become fly-blown. The bird probes in its wound, staining its bill with blood. Immobilisation and death follow in a day or so. 50 adults so killed were found in a population of about 5000, of which about 1000 pairs breed. Thus, the annual mortality from rat predation is of the order of 1% to 2½%.

The rats' behaviour described at Kure Atoll may have been recently and locally acquired, like the habit of opening milk bottles by British tits, but if so it could have happened at other times and places. Obviously Polynesian Rats are potential predators on large sluggish birds nesting on the ground, and cannot be neglected as factors in the reduction or extermination of moas and ground-nesting carinates such as *Aptornis*, *Notornis* and *Cnemioornis*.

REFERENCES

- FLEMING, C. A., 1951: *Notornis* 5: 7-10.
 ———— 1962: *Notornis* 10: 113-7.
 KEPLER, C. B., 1967: *Auk* 84: 427-30



SHORT NOTE

BANDING RECOVERY — RED-TAILED TROPIC BIRD

Whilst J.J. was on passage from Trincomali to Penang on 7/5/65, a Red-tailed Tropic Bird (*Phaethon rubricauda*) landed aboard the M.V. Wairimu. The bird was immature when caught, having a dark bill and with the rachis and tip of the primaries black. The tail streamers were only 1½ inches longer than the other tail feathers, and wholly white, showing none of the adult red colouration. During a stay on board of 4½ hours the bird regurgitated a partially digested flying fish about 3 inches long.

Following banding the bird was released offshore in a South force 5 wind some 24 miles N.E. of Sumatra (6° 19'N; 94° 40'E).

This bird was subsequently recovered at Gunners Quoin Island (19° 57'S; 57° 37'E) North of Mauritius on 20/9/68. This is a distance of 2,700 miles and an elapsed time of 3 years 4 months 13 days.

— JOHN JENKINS
 C. J. R. ROBERTSON

WEKA LIBERATIONS IN THE PALLISER BAY REGION

By L. T. PRACY

N.Z. Forest Service, Wellington

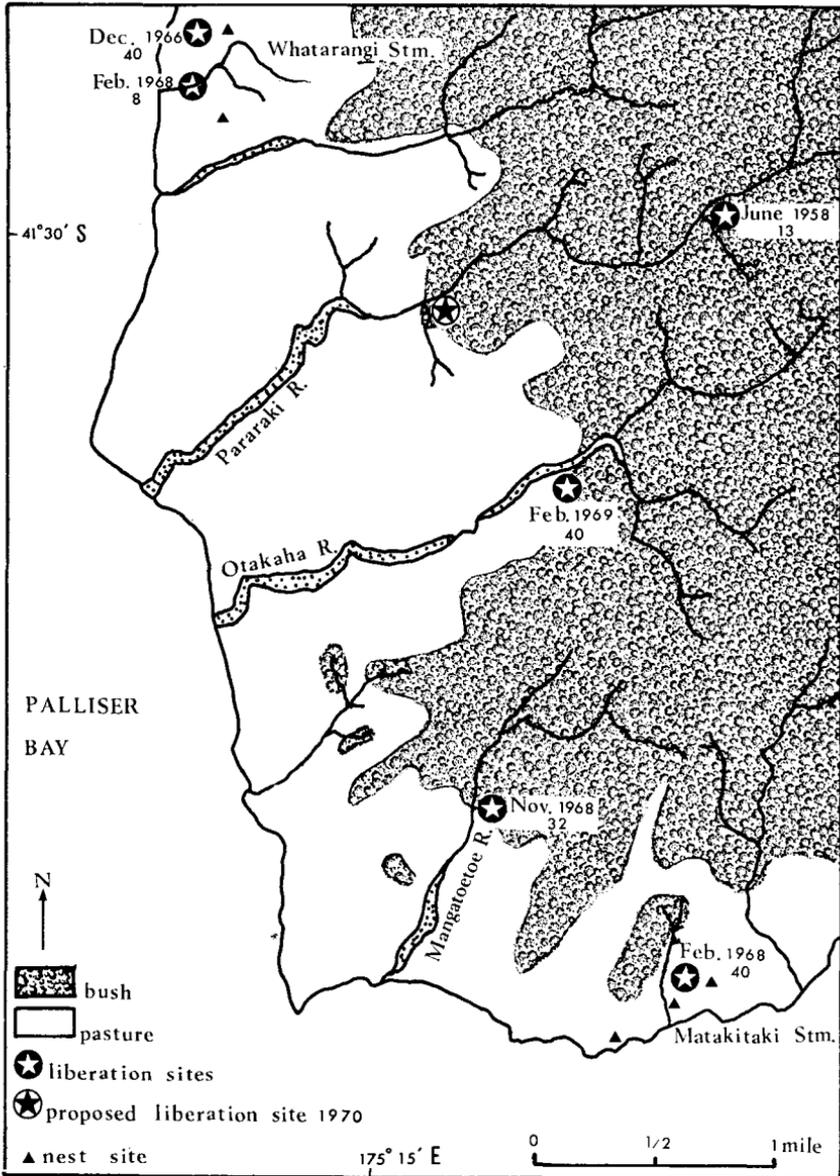
By courtesy of the Wildlife Service, Department of Internal Affairs, a number of wekas (*Gallirallus australis greyi*) from Poverty Bay have been released in Forest Service study areas. Two liberations were made in 1958 into mixed forest habitats up the Pararaki River, Aorangi Range and at the Orongorongo Research Station, Rimutaka Range. Both were unsuccessful. The reasons for failure may be related to the low numbers released (13), to climatic differences and to the birds' inability to adapt to a forest environment and its different food resources. Predators may also have been influential in preventing establishment, particularly at the Orongorongo site, but in the Aorangi Range, stoats, cats and rats are in extremely low numbers and would in no way compare with numbers in Poverty Bay.

With the approval of interested property owners, subsequent liberations were made onto pastoral lands containing adequate cover and water. The programme entailed the release of 40 birds at Whatarangi (December, 1966) followed by the release of a similar number near the Matakītiki Stream, Cape Palliser (February, 1968) with further liberations being made at later dates in the interjacent catchments.

To date, four liberations have been made (Figure 1) with an additional eight birds released at Whatarangi to support known establishment. It is intended to liberate a further 40 birds up the Pararaki River in 1970. Upon the completion of the major liberations, supporting numbers of birds will be released at sites where establishment has occurred.

Dispersion from liberation sites has been limited and personal communication with interested observers reveals that only two birds have been known to disperse any distance. This occurred from the main Whatarangi site shortly after release, the birds in question being recorded in the Whangaimoana Stream five miles away to the north-west.

Both the Whatarangi and Matakītiki liberations appear successful, chicks and nests being found in both areas. A clutch size of two eggs has been recorded from two nests. Observation and recording of the establishment and dispersion of these birds will be continued. Many thanks are due to interested residents and bach owners for the welfare of the birds and for information on their movements.



OBITUARY

The passing of Maurice E. Fitzgerald, O.B.E. (Military Division), a foundation member of the Ornithological Society of New Zealand Inc., will be greatly regretted by his contemporary champions of the native bush and birds. A fighting man always, he went to the South African War at the age of seventeen and was seriously wounded. As a Major in the Royal Engineers, he served with distinction in the First World War in France, where he was decorated.

One of his victories in subsequent fights when he was the Matamata County Engineer was the setting aside of "Fitzgerald Glade," a fine piece of bush on the Auckland-Rotorua road just west of the Mamaku Range. He retired to Tauranga and from there campaigned vigorously in the cause of nature, with letters to the press and otherwise, right up to his recent death at Hamilton. He was particularly interested in the study of the native parakeets and the Brown Teal and contributed articles to "Notornis," the magazine of the Ornithological Society. He is survived by his wife.

Tauranga has the distinction too of having been the retirement haven of another active foundation member, the late Bernard Sladden, who, from early days, contributed a great deal on the Bay of Plenty area, with strong emphasis on the offshore islands.

— H.R.McK.



REVIEW

Birds of the World, I.P.C. Magazines Ltd., London. This is a weekly magazine to be published in 110 parts, and will become available in New Zealand from 28th October. Part 3 of Vol. 1 has recently come into my hands, and I am much impressed by the high standard attained, both in the text and in the illustrations, colour and black and white; but then one would expect a high standard indeed in view of the personnel on the Editorial Board: James Fisher, Roger Tory Peterson, Stanley Cramp, Eric Hosking, John Warham, Vincent Serventy, John G. Williams, and Bruce Coleman. This particular issue covers a number of sea-birds, of special interest to N.Z. readers being articles on the White-faced Storm Petrel and the Diving Petrel. There is also a paper, superbly illustrated, on some of the pelicans. Contributors are all ornithologists of international reputation, viz. W. R. P. Bourne, David Saunders, John Warham, Leo Batten, and Stanley Cramp, and Dr. M. F. Soper has contributed some of the photographs. Numerous distribution maps are a further pleasing and valuable feature of a publication which must have a world-wide appeal.

In the several American publications on the world's birds that I have seen, there has been a noticeable bias towards the birdlife of the Nearctic and Neotropical Regions. Let us hope that the inclusion of Vin Serventy and John Warham on the Editorial Board may preserve a necessary balance between birds of all Regions, for in this issue there is a tendency to bias in favour of Palaearctic birdlife.

— A.B.

LETTER

Sir,

Hindwood (Notornis 16: 64-65) has again brought in discussion the matter of authorship of the new animals described in White's *Journal* (1790), concluding that there is: "no doubt at all that Shaw was responsible for the scientific names of both the birds and the fish described in White's *Journal*."

As I am one of: "some recent authors who attribute the name [*Aegotheles cristatus*] to White," it is perhaps well to state my reasons for doing so, as Hindwood's letter is evidence that on previous occasions I have not been clear enough.

Authorship of scientific names in zoology is covered by article 50 of the International Code of Zoological Nomenclature, which I quote here for the benefit of those who do not have the code available: "The author (authors) of a scientific name is (are) the person (persons) who first publish(es) it in a way that satisfies the criteria of availability, unless it is clear from the contents of the publication that only one (or some) of the joint authors, or some other person (or persons) is alone responsible both for the name and the conditions that make it available." Of great importance are the words "clear" and "alone." In my opinion the correct interpretation of this article is that the author of a work is regarded as responsible for its contents unless it is specifically stated that certain sections have been contributed by somebody else. This is certainly not the case in White's *Journal*, where in the introduction only assistance from others is acknowledged.

The confusion has been caused by a lack of appreciation that two different kinds of authorship are involved. There is the authorship as understood in systematic zoology, which has been codified as above, in which everything appearing under the name of an author is attributed to him. The second interpretation of authorship is the question who has actually written a certain section. This is the more common use of authorship, and the one adhered to by Hindwood. In matters of nomenclature, however, the person under whose name an article appears is responsible for its contents, the question of who has actually written it (or at some later date claims to have written it) being for this purpose irrelevant.

Inasmuch as there is no *clear* statement in the *Journal*, that anybody but White is responsible for its contents, White remains the author of the whole, no matter how much circumstantial evidence there is that others have assisted him and have contributed the bulk of certain sections.

Finally a word about the gender of *Aegotheles*. Scarlett (Notornis 15: 256) treated it as masculine, as did such competent scholars as Salvadori and Hartert. Peters (Check-list Birds of the World IV: 181) expressly states that the gender is masculine. Contrary to this, Hindwood claims that: "The correct usage of *cristatus* Shaw in its present combination with *Aegotheles* is *cristata*"; in other words, Hindwood regards the gender of *Aegotheles* as feminine. According to a Greek dictionary consulted by me *Aegotheles* is a classical name, used in the works of Aristotle, where it is masculine. The correct name of the bird under discussion is therefore *Aegotheles cristatus* (J. White).

— G. F. MEES

NOTICE

A study of the distribution and breeding status of Black-backed Gulls in New Zealand is being conducted by the Wildlife Service. Information is required on:

- (a) the approximate size and location of breeding colonies (where possible with a map reference);
- (b) the types of terrain on which nesting is occurring, e.g. river-bed, island, etc.;
- (c) whether any other colonial birds are nesting in association with the Black-backed Gulls.

Please send any relevant information to:

M. Harrison,
Research Section,
Wildlife Branch,
Internal Affairs Dept.,
Private Bag,
Wellington.



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Nomenclature: Contributors should follow the Checklist of N.Z. Birds for both the scientific and vernacular names. Scientific names of species and genera are printed in italics, and in the script should be underlined; and the specific or subspecific name should be enclosed in brackets if following the vernacular name, thus: Stewart Island Kiwi (*Apteryx australis lawryi*). It is necessary to give the scientific name as well as the vernacular the first time the latter is mentioned, but thereafter only one of the names. Capital letters should be used for vernacular names.

References: If listed, these should be in the form of the following examples:

1. Atkinson, I. A. E., 1964: Feeding stations and food of the North Island Saddleback in August. *Notornis* 11, 2, 93-97.
2. Buller, W. L., 1888: A History of the Birds of New Zealand (2nd ed.) 2 vols., the author, London.

The references should be serially numbered, and in the text, should be shown thus: Atkinson 1964 (1), and Buller 1888 (2). If references are cited in the text, the following shortened form may be used: Atkinson 1964, *Notornis* 11, 2: 93-97.

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