

SEABIRDS FOUND DEAD ON NEW ZEALAND BEACHES IN 1992, AND A REVIEW OF *Larus* SPECIES RECOVERIES, 1943 TO 1992

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KEYWORDS: seabirds, New Zealand, review, *Larus*, beach patrol

ABSTRACT

In 1992, participants of the Beach Patrol Scheme patrolled 4114 km of the New Zealand coastline. 5994 dead seabirds of 53 species plus 143 individuals of 30 other bird species were recovered. The number of seabirds found in 1992 was only 59% of the annual average of 10 187 between 1971 and 1992, and was the seventh consecutive year that below average numbers of dead seabirds have been found. The Common Noddy (*Anous stolidus pileatus*) was recorded for the first time since the start of the Scheme, providing the second record of this species in New Zealand. Thirteen Little Shags (*Phalacrocorax melanoleucos*) were found, more than the average of 5-10 per year during 1971-1992.

14 833 specimens of three species of gulls were recovered between 1943 and 1992. The majority of recoveries (10 190 birds) was that of the Southern Black-backed (*Larus d. dominicanus*), which was found mostly near coastal cities when birds dispersed from the colonies after the breeding season. 4195 Red-billed Gulls (*L. novaehollandiae scopulinus*) were found during 1943-1992, mainly along the eastern coasts of New Zealand. Only 448 Black-billed Gulls (*L. bulleri*) were found during the same period, mainly on eastern South Island beaches.

INTRODUCTION & METHODS

This paper records the results of the Ornithological Society of New Zealand's Beach Patrol Scheme for 1992 and reviews *Larus* species recovered since 1943, when the results of patrols were first recorded on Beach Patrol Cards. All sections of coast (see Powlesland & Imber 1988) were patrolled, except Fiordland. Some patrols were carried out on Chatham Island, the results being given under the heading 'Outlying Islands'. In total, 688 Beach Patrol cards were submitted.

Kilometres 'travelled' are the total distances travelled during patrols, whereas kilometres 'covered' are the lengths of coast patrolled monthly.

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Hence, if the same 1 km stretch of beach is patrolled twice in one month, 2 km have been travelled but only 1 km covered per month. For a detailed description of methods for beach patrolling, and of the Beach Patrol Scheme, see Powlesland & Imber (1988). The taxonomic nomenclature and sequence are as in Turbott (1990). For the meaning of the abbreviations for each section of coast (e.g. AE = Auckland East), see Table 1.

To test whether the annual pattern of recovery for each species depicted in Figures 1, 2 and 3 differed from the uniform distribution (where an equal number of birds per 100 km of beach covered was found each month) we used the Kolmogorov-Smirnov one-sample test (Siegel 1956, p. 47).

RECOVERIES IN 1992

In 1992, the total length of coast travelled was 4114 km, along which 5994 seabirds were found by 132 members of the Ornithological Society of New Zealand and their friends. The average number of birds recovered per kilometre of coast covered was 1.62 (Table 1). The total distance travelled was slightly less than the average of 4137 km per year recorded over the past 22 years (1971-1992), while the number of seabirds found in 1992 was only 59% of the annual average of 10 187 birds for the same 22-year period. This period is used for comparison because the distance travelled annually was fairly constant, whereas from 1943 to 1970 the total distance increased (Powlesland 1990). For the past seven years (1985-1992) below average numbers of seabirds per annum have been found. Table 1 shows the kilometres covered and the number of seabirds found per month and in total for the various sections of coast, plus the number of birds found per kilometre covered for each coastal section. Coastal and monthly totals for 'uncommon' species (11 or fewer specimens) are given in Table 2, while for 'common' species (more than 11 specimens) coastal totals are presented in Table 3 and monthly totals in Table 4.

Unusual finds

A new species found during the Beach Patrol Scheme is the Common Noddy (*Anous stolidus pileatus*). One bird was found on Muriwai Beach (AW) in June 1992. Reischek's 1885 record of an individual on the east coast of the North Island is the only other record of the species on the New Zealand mainland (Turbott 1990). However, in October-November 1989, about 25 pairs were found nesting on Curtis Island of the Kermadec Group (Turbott 1990). The Common Noddy has a circumtropical distribution over the subtropical and tropical seas (Harrison 1983), with *A. s. pileatus* being widely distributed in the Indian and Pacific Oceans (Turbott 1990). On Philip Island, near Norfolk Island, the Common Noddy breeds during January-May (Hermes *et al.* 1986). In winter it leaves the island and apparently moves north to the tropics, where flocks are occasionally seen hundreds of kilometres from land. This northward migration probably accounts for the rarity of this species on New Zealand beaches compared with other subtropical terns, such as the Sooty Tern (*Sterna fuscata*) with 38 beach patrol records and the White Tern (*Gygis alba*) with four records.

Little Shags (*Phalacrocorax melanoleucos*) were found in greater numbers than usual in 1992. The 1992 total was 13, the second highest annual total

TABLE 1 – Numbers of dead seabirds recovered and kilometres covered on the coasts of New Zealand in 1992

Coast	Code		Month												Total km	Total no. birds	Birds/km of coast
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Auckland East	AE	km	76	56	43	11	29	23	38	29	15	41	47	58	466	1215	2.61
		birds	367	77	54	14	12	14	17	10	4	30	280	336			
Auckland West	AW	km	124	188	207	125	146	173	162	173	134	150	215	154	1951	2177	1.12
		birds	297	413	110	29	209	101	158	186	142	51	325	156			
Bay of Plenty	BP	km	14	7	2	1	2	4	7	20	10	10	27	21	125	402	3.22
		birds	81	10	3	1	4	8	23	11	4	7	119	131			
Canterbury North	CN	km	25	11	7	4	30	6	6	7	4	14	9	11	134	243	1.81
		birds	125	23	4	8	18	3	1	4	4	12	3	38			
Canterbury South	CS	km	5	6	0	5	18	0	5	5	6	18	5	5	78	166	2.13
		birds	19	19	0	5	59	0	0	0	8	22	11	23			
East Coast N.I.	EC	km	8	16	12	8	6	17	11	13	13	12	13	7	136	72	0.53
		birds	3	18	9	4	13	1	8	1	1	7	2	5			
North Coast S.I.	NC	km	0	3	0	0	4	10	0	0	0	0	1	0	18	18	1.00
		birds	0	2	0	0	2	9	0	0	0	0	4	1			
Outlying Islands	OI	km	5	0	0	0	0	0	0	0	0	0	0	0	5	8	1.60
		birds	8	0	0	0	0	0	0	0	0	0	0	0			
Otago	OT	km	9	10	9	6	11	12	13	6	6	6	6	6	100	69	0.69
		birds	5	11	15	5	3	10	16	0	2	0	1	1			
Southland	SD	km	19	12	10	9	16	3	3	11	4	14	30	24	155	592	3.82
		birds	15	14	9	12	356	6	2	9	2	13	116	38			
Taranaki	TA	km	10	0	5	0	16	6	8	11	0	0	0	0	56	51	0.91
		birds	24	0	0	0	10	4	7	6	0	0	0	0			
Wairarapa	WA	km	14	3	2	0	6	6	0	7	0	0	4	4	46	16	0.35
		birds	1	4	1	0	0	0	0	3	0	0	5	2			
Westland	WD	km	0	0	0	0	0	0	0	0	2	0	0	0	2	1	0.50
		birds	0	0	0	0	0	0	0	0	1	0	0	0			
Wellington South	WS	km	23	6	2	32	4	10	9	3	5	15	9	9	127	244	1.92
		birds	52	5	8	16	15	9	51	10	3	22	23	30			
Wellington West	WW	km	55	24	-60	26	30	35	35	16	23	0	4	0	308	720	2.34
		birds	216	328	33	14	30	19	39	17	18	1	5	0			
Total km travelled			422	367	366	235	372	326	328	323	257	281	370	299	4114		
Total km covered			387	342	359	227	318	305	297	301	222	280	370	299	3707		
Total birds recovered			1213	924	246	108	731	184	322	257	189	165	894	761	5994		
Birds/km covered			3.13	2.70	0.69	0.48	2.30	0.60	1.08	0.85	0.85	0.59	2.42	2.55		1.62	

TABLE 2 – Coastal and monthly distribution of seabird species rare in 1992 (<11 specimens)

Species	Number found	Coast(s)	Month(s)
<i>Diomedea</i> spp.**	11	AW,CN(2),CS(2), EC(2),OI,SD(2),WW	Jan, Feb(2), Mar, May(4), Oct, Dec(2)
<i>D. exulans</i>	6	AW(5), TA	Jun, Jul, Sep(3), Nov
<i>D. epomophora</i>	1	OT	Feb
<i>D. melanophrys</i>	4	AW(3), AE	Jan, Jun, Jul(2)
<i>D. cauta</i> subsp.**	4	AW(4)	Jan, Feb, Nov, Dec
<i>D. cauta salvini</i>	4	AW(2), CN, EC	Jun(2), Oct, Nov
<i>D. chrysostoma</i>	7	AW(7)	Jul, Aug, Sep(3), Oct(2)
<i>D. bulleri</i>	2	CS, WW	Feb, May
<i>Phoebastria palpebrata</i>	5	AW(5)	Feb, Aug(3), Oct
<i>Puffinus</i> spp.**	6	AW(4), CS, WW	May(3), Jun(2), Jul
<i>P. pacificus</i>	1	AW	Oct
<i>P. gavia/huttoni</i>	4	CN, CS, WW(2)	Jan(3), Feb
<i>Procellaria</i> spp.**	1	CS	Jan
<i>P. aequinoctialis</i>	3	AW(2), OI	Jan, Feb, Jul
<i>Lugensa brevirostris</i>	5	AW(4), AE	Jan, Feb, Jul, Aug, Sep
<i>Thalassoica antarctica</i>	8	AW(7), CN	Apr, May(6), Jun
<i>Fulmarus glacialis</i>	5	AW, SD, WW(3)	Jan(4), Dec
<i>Halobaena caerulea</i>	10	AW(6), CS, TA(3)	Jan(5), Feb, Jun, Aug, Oct, Dec
<i>Pterodroma</i> spp.**	2	AW, CS	Mar, May
<i>P. nigripennis</i>	8	AW(6), AE, EC	Jan(5), Feb(2), Dec
<i>Fregata tropica</i>	1	EC	Oct
<i>Eudiptes pachyrhynchus</i>	4	SD(3), WW	Feb, Apr(2), Aug
<i>Phalacrocorax</i> spp.**	2	AE, OT	Jan, Jul
<i>P. sulcirostris</i>	3	AE, BP, WW	Feb, May, Dec
<i>Leucocarbo chalconotus</i>	2	OT(2)	Feb, Jun
<i>Stictocarbo featherstoni</i>	1	OI	Jan
<i>Catharacta skua lonnbergi</i>	1	SD	May
<i>Larus</i> spp.**	1	CN	May
<i>L. bulleri</i>	9	CN, CS(2), EC(2), OT, SD(2), WW	Jan, Feb(3), May(3), Jul, Oct
<i>Sterna</i> spp.**	2	BP, CN	Apr, Sep
<i>S. caspia</i>	9	AW(7), SD, WW	May(2), Jun, Jul, Aug, Sep(3), Nov
<i>Anous stolidus</i>	1	AW	Jun
Total	133		

**Species or subspecies was not identified by the patroller

TABLE 3 – Coastal distribution of the seabirds species commonly found in 1992 (>11 specimens)

Species	Coast															Total birds
	AW	AE	BP	TA	WW	EC	W	WS	NC	W	CN	CS	OT	SD	OI	
<i>Diomedea cauta steadi</i>	17	0	0	0	3	0	0	1	0	0	0	0	0	3	0	24
<i>Puffinus carneipes</i>	50	74	5	0	0	1	0	0	0	0	1	0	0	0	0	131
<i>P. bulleri</i>	96	99	15	1	17	2	1	3	0	0	1	1	0	0	0	236
<i>P. griseus</i>	396	74	32	6	16	5	4	11	0	0	14	51	3	431	1	1044
<i>P. tenuirostris</i>	39	68	2	6	2	0	0	1	0	0	0	0	0	3	0	121
<i>P.gavia</i>	243	174	74	2	28	1	1	1	1	0	1	2	0	0	0	528
<i>P. huttoni</i>	16	2	0	0	2	2	2	0	0	0	12	4	0	0	0	40
<i>P. assimilis</i>	10	9	1	1	1	0	0	0	0	0	0	0	0	0	0	22
<i>Pelecanoides urinatrix</i>	29	91	47	1	12	0	1	0	1	0	0	0	0	11	0	193
<i>Procellaria parkinsoni</i>	2	5	7	0	0	0	0	0	0	0	0	0	0	0	0	14
<i>Daption capense</i>	11	0	0	0	0	0	0	0	1	0	1	2	0	1	0	16
<i>Macronectes spp.**</i>	12	1	0	0	3	0	1	1	0	0	0	0	0	3	0	21
<i>Pachyptila spp.**</i>	81	0	0	7	232	0	0	0	0	0	15	2	0	3	0	340
<i>P. turtur</i>	305	33	3	3	271	1	1	0	1	0	4	2	0	52	0	676
<i>P.belcheri</i>	50	3	0	1	4	0	0	1	0	0	1	0	0	1	0	61
<i>P.desolata</i>	29	0	0	2	0	0	0	0	0	0	0	0	0	1	0	32
<i>P.salivini</i>	78	0	0	3	15	0	0	2	0	0	0	0	0	7	0	105
<i>P.vittata</i>	9	1	0	0	6	2	0	3	0	0	16	11	2	26	0	76
<i>Pterodroma cookii</i>	8	10	0	0	0	0	0	0	0	0	0	0	0	0	0	18
<i>P. inexpectata</i>	17	1	0	0	2	0	0	0	0	0	0	0	0	6	0	26
<i>P. macroptera</i>	10	24	6	0	0	0	0	0	0	0	0	0	0	0	0	40
<i>P. lessonii</i>	16	0	0	1	2	0	0	1	0	0	0	1	0	1	0	22
<i>Pelagodroma marina</i>	8	8	10	0	0	0	0	0	0	0	0	0	0	1	0	27
<i>Megadyptes antipodes</i>	0	0	0	0	2	0	0	0	0	0	0	9	2	3	0	16
<i>Eudyptula minor</i>	245	381	158	0	18	3	3	3	7	0	19	20	7	5	2	871
<i>Morus serrator</i>	166	51	8	5	6	6	0	2	4	0	2	0	0	1	0	251
<i>Phalacrocorax carbo</i>	0	0	1	0	3	8	0	0	0	0	1	0	0	0	0	13
<i>P. varius</i>	5	23	8	0	1	0	0	0	0	0	3	0	0	1	0	41
<i>P. melanoleucos</i>	1	1	1	0	2	2	0	0	1	0	1	0	4	0	0	13
<i>Stictocarbo punctatus</i>	0	1	0	0	0	0	0	2	1	0	44	24	15	1	0	88
<i>Larus dominicanus</i>	133	51	12	5	45	27	0	204	1	1	46	22	23	16	2	588
<i>L. novaehollandiae</i>	13	23	8	1	12	4	1	7	0	0	40	2	8	5	0	124
<i>Sterna striata</i>	15	2	2	2	3	1	1	1	0	0	13	3	0	0	0	43
Total	2110	1210	400	47	708	65	16	244	18	1	235	156	64	582	5	5861

**Species was not identified by the patroller

TABLE 4 – Monthly distribution of the seabird species commonly found in 1992 (> 11 specimens)

Species	Month												Total birds
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
<i>Diomedea cauta steadi</i>	1	3	3	1	0	0	3	5	2	0	6	0	24
<i>Puffinus carneipes</i>	15	36	18	2	0	0	0	1	2	0	48	9	131
<i>P. bulleri</i>	34	45	23	3	12	4	2	0	2	10	73	28	236
<i>P. griseus</i>	58	44	14	11	483	34	3	2	2	21	262	110	1044
<i>P. tenuirostris</i>	24	2	0	2	17	0	0	1	0	0	3	72	121
<i>P.gavia</i>	183	89	23	4	11	8	13	10	8	14	97	68	528
<i>P. huttoni</i>	10	3	1	1	4	0	0	2	0	2	7	10	40
<i>P. assimilis</i>	5	4	1	0	1	0	0	1	1	1	3	5	22
<i>Pelecanoides urinatrix</i>	31	6	0	1	6	7	13	14	3	6	69	37	193
<i>Procellaria parkinsoni</i>	2	1	0	0	3	0	1	0	0	0	4	3	14
<i>Daption capense</i>	0	0	1	0	1	0	1	2	2	1	7	1	16
<i>Macronectes spp.**</i>	2	1	0	0	1	1	4	4	3	1	3	1	21
<i>Pachyptila spp.**</i>	65	173	14	3	11	17	24	5	7	3	9	9	340
<i>P. turtur</i>	137	255	4	1	10	6	17	67	47	8	97	27	676
<i>P.belcheri</i>	1	0	0	0	1	1	24	27	2	0	2	3	61
<i>P.desolata</i>	0	0	0	0	1	1	26	3	0	0	1	0	32
<i>P.salivini</i>	1	0	1	1	7	14	35	36	6	2	2	0	105
<i>P.vittata</i>	31	3	1	2	2	2	3	7	2	4	13	6	76
<i>Pterodroma cookii</i>	5	5	1	0	0	0	0	0	0	0	2	5	18
<i>P. inexpectata</i>	4	6	1	2	11	0	1	0	0	0	0	1	26
<i>P. macroptera</i>	20	7	1	1	0	0	3	2	0	0	1	5	40
<i>P. lessonii</i>	3	2	0	2	1	3	2	4	1	1	2	1	22
<i>Pelagodroma marina</i>	4	2	0	1	1	0	1	0	2	0	8	8	27
<i>Megadyptes antipodes</i>	0	1	2	1	10	1	0	0	0	1	0	0	16
<i>Eudypula minor</i>	309	95	20	11	13	12	19	14	30	23	75	250	871
<i>Morus serrator</i>	26	26	26	4	7	16	18	21	34	17	39	17	251
<i>Phalacrocorax carbo</i>	1	1	1	2	2	1	4	1	0	0	0	0	13
<i>P. varius</i>	7	7	5	1	2	3	6	3	2	1	1	3	41
<i>P. melanoleucos</i>	1	0	2	0	6	1	2	0	0	0	1	0	13
<i>Stictocarbo punctatus</i>	31	5	7	3	8	5	2	0	6	8	8	5	88
<i>Larus dominicanus</i>	119	58	63	35	65	27	80	13	8	27	43	50	588
<i>L. novaehollandiae</i>	38	22	6	5	10	9	4	2	4	4	3	17	124
<i>Sterna striata</i>	19	4	5	4	1	0	1	2	2	1	1	3	43
Total	1187	906	244	104	708	173	312	249	178	156	890	754	5861

** Species was not identified by the patroller

TABLE 5 – Rate of recovery (average number of gulls found per 100 km of beach covered) of *Larus* species found on New Zealand coasts between 1943-1992

Species	Coast							
	AE	AW	BP	CN	CS	EC	NC	OI
<i>Larus d. dominicanus</i>	5.64	6.74	5.97	31.02	24.55	17.04	25.85	11.32
<i>L. novaehollandiae scopulinus</i>	5.34	1.93	8.92	29.28	5.85	1.30	8.75	1.37
<i>L. bulleri</i>	0.03	0.01	0.11	2.76	5.79	2.89	-	-
	OT	SD	TA	WA	WD	WS	WW	
<i>Larus d. dominicanus</i>	22.65	21.30	13.63	6.52	2.76	35.03	13.42	
<i>L. novaehollandiae scopulinus</i>	9.35	4.30	11.51	0.93	0.32	8.77	1.88	
<i>L. bulleri</i>	2.55	4.66	-	0.19	0.24	0.10	0.41	

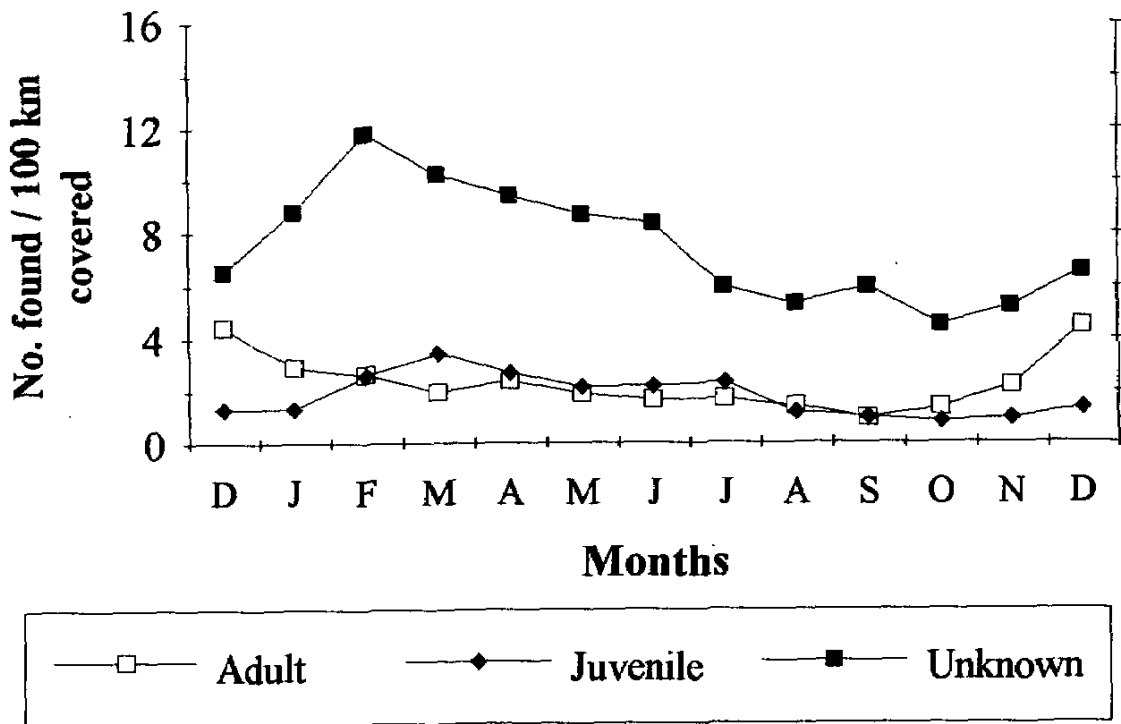


FIGURE 1 – Monthly rate of recovery of Southern Black-backed Gulls (*L. dominicanus*), 1943-1992

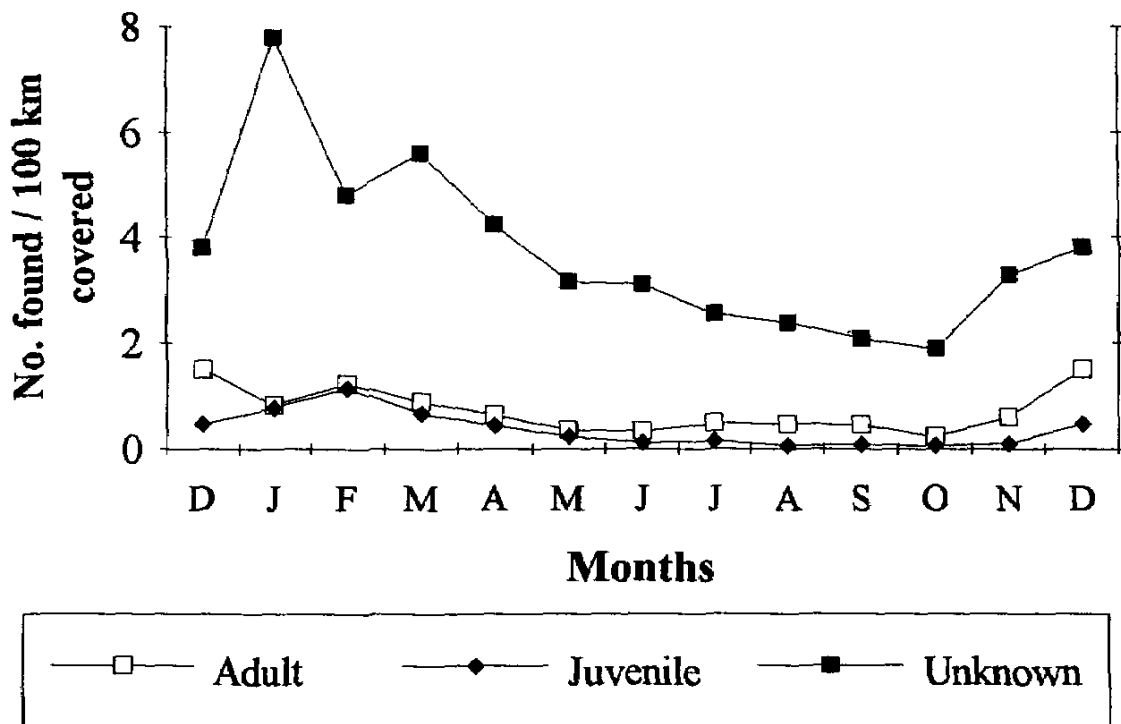


FIGURE 2 – Monthly rate of recovery of Red-billed Gulls (*L. novaehollandiae scopulinus*), 1943-1992

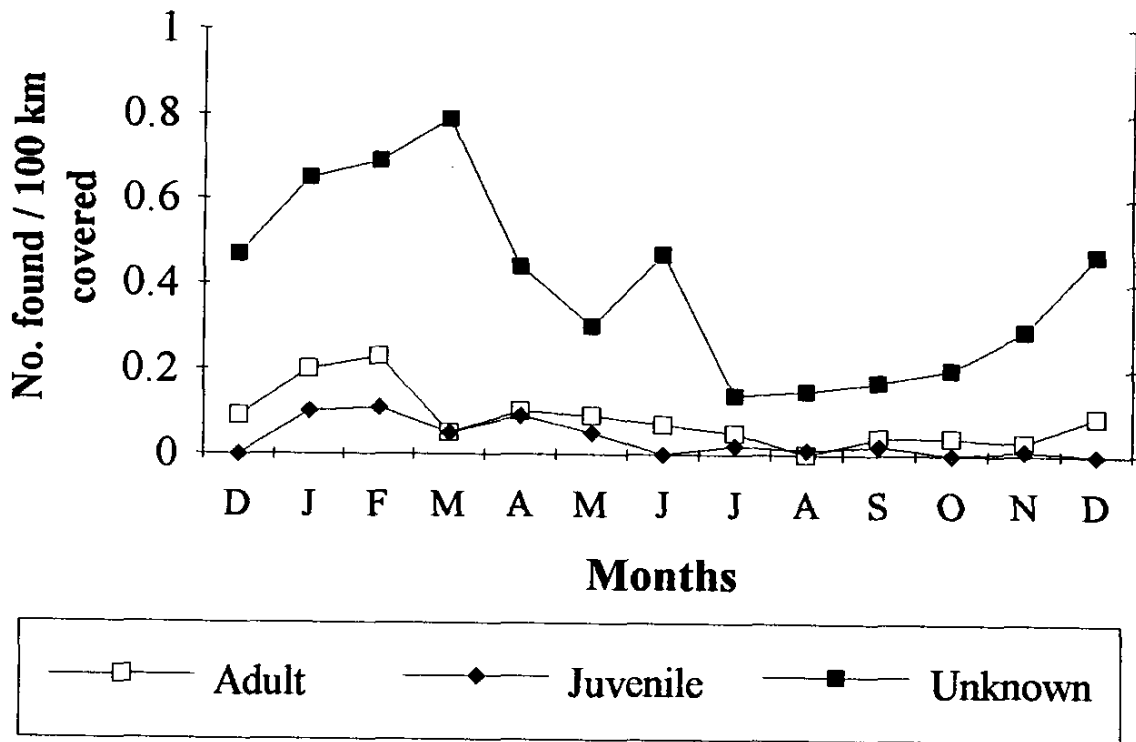


FIGURE 3 – Monthly rate of recovery of Black-billed Gulls (*L. bulleri*), 1943-1992

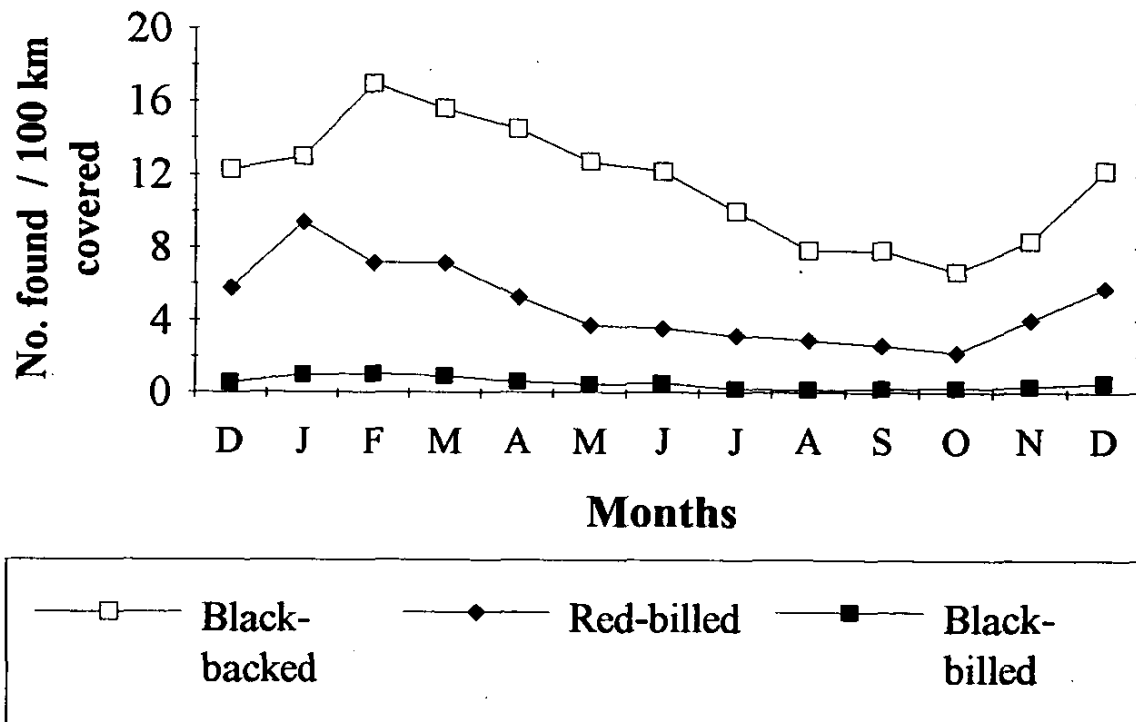


FIGURE 4 – Monthly rate of recovery of three gull species; Southern Black-backed Gulls, Red-billed Gulls and Black-billed Gulls, 1943-1992. All ages combined.

(19 were found in 1981). Usually 5-10 Little Shags are found each year. As these shags were found on beaches from eight sections of coast (Table 3) and over an 11-month period (Table 4), their deaths were not associated with any obvious climatic event.

Miscellaneous birds

A total of 143 birds other than seabirds were recovered in 1992. There were 38 Australian Magpies (*Gymnorhina tibicen*), 15 Black Swans (*Cygnus atratus*), 14 Rock Pigeons (*Columba livia*), nine Mallards (*Anas platyrhynchos*), five each of Paradise Shelducks (*Tadorna variegata*) and Variable Oystercatchers (*Haematopus unicolor*), six Spur-winged Plovers (*Vanellus miles novaehollandiae*), four each of White-faced Herons (*Ardea novaehollandiae*), domestic geese and South Island Pied Oystercatchers (*Haematopus ostralegus finschi*), three each of Canada Geese (*Branta canadensis*), Grey Ducks (*Anas superciliosa*), Australasian Harriers (*Circus approximans*), Wild Turkeys (*Meleagris gallopavo*), Pukekos (*Porphyrio porphyrio melanotus*) and Kereru (*Hemiphaga novaeseelandiae*), two each of unidentified duck species, Ring-necked Pheasants (*Phasianus colchicus*), Eastern Bar-tailed Godwits (*Limosa lapponica baueri*) and Common Mynas (*Acridotheres tristis*), and one each of the Cattle Egret (*Bubulcus ibis*), Grey Teal (*Anas aucklandica*), New Zealand Shoveler (*Anas rhynchos variegata*), Western Weka (*Gallirallus australis australis*), North Island Kaka (*Nestor meridionalis septentrionalis*), Long-tailed Cuckoo (*Eudynamys taitensis*), Morepork (*Ninox novaeseelandiae*), Blackbird (*Turdus merula*), Song Thrush (*Turdus philomelos*), Tui (*Prosthemadera novaeseelandiae*), Goldfinch (*Carduelis carduelis*), Starling (*Sturnus vulgaris*) and unidentified passerine species.

RECOVERIES 1943-1992 of LARUS SPECIES

The following is a summary of the coastal and monthly distributions of *Larus* species found by patrollers during the past 50 years (1943-1992). In total, 14 882 gulls (*Larus* spp.) were found, of which 49 were not identified to species. The remaining 14 833 gulls comprised three species (Table 5).

Southern Black-backed Gull (*Larus d. dominicanus*)

The Southern Black-backed Gull is found in South America, southern Africa, Madagascar, Australia, Lord Howe Island, the subantarctic oceanic islands, Antarctica and New Zealand (Fordham 1985). It is a common and widespread gull on the North and South Islands, inhabiting a variety of habitats from coastal to alpine sites; including rocky and sandy coastlines, estuaries, rivers, lakes, farmland and mountain tarns (Fordham 1985). This gull's ability to inhabit and breed in a wide variety of habitats probably reflects its varied foraging techniques and wide-ranging diet, including echinoderms, molluscs, annelids, crustaceans, amphibians, fish, small reptiles, birds, mammals, offal, carrion and refuse (Fordham 1970). Hundreds of Southern Black-backed Gulls may congregate at some food sources, particularly large city rubbish dumps.

This gull can breed as isolated pairs or in colonies, sometimes consisting of thousands of pairs. Nesting sites are usually where little or no vegetation is present, such as open pasture, beaches or rock ledges. Observations at the Southern Black-backed Gull colony on Somes Island in Wellington Harbour during 1961-62 indicated that pairs first occupied the island by day and began nest-building in July (Fordham 1964a). However, at most other New Zealand colonies the number of adults present by day may not increase appreciably until one to two months before egg-laying. On Somes Island, egg-laying began about mid-October and continued until late January, with the peak period of laying being 5-13 November (Fordham 1964a). The clutch, generally of three eggs, hatches after about 27 days incubation, with the chicks beginning to fly at about seven weeks old (mid-January – February), and leaving the colony two to four weeks later (Fordham 1964b).

Generally, 300-500 Southern Black-backed Gulls have been found annually during the past 22 years of beach patrolling (1971-1992). The number found each year varied from 217 in 1971 to 625 in 1978. In total, 10 190 gulls were found during the period 1943-1992, at an average rate of 11.26 gulls per 100 km of coast covered. Patrollers indicated that 1879 (18.4%) of the gulls were in adult plumage, 1606 (15.8%) were in juvenile plumage (0-3 years old), and the remaining 65.8% were of unknown age, or their age was not recorded.

Of the coastal regions, Wellington South had the greatest rate of Southern Black-backed Gull recovery (35.03 birds/100 km of coast covered), followed by Canterbury North (31.02), North Coast South Island (25.85) and Canterbury South (24.55)(Table 5). Generally, the recovery rate is greatest for those sections of coast with a city or town situated on or close to the coast, where there is ready access to both food (rubbish dumps, sewage outfalls) and nest sites (islands, cliffs, riverbeds, beaches). Such regions are Wellington (WS), Nelson (NC), Christchurch (CN), Timaru (CS), Dunedin (OT) and Invercargill (SD). An interesting exception is the comparatively low recovery rate of Southern Black-backed Gulls for the Auckland East and Auckland West coasts, even though Auckland (AE & AW) and Whangarei (AE) are coastal cities with large gull populations. The probably cause of this is that little patrolling is carried out along the sheltered inner beaches of the Manukau (AW), Waitemata (AE) and Whangarei Harbours (AE) next to these cities, with most patrollers preferring to walk along the beaches exposed to the open sea.

Overall, the monthly rate of recovery of Southern Black-backed Gulls of unknown age was highest in February-April and lowest in October-November (Kolmogorov-Smirnov one-sample test, $N = 6705$, $p \leq 0.01$)(Figure 1). Likewise, the period of peak mortality of juveniles was February-April (Kolmogorov-Smirnov one-sample test, $N = 1606$, $p \leq 0.01$)(Figure 1) when fledglings began flying, leaving the colonies and congregating at food sources (Fordham 1968). This coincides with the mortality pattern of juveniles from Somes Island, where 76% of deaths of first-year birds occurred during February-March (Fordham 1970). The peak of adult recoveries by patrollers occurs during summer, particularly in December, and declines thereafter to a minimum in September

(Kolmogorov-Smirnov one-sample test, $N=1879$, $p \leq 0.01$) (Figure 1). Fordham (1964b) found most dead adults on Somes Island in December. These were mainly males that had died from wounds inflicted by other gulls. It seems that fights resulting in fatal wounds occur most often in December, when nesting gulls are most aggressive towards any gulls venturing near their nests just before hatching and while their chicks are small. The beach patrol results suggest that some gulls fatally injured during fights at colonies eventually die on or are washed ashore on to beaches. In contrast, Fordham (1970) found that the mortality of Southern Blackbacked Gulls older than two years of age was greatest in summer (33%) and autumn (35%), and lowest in winter (14%). During summer and autumn, the gulls leave the colonies and there is rapid growth of flocks at feeding sites (such as dumps) and nearby roosts (Fordham 1968). Fordham (1968) suggested that the increased mortality of gulls he observed in 1961-65 during summer and autumn was "related to feeding pressure caused by the combined feeding of adults, and local and immigrated young of the year" at artificial feeding sites. Since the number of nesting pairs on Somes Island has increased from about 1400 in the early 1960s (Fordham 1964a) to about 2200 pairs in the late 1980s, it would be interesting to determine whether mortality as a result of intraspecific fights has increased or not.

Red-billed Gull (*Larus novaehollandiae scopulinus*)

The Red-billed Gull is a common gull along the coasts of New Zealand, rarely venturing more than a few kilometres inland. Exceptions are nesting colonies at Sulphur Point, Lake Rotorua (Reid & Reid 1965) and at Kohukohu, Northland (Cowan 1967). It also breeds on Stewart Island, the Chathams Group, The Snares, Auckland and Campbell Islands. Nesting colonies are found mainly along the eastern coasts of the North and South Islands (Gurr & Kinsky 1965), usually within 80-100 km of offshore areas of upwelling sub-surface water (Mills 1969). During the nesting season, October-January, the gulls feed mainly on planktonic crustaceans, particularly *Nyctiphanes australis*, concentrated in the upwelling waters (Mills 1969).

During the non-breeding season, most Red-billed Gulls disperse from the colonies, with birds from Kaikoura being found as far away as Invercargill and Auckland (Mills 1985). Some birds return to Kaikoura in late July and defend nest-sites. However, it is not until early October that egg-laying usually starts (Mills 1985). Incubation lasts for 24-27 days, and the chicks begin flying when about six weeks old. The gulls disperse from the colonies from mid-January and feed on fish and invertebrates in inshore waters, on invertebrates from beaches, wet pastures and playing fields, and on refuse at rubbish dumps and sewage outfalls. Since legislation was introduced reducing the discharge of wastes into the sea, the number of Red-billed Gulls has declined (Mills 1985).

During the period 1943-1992, patrollers found 4195 Red-billed Gulls. Between 100 and 200 gulls were found in most years during 1971-1992, ranging between 90 in 1987 and 283 in 1985. Overall, the average rate of recovery was 4.63 birds per 100 km of coast covered. Observers recorded

that 585 (13.9%) were in adult plumage, 307 (7.3%) were in juvenile plumage (0-2 years; Gurr 1953); the remaining 78.8% were of unknown age or their age was not recorded.

Of the coastal regions, Canterbury North had by far the highest rate of recovery (29.28 gulls/100 km of coast covered)(Table 5), no doubt because of the large colony at Kaikoura (Gurr & Kinsky 1965) and the probability that many of the gulls remain in the Canterbury North coast during the non-breeding season. Given that there is only one moderate sized colony (500-1000 pairs) on the Taranaki coast (Gurr & Kinsky 1965), it is notable that this section of coast had the second highest rate of recovery of beach-wrecked Red-billed Gulls (11.51 gulls/100 km of coast)(Table 5).

The monthly rate of recovery of adult Red-billed Gulls was greatest in summer and lowest in winter-spring (Kolmogorov-Smirnov one-sample test, $N = 585$, $p < 0.01$)(Figure 2). Whether the peak mortality during December occurs because of the demands of finding sufficient food for a brood, fatal injuries suffered during fights between breeders, as in the Southern Black-backed Gull, or some other factor, is unknown. The period of peak mortality of juveniles occurs in February (Kolmogorov-Smirnov one-sample test, $N = 307$, $p < 0.01$)(Figure 2) and coincides with the fledglings becoming independent and learning to forage.

Black-billed Gull (*Larus bulleri*)

During the breeding season (September-December), the endemic Black-billed Gull is found nesting mainly along the shingle riverbeds and lake shores of Canterbury, Otago and Southland (Gurr 1985). However, a few small colonies occur in the North Island; Sulphur Point, Lake Rotorua, is probably the largest, consisting of about 500 pairs in 1961 (Reid & Reid 1965). Adult birds begin arriving to nest sites in September, with nest-building and egg-laying during October. The eggs hatch after 20-24 days of incubation and the chicks fly at about 26 days (Gurr 1985). During the breeding season, the gulls feed on small freshwater fish and invertebrates taken from lakes, rivers and streams. Also, invertebrates are taken in flight, from wet pastures and those exposed by ploughing. As soon as the chicks can fly, both adults and young disperse from the colonies. During the non-breeding season, Blackbilled Gulls disperse widely, often to the coast. A small proportion of the South Island gulls migrate to coastal North Island sites, mainly south of Wanganui on the west coast and south of Gisborne on the east coast (Bull *et al.* 1985).

Usually, 10-30 Black-billed Gulls have been found annually during the past 22 years (1971-1992). The number of gulls found each year varied from seven in 1992 to 45 in 1978. In total, 448 Black-billed Gulls were found during the period 1943-1992, at an average rate of 0.49 gulls per 100 km of coast covered. Patrollers recorded that 71 (15.8%) were in adult plumage, 34 (7.6%) were in juvenile plumage (0-2 years; Dawson 1954); the remaining 76.6% were of unknown age or their age was not recorded.

Of the sections of coast patrolled, Canterbury South had the greatest rate of Black-billed Gull recovery (5.79 birds/100 km of coast covered),

followed by Southland (4.66), East Coast North Island (2.89), Canterbury North (2.76) and Otago (2.55)(Table 5). These results were as expected from the distribution of gulls along the eastern South Island (Bull *et al.* 1985), but the high rate of gulls found along the East Coast North Island coast is notable. This possibly results from the migration of some South Island and Rotorua birds to this coastline. However, of 37 092 Black-billed Gulls banded (Cossee 1993), none have been found in the Hawkes Bay region (R.O. Cossee pers. comm.)

The monthly rate of recovery of adult and juvenile Black-billed Gulls changed significantly during the year (Kolmogorov-Smirnov one-sample test, $N = 71$ and 34 respectively, $p < 0.01$)(Figure 3). Since the species breeds mainly at inland sites on South Island riverbeds, presumably this is why few have been found dead on beaches during July-November. However, once nesting has been completed during December and the gulls start dispersing from the nesting colonies, there is a rise in the recovery rate of beach-wrecked gulls. The peak period of mortality for both adults and juveniles occurs during January-February (Figure 3).

Figure 4 shows the monthly recovery rates for the three *Larus* species (total of adult, juvenile plus those of unknown age). The monthly pattern of all three species is similar, with the greatest mortality in summer and lowest in spring. For each month, the rate of recovery was highest for the Southern Black-backed Gull, lowest for the Black-billed Gull, and intermediate for the Red-billed Gull. This possibly relates to two factors – the differences in the total population of each species and their ecology. Robertson and Bell (1984) conservatively estimated that the number of breeding pairs of the cosmopolitan Southern Black-backed Gull in the New Zealand region was over a million. While the species is found well inland, even nesting in subalpine habitats, the majority of the birds forage and roost in coastal habitats. Also, while there are huge populations associated with coastal towns and cities where food is often superabundant, there are few stretches of the coastline without a pair of Southern Black-backed Gulls present year round.

By comparison, the total populations of the Red-billed Gull and Black-billed Gull were estimated at 100,000 to one million breeding pairs each (Robertson & Bell 1984). As well as the smaller total population than that of the Southern Black-backed Gull, only a small proportion of Red-billed Gulls live along the western coasts of the North and South Islands (Bull *et al.* 1985). Also, a significant proportion of 'Red-bills' live on offshore islands, such as the Three Kings, Poor Knights and Mokohinau Groups (Gurr & Kinsky 1965), where beach patrolling is rarely, if ever, carried out. Additionally, this species spends much time foraging over eastern inshore waters, where the predominately offshore winds would probably blow dead birds further out to sea.

Consistently fewer Black-billed Gulls than Red-billed Gulls were found each month possibly, in part, because much of the population forages and roosts at inland sites throughout the year, particularly riverine and pastoral habitats, in contrast to the more coastal distribution of the Red-billed Gull. However, although Robertson & Bell (1984) estimated that there were broadly similar numbers of both species, it is probable that there are fewer

Black-billed Gulls. This species prefers to nest on open braided riverbeds, which are found mainly on the east of the South Island (Gurr 1985). The availability of such habitat has been significantly reduced as a result of inundation by hydroelectric storage lakes, and the degradation of much of the remainder by encroachment of introduced plants (e.g. willow (*Salix* spp.), gorse (*Ulex europaeus*), lupins (*Lupinus arboreus*) and its colonisation by introduced predators (Robertson *et al.* 1984).

ACKNOWLEDGEMENTS

The success of the Beach Patrol Scheme in 1992 was due to the members listed below whose names were entered on the cards, and to many other people who carried out or took part in patrols. Auckland Team, D. & P. Agnew, M. Barnes, K. Barrow, B., D., E., L., M., P. & S. Bell, G. & L. Blackmore, K. Bond, P. Bovill, G. Bremner, R. Buchanan, P. Bull, Canterbury Team, S. Chamberlin, H. Clifford, W. Cook, R. & S. Cotter, P. Cozens, M. Crawford, D. & R. Crockett, P. Crombie, A. Crossland, P. Cuming, J. Dawn, B. Dingle, J. Driksen, A. Eagle, G. Eller, R. Empson, L. Esler, L. Fogg, G. Foreman, B. Friend, D. Gaw, D. Geddes, A. Giblin, I. Godbert, A. Goodwin, L. Gough, E. Graham, G. Grant, J. Hamilton, D. Hawke, J. Hawken, J. Hawkins, D. Hayward, B. Heather, H. Heinekamp, R. Hitchmough, A. Hodgson, W. Hutton, M. Imber, B. Jones, M. King, R. Lambert, P. Langlands, P. Latham, S. Lauder, D. Lawrie, W. Lock, M. Looney, C. Lucas, J. Luke, I. May, P. McClelland, C. McRae, D. & J. Medway, W. Messenger, J. Miles, K. & P. Miller, S. Moore, C. Morris, J. & K. Morrison, T. Morrison, A. Munro, F. Nieuwland, L. Oakes, R. Parrish, J. Philpott, R. Pierce, M. & R. Powlesland, E. Price, G. Pulham, I. Reid, P. Reese, P. Rhodes, H. Robertson, M. Robinson, N. Rothwell, J. & S. Rowe, P. Sagar, A. Saxby, C. Schischka, L. Scott, D. Sim, L. Simpkin, R. Skinner, R. Slack, A. Smith, P. Smith, South Auckland Team, H. Spencer, H. Stewart, B. Taylor, G. & S. Taylor, A. & B. Tennyson, K. Todd, S. Triggs, M. Twydale, C. Veitch, B. Walsh, J. West, R. Wheeler, A. Williams, G. Woodward, B. Woolley, J. Woon, A. Wright, B. Wright.

E. & O.E.

We thank the Department of Conservation for institutional support, the New Zealand Lottery Grants Board for financial support, and Robin Fordham, Lou Gurr and Chris Robertson for their constructive comments on drafts of this paper.

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