

bill is up to 3mm. longer, and yet not much wider than that of the fluttering shearwater, and the resulting narrower shape is noticeable when the two are compared. The plumage is practically the same as in *P. gavia gavia*, although the Kapiti skin is particularly dark on the back and both the Kapiti and the last Pukerua Bay bird have darker axillaries than the fluttering shearwater (wholly brown, without white tips). Dimensions are compared in the following table. Fluttering shearwaters from northern New Zealand and New South Wales (*Puffinus gavia byroni* (Math.) have been distinguished from those of the Cook Strait breeding area (*P. g. gavia* Forst.) by some workers, but there are too few of the latter available to tabulate them separately.

Puffinus gavia gavia/byroni (extreme dimensions of 35 Australian and New Zealand examples, from Serventy, 1939).

Wing.	Tail.	Tarsus.	Culmen
180—221	58—68	36—46	30—35mm.

Puffinus gavia huttoni (extreme dimensions of six Snares and Australian examples, from Serventy, 1939).

Wing.	Tail.	Tarsus.	Culmen.
207—228	64—71	40—43	35—38mm.

Puffinus gavia huttoni (three examples from Cook Strait).

	Wing.	Tail.	Tarsus.	Culmen.
A	228	68	44	38mm.
B	—	—	—	37mm.
C	228	67 (approx.)	44	37mm.

A—Skin from Kapiti, Dominion Museum, collected by A. S. Wilkinson.

B—Dried head, Pukerua Bay, April, 1947, collected by V.I.C.

C—Fragmentary specimen, Pukerua Bay, October, 1947, collected by V.I.C.

Although the Snares Islands, 62 miles south of Stewart Island, are the only known reported breeding ground of Hutton's shearwater, others may exist, but it is probably safe to think of the above Cook Strait birds as widely dispersed members of that southern population. On the other hand, it is remotely possible that the Cook Strait birds are not the same as the Snares one: only more definite information can settle the problem.

Reference.—Serventy, D. L., 1939. The White-breasted Petrel of South Australia. *Emu*, vol. 39, pt. 2, pp 95-107.

SEABIRD MORTALITY IN FEBRUARY, 1947.

By J. M. Cunningham, Masterton.

In mid-February, 1947, a southerly storm of unusual severity hit the southern part of the North Island. Widespread damage and some flooding was the result in the Wairarapa, and at sea large numbers of birds of several species perished. A visit to the Wairarapa by Mr. H. R. McKenzie happily coincided with this storm, and his experience of northern petrels was invaluable on February 16, when a visit was made by the writer with Messrs. McKenzie, R. H. D. Stidolph and P. J. Parr, to Lake Ferry. This is at the south-east extremity of Lake Onoke, which is separated from the sea by Palliser Spit, access to which is made from the western side of the lake. The gale, though still strong, was by this time abating, and it was a fine experience to see several shy mollymawks (*Thalassarche cauta*) and Buller's shearwaters (*Puffinus bulleri*) flying within a few yards of us over the lake, and beating along the line of breakers across the spit. One or two other birds could be seen at

sea, but owing to the distance we were unable to identify these.

Specimens were taken from the shores of the lake here, and the writer and Parr collected many corpses from the Spit the following week, when Stidolph visited the northern end of Lake Wairarapa, at Featherston Domain. Here he found corpses of six species, washed up on a shingly beach. Messrs. McKenzie and H. L. Secker collected further specimens from Petone beach and Lyall Bay, Wellington, respectively: a grey-backed storm petrel (*Garrodia nereis*) was sent to the writer for identification by Mr. W. Knight from Paraparaumu Beach, and Major R. A. Wilson inspected two miles of beach between the Rangitikei and Manawatu rivers, finding only a penguin. Mr. V. I. Clark recorded some interesting corpses from Pukerua Bay, but Mr. C. H. Skuse was unable to find any corpses on Hokio Beach, Levin: the wind here was practically parallel with the coastline. Finally, a number of birds were washed ashore or blown inland at Wanganui, and were recorded by Mr. J. Moreland. It is of interest to note that no birds from westerly beaches were sent in in response to newspaper requests, as in a storm in the previous November. I am indebted to all the foregoing for placing their information before me, to Messrs. C. A. Fleming and E. G. Turbott for confirming various identifications, and to Dr. W. M. Hamilton for calculating the standard deviations in appendix 2. I particularly wish to thank the Assistant Director of Meteorological Services, Wellington, for his valuable reports of the storm, and for the tables and maps which he willingly made available.

LIST OF SPECIMENS.

Little blue penguin (*Eudptula minor*).—Wilson collected one between the Rangitikei and Manawatu rivers.

Diving petrel (*Pelecanoides urinatrix*).—Stidolph found a single bird at the Featherston Domain.

Grey-backed storm petrel (*Garrodia nereis*).—A single bird was found by Knight in a dying condition on Marine Parade, Paraparaumu Beach.

White-faced storm petrel (*Pelagadroma marina*).—Stidolph found a single specimen at Featherston Domain: it may, however, have been the victim of a previous storm.

Broad-billed prion (*Pachyptila vittata*).—This species is generally found on west coast beaches after prolonged westerly storms, particularly in July and August. The history of the February storm was such that destruction of prions on a large scale was not to be expected. A wing, possibly attributable to this species, was found at Lake Ferry, and McKenzie reported two prion wings from Petone. Two birds found at Ohariu Bay, Wellington, were reported to Secker, who states that one he examined was of this species.

Fairy prion (*P. turtur*).—Two corpses found at Featherston Domain by Stidolph.

Buller's shearwater (*Puffinus bulleri*).—On February 16, when the wind was decreasing, three or four of these birds were seen flying over the breakers and over Lake Onoke, on the waters of which, sheltered by the Spit, they sometimes settled. The following week 21 corpses were collected from the Spit, and one from Featherston Domain. On subsequent visits small numbers were found, probably having been missed in

February, and it is likely that along this stretch of coast the mortality exceeded twelve to each mile. Measurements of those collected are given in Appendix 2. Secker collected a male from Tongue Point, Wellington, and a female from Lyall Bay. These were examined by Fleming who states that the gonads, which were considerably regressed, suggested that the birds were mature but were not breeding in the 1946-47 season. There was evidence of moult of some of the neck, interscapular, scapular, rump and belly feathers, but not of flight feathers.

Sooty shearwater (*P. griseus*).—Tongue Point, two corpses, not moulting, reported by Secker. Clark found two corpses at Pukerua Bay on 20/4/47, apparently dating from February (N.Z. Bird Notes.) One was washed ashore at Wanganui, February 16 (Moreland).

Fluttering shearwater (*P. gavia*).—Reference is made elsewhere in this issue to eight corpses including three *P. g. huttoni*, dating from February, found at Pukerua Bay, 20/4/47, by Clark.

Wandering albatross (*Diomedea exulans*).—Three immature (first year) birds were found on Palliser Spit. Secker, who found two at Tongue Point on February 23, states that these were in the usual early juvenile phase. McKenzie inspected a live bird (later released) not quite in full adult plumage, at Petone Beach, and another first year bird was washed ashore at Wanganui, to be ringed and released by Moreland. The available bill measurements are (exposed culmen):—Palliser Spit, 148mm; Tongue Point, 138mm.; Tongue Point, 142mm.; Wanganui, 143mm. Murphy (1936) who gives the extreme measurements of 32 males from the New Zealand region as 144mm. to 170mm., mentions that strikingly small adults, as well as others of maximum size, occur among series from the New Zealand area.

Royal albatross (*D. epomophora*).—Fleming informs me that the plumage and measurements (wing 648, culmen 165) of an adult found at Lake Ferry were of the Chatham Islands-Otago race *sanfordi*, Murphy. Secker found another, wing 650, culmen 170, at Lyall Bay in May, and believes it a relic from the February storm.

Grey-faced petrel (*Pterodroma macroptera*).—Several corpses were found at Lake Ferry, and eight were collected from the Spit the following week, when Stidolph also found three at Featherston Domain. One was sent to Auckland where Turbott confirmed it was a typical specimen of the New Zealand breeding subspecies *gouldi*. It was a non-breeding male.

White-capped (shy) mollymawk (*Thalassarche cauta*).—Several birds of this species were seen flying over the breakers from Lake Ferry on February 16, and on occasions they flew over the lake within 20 yards of the shore. The following week thirty-four corpses were counted on the Spit, and Stidolph found three at Featherston Domain. All appeared to belong to the Bounty Island race *salvini* Rothschild. Secker found six at Lyall Bay (the culmens of three being 128, 130.75 and 131mm.). Four of these were examined by Fleming, who believes they were of this subspecies. A live bird was blown into a garden at Petone, and later released. Fleming identified this from an unpublished photograph in the "Evening Post" files as a shy mollymawk and not a Buller's mollymawk (*T. bulleri*) as had previously been reported. McKenzie reported five dead and a live bird from Petone Beach, and More-

land found a live bird at Wanganui on February 16, and two dead the following day.

Gannet (*Moris serrator*).—One was found at Petone by McKenzie.

To summarise.—There was a particularly heavy mortality of shy mollymawks, the only species of mollymawk known to have suffered. Corpses were found on the southern coast, Wellington Harbour, and also at Wanganui. Royal and wandering albatrosses were also affected, only the latter, however, being found at Wanganui as well as the southern coast. Of the smaller species, it is of interest to note the large number of Buller's shearwaters and grey-faced petrels found on Palliser Spit. The occurrence of these birds here, and some distance inland, but not at Wellington or Wanganui, inevitably leads to the question: "Where were the birds when the storm developed?" Though Buller's petrel has on occasions been reported (Fleming, 1939) from Chatham Island waters and Cook Strait (the species was described by Buller, 1888, from a specimen found on the Waikanae Beach), the grey-faced petrel is not usually found south of latitude 40. (Falla, 1937.) Both, however, breed in the East Cape area (Falla, 1934, and Fleming, unpublished). Is it possible that these birds were first blown southwards, only to be turned north again by the southerly gale?

The meteorological data seems to support this view. For the week preceding the gale, the predominant winds over the southern part of the North Island were from the south-east quarter. On February 11 and 12 there were strong north-easterlies, mainly of force about 6 (Beaufort scale, 22-27 m.p.h.) offshore from East Cape southwards. On February 14 and 15 a depression which formed near Farewell Spit moved rapidly in an east-north-east direction, the centre passing south of Napier. Such depressions often form further west, and are usually then preceded by strong northerlies, which veer to southerlies as they cross the island to the east. This storm, however, developing as it did over the Wellington province, was not preceded by northerlies in this area. From February 11 to 13 winds at Wanganui were of a light nature, rather variable, but during Feb. 14 the southerly reached the area with strong gale force (about 7 to 10: 28 to 56 m.p.h.). The winds in the Wellington area reached a maximum during the night of Feb. 14: inland, an anemometer at Ohakea aerodrome recorded a maximum gust of 94 m.p.h. during the storm.

Examining the list of species and bearing the above data in mind, it becomes clear that any birds feeding off the East Coast of the North Island would be likely to be blown far south and south-west by the strong north-easterlies. There, at sea, they might well have remained unnoticed unless caught up in the margin of the moderate south-easterlies, to be blown inland or washed ashore as the wind strengthened and veered more directly from the south and south-west. Birds in the Taranaki Bight would be blown ashore by the southerlies also, as were mollymawks, albatrosses and a mutton bird. The fact that grey-faced petrels and Buller's shearwaters were found only on Palliser Spit gives weight to the supposition that they were not in Taranaki Bight-Cook Strait waters but were in fact blown south from East Cape waters. The occurrence of the larger mollymawks and albatrosses at Wanganui as well as Wellington Harbour and Palliser Spit points to their wider distribution,

as do the records of the sooty shearwater from Wellington, Pukerua Bay and Wanganui. On the other hand, the non-breeding condition of *Pterodroma macroptera* and *Puffinus bulleri* might mean that they were feeding further south from their known breeding stations, and were indeed off Palliser Bay when the southerly arose.

LAND BIRDS.

Reports were published in the daily papers of heavy mortality of small birds, mainly sparrows (*Passer domesticus*). In several localities, including Masterton, sparrows were reported to have been collected by the bucketful under their roosts in pine plantations, and it appears that in certain localities almost the entire local populations perished. At Westmere, 15 miles south-east of Masterton, sparrows have not yet (September, 1947) begun to appear in any numbers again. I found nothing to suggest, however, that fantails (*Rhipidura fuliginosa*), silver-eye (*Zosterops lateralis*), or warblers (*Pseudogerygone igata*) were affected. It may have been that the low temperature (see appendix 1) combined with the wind and heavy rain, coincided with a peculiarly weak physiological condition of the sparrows. Most of the southern part of the island received 4 inches of rain for the 24 hours ended 9.30 a.m., February 15, and 2in. to 3in. in the following 24 hours. Isolated areas received as much as 9in. or more in this period.

APPENDIX 1.—(WIND SPEEDS AND DIRECTIONS.)

The following wind speeds and directions were taken from the Meteorological Station at Kelburn, Wellington, as the anemometer at Rongotai Aerodrome, on the coast, was unfortunately not operating at the time. During southerly gales, however, the latter usually reads about 20 m.p.h. higher than the Kelburn instrument. The records are averaged (approximately) for three-hourly periods.

Date	Three hours ending.	Direction (degrees)	Average Speed (m.p.h.)	Maximum Gust (m.p.h.)
Feb. 13	21 hours	160	8	19
	24	160	7	18
Feb. 14	03	180	13	26
	06	200	15	29
	09	200	18	36
	12	220	19	39
	15	190	23	43
	18	180	24	47
	21	180	30	56
	24	200	34	67
Feb. 15	03	200	43	80
	06	200	47	78
	09	210	42	74
	12	200	41	69
	15	190	35	62
	18	170	34	63
	21	170	28	56
	24	170	30	57

The following estimates of wind speeds and directions are from Wanganui, the force being on the Beaufort scale:—

Date	6 a.m.	8.30 a.m.	11.45 a.m.	2.30 p.m.
Feb. 11	E-S-E 2	E 4	S-E 5	S-E 5
12	E 2	E 1	N-E 1	S-E 3
13	N-E 1	Calm	W 3	W 3
14	N-E 2	N 1	Calm	S 8
15	S-W 10	S-W 8	S 10	S 10
16	S 8	S 7	S 3	S 7

TEMPERATURES.

The hourly figures supplied by the Meteorological Service were averaged to show in more significant form the temperatures at Kelburn: it will be seen that although the minimum did not drop to a very low figure, the temperatures for Feb. 14 and 15 were well below those of the previous few days. What figures are available from Waingawa, near Masterton, do not, however, show so pronounced a fall. The Kelburn figures are:—

	1—5 hrs.	6—10 hrs.	11—15 hrs.	16—20 hrs.	21—24 hrs.
Feb. 11	51	60	65	58	56
12	56	64	78	75	65
13	61	68	81	61	56
14	52	48	47	47	47
15	46	44	44	46	49

APPENDIX 2—(MEASUREMENTS.)

	Mean.	Standard Deviation. Plus/Minus	Range.	Number in Sample.
<i>Pterodroma macroptera</i>—				
Exposed Culmen	36.92	1.02	35 —38	6
Culmen, Depth	19.00	.63	18 —19.5	6
Culmen Width	15.67	.75	14.5—16.5	6
Tarsus	44.67	.52	44 —45	6
Mid Toe and Claw	66.67	.75	65.5—67	6
<i>Puffinus bulleri</i>—				
Exposed Culmen	41.33	1.69	38.5—44.5	21
Culmen Depth	15.04	1.06	12 —16.5	21
Culmen Width	12.14	.98	11 —15	21
Tarsus	52.45	1.80	49 —56	21
Mid Toe and Claw	66.26	4.30	61 —68.5	21
Wing (straight end)	284.06	9.64	268 —300	16

Correlations for various measurements of the *Puffinus bulleri* series are as follow:—

Length and Width of Culmen	r equals plus .46
Length and Depth of Culmen	r equals plus .52
Length of Culmen and Tarsus	r equals plus .63
Depth and Width of Culmen	r equals minus .10
Tarsus and Toe	r equals minus .07

For 19 degrees of freedom at the 1% level of significance — .549

For 19 degrees of freedom at the 5% level of significance — .433

The first three correlations are therefore significant, the length and width of culmen, and the length and depth of culmen at the 5% level, and the length of culmen and tarsus at the 1% level of significance.

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