

REPORT

Beach patrol scheme: Seabirds found dead on New Zealand beaches, 1997 - 1999

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Abstract Participants in the Ornithological Society of New Zealand's beach patrol scheme patrolled 3691 km, 3836 km and 3835 km of New Zealand's coastline in 1997, 1998 and 1999, and recovered 5896, 14214, and 9680 dead seabirds. In addition, 636 birds of 52 non-seabird species were found dead. Unusual finds included the first New Zealand record of Bulwer's petrel (*Bulweria bulwerii*) and the 6th New Zealand record of Leach's storm petrel (*Oceanodroma leucorhoa*). A white-winged black tern (*Chlidonias leucopterus*) and a royal penguin (*Eudyptes chrysolophus schlegeli*) were the first specimens reported from the beach patrol scheme. The largest numbers of mottled petrels (*Pterodroma inexpectata*) to be reported by beach patrollers in a single year (141) washed ashore in 1997. In 1998, there were wrecks of 4480 common diving petrels (*Pelecanoides urinatrix*), 2363 fluttering shearwaters (*Puffinus gavia*) and 3517 little blue penguins (*Eudyptula minor*), the largest, 2nd- largest and 3rd- largest annual totals, respectively, recorded by the beach patrol scheme. Twenty-six other seabird species washed ashore in much higher numbers than normal during this three-year period. Causes of seabird mortality are discussed including observations of fisheries impacts and oiled seabirds.

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INTRODUCTION

This report presents the results of the Ornithological Society of New Zealand's beach patrol scheme (Powlesland 1990; Powlesland & Imber 1988) between 1997 and 1999.

For the purposes of this scheme, the New Zealand coastline is divided into 18 sections (see Table 1). In each of the three years reported here, all sections of New Zealand's coast were patrolled, except for Fiordland. In total, 550 patrol cards were filled in by beach patrollers in 1997, 628 in 1998 and 658 in 1999. Information from beach patrol cards has been stored on the beach patrol database maintained by OSNZ. From this database a 25-year summary table (1970-1994) was constructed and these data used to compare the number of birds found between 1997 and 1999. This period is used for comparison because the distance travelled annually was fairly constant, whereas in earlier years of the scheme (1943 - 1970) the distance travelled increased annually (Powlesland 1990).

The taxonomic nomenclature and sequence are as in Turbott (1990), except for albatrosses which follows Robertson and Nunn (1998).

RESULTS

Distance patrolled and recoveries made

In 1997, 164 patrollers covered 3691 km of coastline along which they found 5896 seabirds (1.78 birds/km; Table 1). The total distance patrolled was 92% of the 25-year annual average of 4007 km and the number of seabirds found was 63% of the 25-year annual average of 9382. Summary statistics of the patrols are presented in Tables 1-4.

In 1998, 180 patrollers covered 3836 km of coastline retrieving 14214 dead seabirds (4.23 birds/km; Table 5). The total distance patrolled was 96% of the 25-year annual average while the number of seabirds found was 50% higher than the average. This was the first year since 1986, when 14462 birds were retrieved, that above average numbers of seabirds have been found on New Zealand beaches. Summary statistics of these patrols are presented in Tables 5-8.

In 1999, 3835 km of coastline was covered by 177 patrollers and 9680 dead seabirds were found (2.81 birds/km; Table 9). The total distance patrolled was 96% of the 25-year annual average and the number of seabirds found was 3% higher than average. Thus, for a second consecutive year, above average numbers of seabirds were retrieved. Summary statistics are presented in Tables 9-12.

Table 1 Length (km) of coastline patrolled in each region in 1997 and numbers of dead seabirds recovered.

Coast	Code		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total km	No. birds	Birds /km
Auckland East	AE	km	22	3	4	3	4	1	0	4	0	0	0	0	41		
		birds	44	10	10	0	6	1	0	1	0	0	0	0	0		72
Auckland West	AW	km	81	27	43	36	29	61	44	37	59	60	60	47	584		
		birds	183	16	15	21	8	16	56	100	104	139	257	156		1071	1.83
Bay Of Plenty	BP	km	2	24	0	0	4	1	0	0	5	3	1	1	41		
		birds	4	38	0	0	12	4	0	0	4	1	1	0		64	1.56
Canterbury North	CN	km	0	0	0	0	0	0	0	0	0	0	6	26	13	45	
		birds	0	0	0	0	0	0	0	0	0	4	22	10		36	0.80
Canterbury South	CS	km	0	0	1	0	0	0	0	0	0	0	0	0	1		
		birds	0	0	6	0	0	0	0	0	0	0	0	0		6	6.00
East Coast NI	EC	km	6	10	0	13	14	12	14	12	7	11	6	13	118		
		birds	13	27	0	3	8	3	4	2	3	3	5	10		81	0.69
North Coast SI	NC	km	5	0	0	0	0	0	0	0	0	0	0	0	5		
		birds	12	0	0	0	0	0	0	0	0	0	0	0		12	2.40
Northland East	NE	km	22	46	53	29	67	27	27	54	20	65	43	74	527		
		birds	54	109	38	7	58	13	17	34	27	45	30	258		690	1.31
Northland West	NW	km	93	70	71	85	73	120	122	100	117	128	95	129	1204		
		birds	59	64	20	17	37	56	240	349	165	181	150	325		1663	1.38
Outlying Islands	OI	km	27	16	16	16	16	28	10	0	0	16	4	29	178		
		birds	6	9	4	8	54	12	3	0	0	19	3	56		174	0.98
Otago	OT	km	10	29	17	7	8	8	5	1	1	1	2	3	92		
		birds	17	70	17	7	5	11	5	0	0	1	1	1		135	1.47
Southland	SD	km	15	13	29	8	24	6	6	8	31	26	13	23	202		
		birds	50	56	39	13	587	8	14	8	58	80	131	140		1184	5.86
Taranaki	TA	km	13	10	0	2	0	0	3	0	0	10	8	17	63		
		birds	90	9	0	3	0	0	14	0	0	73	75	88		352	5.59
Wairarapa	WA	km	0	0	4	0	4	0	0	0	0	0	0	0	8		
		birds	0	0	9	0	1	0	0	0	0	0	0	0		10	1.25
Westland	WD	km	0	0	1	0	0	0	0	0	0	0	0	0	1		
		birds	0	0	0	0	0	0	0	0	0	0	0	0		0	0.00
Wellington South	WS	km	9	17	8	1	7	6	13	4	11	4	7	4	91		
		birds	31	8	10	1	9	0	17	8	4	13	8	4		113	1.24
Wellington West	WW	km	7	14	7	5	4	5	9	21	1	8	15	7	103		
		birds	10	74	12	11	12	4	11	37	0	3	28	31		233	2.26
Total km patrolled			312	279	254	205	254	275	253	241	252	338	280	361	3304		
Total birds recovered			573	490	180	91	797	128	381	539	365	562	711	1079		5896	
Recovery rate (birds/km)			1.84	1.76	0.71	0.44	3.14	0.47	1.51	2.24	1.45	1.66	2.54	2.99			1.78

Only five coastal sections had >100 km of beaches patrolled in each year: Northland West, Auckland West, Northland East, Southland and Wellington West (Tables 1,5,9). East Coast North Island had patrols totalling >100 km in 1997 and 1998, Outlying Islands had 178 km patrolled in 1997, Auckland East 168 km in 1998 and Taranaki 106 km of beaches in 1998.

Of the coastal sections where >50 km of beaches were covered in 1997 (Table 1), Southland had the highest rate of recovery at 5.86 birds/km. Taranaki beaches had a similar recovery rate (5.59 birds/km). In 1998, the highest recovery rates were on Bay of Plenty (10.59 birds/km), and Northland West (5.91 birds/km) beaches (Table 5). In 1999, Bay of Plenty again had the highest recovery rate (8.03 birds/km) followed by Taranaki (4.27 birds/km) (Table 9). The lowest rate of seabird recovery

during this three-year period was on Outlying Islands beaches (all on Chatham Islands) with 0.26 birds/km in 1998.

Unusual recoveries

A freshly dead Bulwer's petrel (*Bulweria bulwerii*) was found on Te Horo Beach (WW) on 8 Jan.1998 by J. Luke, the first New Zealand record for this species (Medway 2001). Bulwer's petrel is a small, all dark seabird which resembles an oversized storm petrel or a miniature shearwater (body length 27 cm, bill length 22 mm, wing length c.200 mm). The specimen was deposited at Museum of New Zealand Te Papa Tongarewa (MNZ25739).

A Leach's storm petrel (*Oceanodroma leucorhoa*) in fresh condition was found on Ninety-Mile Beach (NW) on 17 Oct.1998 by L. Honnor. The specimen was deposited at Museum of New Zealand Te Papa

Table 2 Numbers, location and month of recovery of seabirds of which <15 specimens were found in 1997. * Aggregate of 4 "wandering albatross" species (species not identified by patroller); ** Species not identified by the patroller

Species	No.	Coast(s)	Month(s)
<i>Diomedea exulans</i> agg.*	12	AW, NW (11)	Jan, Feb (5), Jun (2), Jul, Sep, Oct (2)
<i>D. epomophora/sanfordini</i>	4	AW (2), NW, SD	Jan, Apr, Oct, Nov
<i>Thalassarche salvini</i>	4	OI, SD (2), WS	Jan, Feb, Nov (2)
<i>T. chrysostoma</i>	12	AW, NW (9), OI, TA	Jan, Apr, Jul, Aug (2), Sep (2), Oct (2), Nov (2), Dec
<i>T. melanophrys/impavida</i>	3	NW (3)	May, Dec (2)
<i>Phoebastria palpebrata</i>	5	AW, NW (4)	Jul (2), Aug (2), Sep
<i>Puffinus</i> spp.**	6	AW (2), AE, TA, WW (2)	Jan, Mar, Apr, Jul, Aug, Oct
<i>P. gavia/huttoni</i>	1	WW	Jan
<i>Procellaria</i> spp.**	1	SD	Nov
<i>P. cinerea</i>	1	OI	Jul
<i>P. parkinsoni</i>	14	AW, NE (8), NW(5)	Jan (3), Feb (4), Apr, Sep, Nov (2), Dec(3)
<i>P. westlandica</i>	2	NE, OI	Apr, Dec
<i>P. aequinoctialis</i>	6	AW 2), SD(3), WW	Jan, Mar, Nov, Dec (3)
<i>Lugensa brevirostris</i>	12	AW (10), NW (2)	Aug (2), Sep (7), Oct, Nov, Dec
<i>Fulmarus glacialisoides</i>	1	AW	Dec
<i>Macronectes</i> spp.**	8	NE, NW(7)	May, Jun, Jul (2), Aug, Oct (2), Nov
<i>M. halli</i>	3	NW, SD, WW	Jun, Aug, Oct
<i>M. giganteus</i>	3	AW, NW (2)	Apr, Sep, Nov
<i>Pachyptila desolata*</i>	8	AW (4), NW (2), SD (2)	May, Jun, Sep (3), Oct (2), Nov
<i>Pterodroma leucoptera</i>	6	AW (6)	Nov (2), Dec (4)
<i>P. cookii</i>	7	AW, AE (3), NE (3)	Jan (4), Feb, Dec (2)
<i>P. nigripennis</i>	1	OI	Mar
<i>Oceanites nereis</i>	2	OI (2)	Dec (2)
<i>Fregatta tropica</i>	1	SD	Dec
<i>Eudyptes</i> spp.	3	SD (3)	Dec (3)
<i>E. pachyrhynchus</i>	5	SD (5)	Jan (2), Oct, Nov, Dec
<i>E. chrysolophus schlegeli</i>	1	SD	Feb
<i>Phalacrocorax</i> spp.**	2	AW, EC	May, Aug
<i>P. sulcirostris</i>	3	EC (3)	May (2), Jun
<i>P.melanoleucos</i>	3	OT, SD, WS	Jun, Jul, Oct
<i>Leucocarbo onslowi</i>	2	OI (2)	Feb, Dec
<i>Stictocarbo featherstoni</i>	6	OI (6)	Feb, Apr, May, Dec (3)
<i>Catharacta skua lombergi</i>	1	AW	Sep
<i>Stercorarius</i> spp.**	1	TA	Dec
<i>S. longicaudus</i>	1	AW	Jan
<i>Larus</i> spp.**	1	OT	Jun
<i>Sterna caspia</i>	4	AW (2), NW (2)	Aug (2), Nov (2)
<i>Anous tenuirostris minutes</i>	2	AW, AE	Jan (2)
Total	158		

Tongarewa (MNZ25797) and the record accepted by the New Zealand Rare Birds Committee (Medway 2001). This is its 6th record for New Zealand (Imber & Lovegrove 1982; Turbott 1990; Imber 1994) and the 2nd specimen found under the beach patrol scheme.

A dried corpse of a white-winged black tern (*Chlidonias leucopterus*) in breeding plumage was found by G. and C. Schischka on Karekare/Piha Beach (AW) on 23 Nov.1998. Although this Eurasian breeding species is a regular visitor to New Zealand in small numbers (Turbott 1990), this is the first specimen recorded by the beach patrol scheme.

A freshly dead adult royal penguin (*Eudyptes chrysolophus schlegeli*) was found at Colac Bay (SD) on 23 Feb.1997, the first record for the beach patrol scheme. Royal penguins breed on Macquarie Island

and a few birds regularly straggle to New Zealand subantarctic islands, and occasionally to South Island beaches, to moult in late summer (Turbott 1990). The Colac Bay bird was very fat and moulting (L. Esler pers. comm.). The head was deposited at Museum of New Zealand Te Papa Tongarewa (MNZ26726).

A skeletal pomarine skua (*Stercorarius pomarinus*) was found on Dargaville (Tikinui to Bluff) Beach (NW) on 4 Sep.1999 (identified by D. Crockett), only the 2nd specimen of this species found by beach patrollers. Skeletal remains of a white tern (*Gygis alba*) were found nearby on Dargaville (Maunganui Bluff to Tikinui) Beach (NW) on 4 Jul.1998, the 5th record for the beach patrol scheme.

Table 3 Coastal distribution of commonly-found (>15) dead seabirds in 1997. * species not identified by the patroller

Species	Coast															Total	
	AW	AE	NW	NE	BP	TA	WW	EC	WA	WS	NC	CN	CS	OT	SD		OI
<i>Diomedea/Thalassarche</i> spp.*	3	0	3	0	0	0	0	1	0	0	0	0	0	1	4	5	17
<i>Diomedea cauta/steadii</i>	11	0	12	0	0	1	0	0	0	1	0	0	0	1	3	0	29
<i>Thalassarche bulleri/platei</i>	1	0	5	0	0	0	0	0	0	0	0	0	0	0	32	8	46
<i>Puffinus carneipes</i>	2	21	6	58	3	0	1	2	0	0	0	0	0	0	0	0	93
<i>P. bulleri</i>	30	3	52	12	4	16	9	4	0	0	0	0	0	0	0	1	131
<i>P. griseus</i>	259	2	268	49	8	84	16	6	0	0	0	9	1	6	601	81	1390
<i>P. tenuirostris</i>	13	0	27	11	0	15	10	0	0	0	0	0	1	29	0	0	106
<i>P. gavia</i>	90	5	278	102	6	30	4	2	0	1	0	0	0	0	0	0	518
<i>P. huttoni</i>	9	0	1	0	0	0	0	7	2	1	0	13	0	0	1	0	34
<i>P. assimilis</i>	3	1	7	4	0	0	0	0	0	0	0	0	0	0	0	1	16
<i>Pelecanoides urinatrix</i>	106	2	196	133	5	18	26	0	0	3	0	0	0	0	65	1	555
<i>Daption capense</i>	18	0	19	7	0	5	2	0	0	2	0	3	0	1	6	1	64
<i>Pachyptila</i> spp.	60	0	51	2	0	48	34	1	0	0	0	0	0	0	18	21	235
<i>Pachyptila turtur</i>	136	0	162	14	3	53	71	1	0	2	0	0	0	0	40	4	486
<i>P. belcheri</i>	19	0	16	1	0	7	0	0	0	0	0	0	0	0	1	0	44
<i>P. salvini</i>	10	0	15	0	0	1	2	0	0	0	0	0	0	0	2	0	30
<i>P. vittata</i>	14	0	5	1	1	2	5	0	0	0	0	0	0	0	106	2	136
<i>Halobaena caerulea</i>	5	0	9	1	1	2	0	0	0	0	0	0	0	0	2	2	22
<i>Pterodroma inexpectata</i>	11	0	27	0	0	5	3	0	0	0	0	0	0	0	94	1	141
<i>P. macroptera</i>	4	5	10	19	9	0	0	0	0	0	0	0	0	0	0	0	47
<i>P. lessonii</i>	21	0	30	1	0	5	3	0	0	0	0	0	0	0	1	2	63
<i>Pelagodroma marina</i>	8	0	9	8	2	2	0	0	0	0	0	0	0	1	0	4	34
<i>Megadyptes antipodes</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	81	2	0	83
<i>Eudyptula minor</i>	31	10	97	130	18	14	5	6	5	10	1	3	1	7	37	14	389
<i>Morus serrator</i>	124	13	236	39	1	29	4	2	1	0	1	0	0	0	0	0	450
<i>Phalacrocorax carbo</i>	1	1	1	1	0	0	3	14	0	1	0	0	0	0	0	1	23
<i>P. varius</i>	8	2	5	7	1	0	0	0	0	1	1	0	0	0	2	0	27
<i>Leucocarbo chalconotus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	5	14	0	19
<i>Stictocarbo punctatus</i>	0	0	0	0	0	0	2	0	0	3	1	0	4	13	19	0	42
<i>Larus dominicanus</i>	24	0	62	51	2	9	21	17	2	81	1	0	0	8	64	8	350
<i>L. novaehollandiae</i>	2	1	2	22	0	0	4	4	0	5	0	2	0	7	5	2	56
<i>L. bulleri</i>	0	0	0	0	0	0	1	6	0	0	0	6	0	0	12	0	25
<i>Sterna striata</i>	9	1	3	4	0	3	2	4	0	0	7	0	0	1	3	0	37
Total	1032	67	1614	677	64	349	228	77	10	111	12	36	6	133	1163	159	5738

Three dead white-capped noddies (*Anous tenuirostris minutus*) were found by beach patrollers in 1997-99. The first was found by A. Tennyson on Mangawhai Spit (AE) on 16 Jan.1997 and the second by B. Woolley on Ruapuke Beach (AW) on 21 Jan.1997. Both were found soon after tropical cyclone 'Drena' passed New Zealand on 11 Jan.1997 and both have been deposited at Museum of New Zealand Te Papa Tongarewa (MNZ26438, MNZ26754). The third recovery was of an adult bird found on Muriwai Beach (AW) by P. Scofield on 18 Oct.1998. This specimen was deposited at Canterbury Museum (AV38258). The four previous recoveries of this species under the beach patrol scheme were at Muriwai Beach (AW) and Karikari Bay (NE) in January 1986 and two between Maunganui Bluff and Pouto, near Dargaville (NW) in October and November 1989.

Two black-bellied storm petrels (*Fregatta tropica*) were found, at Oreti Beach (SD) on 31 Dec.1997 and on Moutohora Island (BP) on 6 Feb.1999. These were the 7th and 8th records for the beach patrol

scheme. Previous specimens were found in 1963,1968,1975, 1977, 1981 and 1988.

One red-tailed tropicbird (*Phaethon rubricauda*) was found on Maunganui Bluff to Mahuta Gap Beach (NW) on 14 Nov.1998, the 9th record for the beach patrol scheme. On 10 Jan.1999, skeletal remains of a white-tailed tropicbird (*Phaethon lepturus*) were found on Tokerau Beach (NE) by L. & A. Howell. The identification was confirmed by D. Crockett. This was the 11th record for the beach patrol scheme. Previous tropicbird recoveries on New Zealand beaches are reported by Powlesland *et al.* (1992) and Powlesland & Powlesland (1993).

One Wilson's storm petrel (*Oceanites oceanicus*) was picked up by A. Williams on Bream Bay (NE) on 1 Jan.1999, the 13th record for the beach patrol scheme (Petyt 2001). An erect-crested penguin (*Eudyptes sclateri*), found by M. Imber on Sealers Bay, Codfish Island (SD) on 6 Dec.1998, was the 20th scheme record and the first since 1989.

Six New Caledonian petrels (*Pterodroma leucoptera caledonica*) found on Muriwai Beach (AW)

Table 4 Monthly distribution of commonly-found (>15) dead seabirds in 1997. * species not identified by the patroller

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Diomedea/Thalassarche</i> spp.*	1	1	0	1	1	1	2	0	1	1	2	6	17
<i>Thalassarche cauta/steadii</i>	7	1	0	3	3	2	0	0	1	3	7	2	29
<i>T. bulleri/platei</i>	0	0	0	1	2	9	2	3	20	6	0	3	46
<i>Puffinus carneipes</i>	21	32	4	0	8	1	0	2	0	0	5	20	93
<i>P. bulleri</i>	30	14	4	8	10	3	2	0	1	22	17	20	131
<i>P. griseus</i>	105	22	9	13	604	19	3	1	3	25	213	373	1390
<i>P. tenuirostris</i>	9	3	0	1	12	1	2	0	0	3	14	61	106
<i>P. gavia</i>	24	38	16	7	11	12	99	128	18	62	43	60	518
<i>P. huttoni</i>	2	4	3	0	0	0	5	0	1	3	9	7	34
<i>P. assimilis</i>	3	2	0	1	0	0	1	4	0	1	1	3	16
<i>Pelecanoides urinatrix</i>	23	6	1	0	10	3	114	162	45	50	40	101	555
<i>Daption capense</i>	2	1	0	0	1	0	2	10	7	22	13	6	64
<i>Pachyptila</i> spp. *	13	24	0	2	0	4	13	17	13	63	56	30	235
<i>P. turtur</i>	30	48	1	1	4	11	45	81	83	66	59	57	486
<i>P. belcheri</i>	2	0	0	0	1	0	3	9	10	17	2	0	44
<i>P. salvini</i>	3	0	1	1	0	0	4	4	3	8	2	4	30
<i>P. vittata</i>	8	3	0	0	11	0	1	3	10	24	40	36	136
<i>Halobaena caerulea</i>	0	0	0	1	1	1	1	6	2	8	0	2	22
<i>Pterodroma inexpectata</i>	7	6	1	0	39	0	0	0	0	3	22	63	141
<i>P. macroptera</i>	14	9	0	1	12	0	1	2	3	1	0	4	47
<i>P. lessoni</i>	16	0	1	2	4	3	2	3	5	7	16	14	63
<i>Pelagodroma marina</i>	3	1	0	0	0	0	0	2	4	6	5	13	34
<i>Megadyptes antipodes</i>	13	48	14	4	2	1	1	0	0	0	0	0	83
<i>Eudyptula minor</i>	85	115	37	3	9	5	11	7	5	25	19	68	389
<i>Morus serrator</i>	64	26	11	3	9	9	11	61	83	68	62	43	450
<i>Phalacrocorax carbo</i>	6	3	0	1	2	1	2	0	0	3	1	4	23
<i>P. varius</i>	5	1	0	3	3	3	1	1	3	2	2	3	27
<i>Leucocarbo chalconotus</i>	0	1	10	0	1	2	1	0	1	1	1	1	19
<i>Stictocarbo punctatus</i>	6	5	9	3	0	4	4	3	0	6	1	1	42
<i>Larus dominicanus</i>	49	48	39	19	25	23	31	8	23	32	22	31	350
<i>L. novaehollandiae</i>	1	8	9	3	4	1	4	5	2	7	4	8	56
<i>L. bulleri</i>	0	3	6	1	0	0	4	1	0	1	8	1	25
<i>Sterna striata</i>	12	3	1	1	1	1	0	4	1	2	7	4	37
Total	554	476	177	84	790	120	372	527	348	548	693	1049	5738

in 1997 (two on 9 November, four on 7 December; identified by S. Chamberlin) was the highest annual total since 10 birds were picked up on Muriwai Beach (AW) in April 1942 (Bull 1943; Imber & Jenkins 1981). Another two birds were found; one on 11 Nov.1998 at Mangawhai Spit (AE) by A. Williams and one on 20 Nov.1999 at Ninety-Mile Beach (NW) by L. Howell. These eight birds brought the number of this species found under the beach patrol scheme to 24.

Wrecks of seabirds

Three species wrecked in large numbers in 1998 (Table 8). The most significant was that of common diving petrels (*Pelecanoides urinatrix*) when 4480 birds were recovered, mostly on NW and NE coastal beaches between June and August. The largest single wreck occurred on Ninety-Mile Beach where 989 were found on 37.5 km of beach (26/km) on 18 July. This mortality event started as early as 20 June (289 birds found on Ninety-Mile

Beach) and by July had spread to all North Island west coast beaches and across Cook Strait to Nelson beaches. NE and BP beaches also had large numbers washed up in July. Large numbers of common diving petrels continued to wash up on Northland beaches during August and early September (Tables 7,8). Heavy rainfall was reported in many regions in June and July, and warmer than average sea temperatures prevailed in the Tasman Sea during this period (NIWA 2002), and the most likely explanation for these deaths is that food supplies failed or became scarce during the winter. Following this wreck, breeding was delayed at several northern colonies e.g. on Stanley Island (Mercury Islands) some common diving petrels were found on freshly laid eggs in early November 1998 and most birds were then still incubating (G. Taylor pers. obs.). At the Mercury Islands, laying is normally in August/early September and hatching occurs in October (Thoresen 1969). In November 1998, common diving petrel chicks at

Table 5 Length (km) of coastline patrolled in each region in 1998 and numbers of dead seabirds recovered.

Coast	Code	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total km	No. Birds	Birds /km
Auckland East	AE km	10	15	0	12	12	3	12	29	20	18	17	20	168		
	birds	22	8	0	3	5	9	49	297	81	4	33	110		621	3.70
Auckland West	AW km	45	14	35	39	74	32	33	48	69	62	82	51	584		
	birds	137	13	27	24	182	173	76	171	199	151	140	107		1400	2.40
Bay Of Plenty	BP km	12	0	0	1	3	2	17	25	4	2	0	5	71		
	birds	57	0	0	6	15	8	51	426	85	9	0	95		752	10.59
Canterbury North	CN km	12	26	0	0	0	4	0	4	0	0	0	0	46		
	birds	15	41	0	0	0	2	0	1	0	0	0	0		59	1.28
Canterbury South	CS km	0	0	0	0	0	0	0	1	0	0	0	0	1		
	birds	0	0	0	0	0	0	0	1	0	0	0	0		1	1.00
East Coast NI	EC km	7	5	10	9	3	10	11	10	16	5	8	7	101		
	birds	23	4	23	11	0	7	6	8	10	3	12	14		121	1.20
North Coast SI	NC km	0	1	3	0	3	4	15	3	9	6	4	2	50		
	birds	0	12	14	0	2	11	169	1	12	31	4	13		269	5.38
Northland East	NE km	27	54	53	40	33	38	53	51	40	57	35	62	543		
	birds	31	123	47	52	63	86	968	1196	244	106	110	98		3124	5.75
Northland West	NW km	115	85	77	82	89	87	107	89	85	84	65	93	1058		
	birds	300	61	69	25	284	644	1850	1486	1018	170	147	197		6251	5.91
Outlying Islands	OI km	13	10	16	12	0	0	0	0	0	0	7	0	58		
	birds	7	0	3	2	0	0	0	0	0	0	3	0		15	0.26
Otago	OT km	5	26	4	0	0	5	0	3	5	12	9	0	69		
	birds	2	16	24	0	0	7	0	2	2	7	3	0		63	0.91
Southland	SD km	6	6	10	6	24	10	6	13	33	18	5	13	150		
	birds	56	38	16	7	328	17	12	44	78	44	16	15		671	4.47
Taranaki	TA km	14	3	10	4	9	9	4	17	3	8	15	10	106		
	birds	57	1	5	1	10	47	14	96	11	16	31	24		313	2.95
Wairarapa	WA km	0	2	0	0	0	0	4	0	0	3	0	1	10		
	birds	0	2	0	0	0	0	3	0	0	15	0	3		23	2.30
Wellington South	WS km	11	7	6	7	8	6	6	10	9	12	10	10	102		
	birds	14	3	5	4	14	4	22	12	0	6	8	1		93	0.91
Wellington West	WW km	11	17	3	18	14	32	23	41	21	22	27	11	240		
	birds	32	65	2	6	10	28	8	84	32	50	92	29		438	1.83
Total km patrolled		288	271	227	230	272	242	291	344	314	309	284	285	3357		
Total birds recovered		753	387	235	141	913	1043	3228	3825	1772	612	599	706		14214	
Recovery rate (birds/km)		2.61	1.43	1.04	0.61	3.36	4.31	11.09	11.12	5.64	1.98	2.11	2.48			4.23

the Sugarloaf Islands, New Plymouth, were about two weeks behind in development compared to 1997 (G. Taylor pers. obs.).

The common diving petrel wreck in 1998 was followed closely by a large wreck of fluttering shearwaters (*Puffinus gavia*) (Tables 7,8). These birds began washing ashore in large number from early August (e.g. 214 found on 11 August on 14 km of Tokerau Beach, NE). The wreck extended down the entire west coast of the North Island and was particularly prevalent in BP (e.g., 57 birds on 29 August on 3 km of Papamoa Beach). It continued into early September on NW beaches (e.g., 508 found on 5 September on 54 km of Dargaville Beach). In total, 2363 fluttering shearwaters were recovered.

Blue penguins (*Eudyptula minor*) also wrecked in large numbers (3517), especially during May to September 1998 (Tables 7,8). This wreck was mainly confined to NW and NE regions but patrols on AW, AE and BP beaches in August also found greater

numbers than usual. Maximum numbers were found on Ninety-Mile beach (NW) on 18 July when 378 penguins were found on 37 km of beach (10/km). However the peak recovery rate occurred on Kauri Mountain/Ocean Beach (NE) on 15 August when 166 penguins were found on 6.5km of beach (25/km).

The large concurrent wrecks of three inshore feeding seabirds that obtain their food by diving suggests that food failure, or a significant marine event, was an important contributing factor.

Several wrecks of sooty shearwaters (*Puffinus griseus*) occurred. A large wreck of 499 was found on 18 km of Mason's Bay on 4 May 1997. The birds were all recently fledged chicks. A smaller wreck, of 2-4 adults/km, occurred on numerous AW beaches in December 1997, a localised wreck of sooty shearwaters on BP beaches in November 1999 (7/km on Papamoa beach on 12-14 November) and some smaller wrecks on NE beaches in December.

Table 6 Numbers, location and month of recovery of seabirds of which <15 specimens were found in 1998. * Aggregate of 4 "wandering albatross" species (species not identified by patroller); ** Species not identified by the patroller

Species	No.	Coast(s)	Month(s)
<i>Diomedea exulans</i> agg.*	7	AW, AE, NW (4), TA	Jun (2), Oct(3), Nov, Dec
<i>D. epomophora/sanfordi</i>	2	OI (2)	Jan, Nov
<i>Diomedea/Thalassarche</i> spp.	5	NE, NW, SD (3)	Aug (2), Sep (2), Oct
<i>Thalassarche cauta/steadii</i> .	2	AW, NC	Jun, Dec
<i>T. chrysostoma</i>	7	AW (3), NW (3), WW	Jun (2), Aug (2), Sep (2), Oct
<i>T. melanophrys/impavidia</i>	4	AW, NW (3)	May, Jun, Aug (2)
<i>Phoebastria palpebrata</i>	4	AW, NW (3)	Apr, Aug, Sep, Oct
<i>Puffinus</i> spp.**	11	AW (4), AE, NW (5), TA	Jan (2), May (2), Jun (3), Jul, Aug, Sep, Nov
<i>P. gavia/huttoni</i>	5	NC, WW (4)	Feb (4), Dec
<i>P. pacificus</i>	1	NE	Jul
<i>Procellaria cinerea</i>	1	BP	Jul
<i>P. parkinsoni</i>	10	AW (2), AE, NE (5), NW (2)	Jan (2), Feb, Mar, Apr, May, Aug, Oct, Nov, Dec
<i>P. westlandica</i>	4	AW (2), NW, WW	Jan, Jun, Oct (2)
<i>P. aequinoctialis</i>	10	AW (3), NE, NW (5), SD	Jan (5), Feb, Apr, Nov, Dec (2)
<i>Lugensa brevirostris</i>	11	AW (6), NW (4), WW	Jun, Aug, Sep (6), Oct (3)
<i>Thalassoica antarctica</i>	1	AW	Nov
<i>Fulmarus glacialisoides</i>	5	NW, SD (4)	Feb, Sep (2), Oct, Nov
<i>Macronectes</i> spp. **	9	AW (2), NE (2), NW (4), NC	Mar, Jun, Aug (4), Sep (2), Oct
<i>M. halli</i>	4	NW (4)	Jan (2), Jul (2)
<i>M. giganteus</i>	7	AW (3), BP, EC, SD (2)	May (2), Jun, Aug, Sep (2), Oct
<i>Pachyptila crassirostris</i>	1	AW	Nov
<i>Pterodroma</i> spp.**	2	NW, TA	May, Nov
<i>P. leucoptera</i>	1	AE	Nov
<i>P. pycrofti</i>	1	AW	Feb
<i>P. nigripennis</i>	4	NE (2), TA (2)	Jan (2), Dec (2)
<i>Bulweria bulwerii</i>	1	WW	Jan
<i>Oceanodroma leucorhoa</i>	1	NW	Oct
<i>Oceanites nereis</i>	1	WS	Jul
<i>Megadyptes antipodes</i>	2	SD (2)	Apr (2)
<i>Eudyptes pachyrhynchus</i>	3	SD (3)	Feb, Jun, Nov
<i>E. sclateri</i>	1	SD	Dec
<i>Phaethon rubricauda</i>	1	NW	Nov
<i>Phalacrocorax carbo</i>	10	AW, EC (5), NC, SD, TA, WS	Jan, Feb, Jun, Jul, Aug (2), Sep (2), Nov, Dec
<i>P.melanoleucos</i>	8	AW (4), NW, WS (3)	Jan, Feb, Jun (2), Jul, Aug (2), Oct
<i>Leucocarbo chalconotus</i>	3	SD (3)	Feb, May, Aug
<i>L. onslowi</i>	1	OI	Mar
<i>Stictocarbo featherstoni</i>	1	OI	Jan
<i>Catharacta skua lombergi</i>	2	AW, NW	Mar, Apr
<i>Stercorarius</i> spp.**	1	NE	Nov
<i>S. parasiticus</i>	1	WW	May
<i>Larus bulleri</i>	15	EC (11), SD (4)	Jan (8), Feb (2), Mar, Apr, Jun, Oct, Dec
<i>Chlidonias leucopterus</i>	1	AW	Nov
<i>Sterna</i> spp.**	2	NW, BP	Jan, Jun
<i>S. caspia</i>	6	NE (2), NW (4)	Jan (4), Mar, Jul
<i>S. fuscata</i>	2	NW (2)	Jan, Dec
<i>Anous tenuirostris minutus</i>	1	AW	Oct
<i>Gygis alba</i>	1	NW	Jul
Total	184		

Antarctic fulmars (*Fulmarus glacialisoides*) came ashore in September and October 1999, the largest numbers (100; 2/km) being found on Dargaville Beach (NW) on 2 October. They washed ashore on AW beaches at similar rates (1-2/km) during the same period. Other species that wrecked in moderate numbers around the same time were fairy prions (*Pachyptila turtur*) (875 in August), Kerguelen petrels (*Lugensa brevirostris*) (195 in

August), thin-billed prions (*Pachyptila belcheri*) in July and August (156 and 175 birds respectively) and blue petrels (*Halobaena caerulea*) in August and September 1999 (149 and 187 birds respectively).

A small wreck of common diving petrels and fluttering shearwaters occurred on AW and NW beaches in July-August 1997, the birds washing ashore at rates of 1-2/km.

Table 7 Coastal distribution of commonly-found (>15) dead seabirds in 1998. * species not identified by the patroller

Species	Coast																Total	
	AW	AE	NW	NE	BP	TA	WW	EC	WA	WS	NC	WD	CN	CS	OT	SD		OI
<i>Thalassarche cauta/steadi</i>	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	57	0	62
<i>T. bulleri/platei</i>	8	0	11	0	0	0	6	0	0	0	0	0	0	0	0	2	0	27
<i>Puffinus carneipes</i>	2	31	21	113	0	0	0	0	0	0	0	0	0	0	0	0	0	167
<i>P. bulleri</i>	46	4	65	19	1	3	18	8	0	0	1	0	0	0	0	2	1	168
<i>P. griseus</i>	165	12	248	19	1	30	16	8	0	0	1	0	2	0	0	309	0	811
<i>P. tenuirostris</i>	63	0	95	19	6	23	20	3	0	1	2	0	0	0	0	12	0	244
<i>P. gavia</i>	288	117	892	532	347	84	74	6	4	4	15	0	0	0	0	0	0	2363
<i>P. huttoni</i>	4	0	2	0	1	0	4	3	0	0	1	0	18	0	0	0	0	33
<i>P. assimilis</i>	1	4	10	13	3	0	0	0	0	0	0	0	0	0	0	0	0	31
<i>Pelecanoides urinatrix</i>	225	122	2682	872	197	77	45	1	11	10	170	0	0	0	0	68	0	4480
<i>Daption capense</i>	12	0	14	4	2	2	4	3	0	0	4	0	3	0	1	5	0	54
<i>Pachyptila</i> spp. *	23	2	58	4	1	9	30	1	1	0	2	0	2	0	0	0	0	133
<i>P. turtur</i>	120	9	159	107	12	25	123	1	1	4	30	0	3	0	0	28	2	624
<i>P. belcheri</i>	21	1	21	2	0	0	2	0	0	0	1	0	0	0	0	1	0	49
<i>P. desolata</i>	10	1	3	3	0	1	3	0	0	0	1	0	0	0	0	3	0	25
<i>P. salvini</i>	10	1	20	2	0	1	0	0	0	0	1	0	0	0	0	3	0	38
<i>P. vittata</i>	12	0	6	0	0	5	3	0	1	0	2	0	0	0	0	45	0	74
<i>Halobaena caerulea</i>	5	0	13	1	17	0	1	0	0	0	0	0	0	0	0	2	0	39
<i>Pterodroma cookii</i>	2	7	6	24	0	0	0	0	0	0	0	0	0	0	0	1	0	40
<i>P. inexpectata</i>	8	0	11	1	0	4	2	0	0	0	0	0	0	0	0	15	0	41
<i>P. macroptera</i>	3	6	29	15	6	2	2	0	0	0	0	0	0	0	0	0	0	63
<i>P. lessonii</i>	17	0	28	0	1	1	3	0	0	1	0	0	0	0	0	0	0	51
<i>Pelagodroma marina</i>	3	2	6	2	5	0	0	0	0	0	0	0	0	0	0	0	0	18
<i>Eudyptula minor</i>	187	268	1568	1227	135	9	21	7	3	17	13	0	16	0	7	34	5	3517
<i>Morus serrator</i>	73	13	111	38	6	17	7	9	1	0	2	0	0	0	1	1	1	280
<i>Phalacrocorax varius</i>	12	9	5	13	1	0	0	0	0	0	6	0	0	0	2	0	0	48
<i>Stictocarbo punctatus</i>	2	1	0	0	0	1	0	0	0	4	4	0	2	1	37	12	0	64
<i>Larus dominicanus</i>	25	5	97	57	6	8	44	44	1	45	4	0	8	0	8	37	0	389
<i>L. novaehollandiae</i>	1	2	7	16	1	0	1	5	0	2	5	0	5	0	6	7	2	60
<i>Sterna striata</i>	11	0	6	6	0	5	0	5	0	0	0	0	0	0	1	3	0	37
Total	1360	617	6198	3109	749	307	429	104	23	88	265	0	59	1	63	647	11	14030

Species recovered in high numbers

Twenty-nine species were recovered in numbers higher than their 25-year average in the beach patrol scheme.

Mottled petrels (*Pterodroma inexpectata*) washed ashore in exceptionally large numbers in 1997 (Table 4). The 141 birds recorded was the highest annual total since the start of the beach patrol scheme and was twice the previous highest annual total of 68 in 1982. These exceptional mortality events coincided with the two most extreme El Niño events of the past 40 years. Large numbers of mottled petrels wrecked on Alaskan beaches in 1997 (V. Mendenhall pers. comm.) and it seems that oceanic conditions may have affected this species on both sides of the equator.

Six New Caledonian petrels were found on beaches in 1997, the highest annual total recorded for this species.

Eighty-three yellow-eyed penguins (*Megadyptes antipodes*) were found dead (mostly on OT beaches) in 1997, the scheme's highest annual total. The previous highest total was 49 in 1972. This wreck followed a

mortality event that occurred during January - March. The number recovered was greatly increased by members of the public sending freshly dead birds to Otago Museum. These records were placed on beach patrol cards by P. Schweigman. While this mortality event was unusually severe, it was not as severe as that in 1990 (J. Darby pers. comm.).

Six Pitt Island shags (*Stictocarbo featherstoni*) were found in 1997, the 2nd highest annual total (cf. seven in 1996) for this species and was the result of regular beach patrols, co-ordinated by Mike Bell, being carried out on the Chatham Islands by OSNZ members. Other shags recovered in high numbers in 1997 included Stewart Island shags (*Leucocarbo chalconotus*) (19; their 6th highest annual total), and black shags (*Phalacrocorax carbo*) (23; their 3rd highest annual total and, at 0.7/100 km, their 2nd highest annual recovery rate).

Other species recovered in high numbers in 1997 (Table 4) included: 445 Australasian gannets (*Morus serrator*), their 3rd highest annual total (cf. 648 in 1995 and 500 in 1985); 14 black petrels (*Procellaria parkinsoni*), their 3rd highest annual

Table 8 Monthly distribution of commonly-found (>15) dead seabirds in 1998. * species not identified by the patroller

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>T. bulleri/platei</i>	0	0	0	0	3	5	2	17	30	3	2	0	62
<i>Thalassarche cauta/steadii</i>	3	0	0	3	3	3	2	1	4	3	5	0	27
<i>Puffinus carneipes</i>	10	35	5	7	2	3	2	0	0	1	75	27	167
<i>P. bulleri</i>	39	16	14	5	18	16	0	0		019	21	20	168
<i>P. griseus</i>	136	19	11	4	333	36	4	0	2	40	148	78	811
<i>P. tenuirostris</i>	57	12	3	1	15	0	0	3	1	5	12	135	244
<i>P. gavia</i>	44	43	22	16	29	20	69	1071	856	103	33	57	2363
<i>P. huttoni</i>	3	17	0	0	2	0	2	2	1	3	2	1	33
<i>P. assimilis</i>	2	2	0	1	0	1	8	6	1	0	5	5	31
<i>Pelecanoides urinatrix</i>	65	10	3	5	43	517	2082	1207	246	76	22	204	4480
<i>Daption capense</i>	7	1	0	1	2	4	2	3	9	17	7	1	54
<i>Pachyptila</i> spp. *	13	11	0	1	5	23	9	4	10	25	29	3	133
<i>P. turtur</i>	47	39	6	3	17	37	117	54	94	104	73	33	624
<i>P. belcheri</i>	0	1	0	0	1	3	9	6	14	8	7	0	49
<i>P. desolata</i>	1	0	0	2	2	3	3	1	1	10	1	1	25
<i>P. salvini</i>	0	0	0	3	9	8	7	0	2	5	4	0	38
<i>P. vittata</i>	18	6	0	2	9	5	5	4	13	5	5	2	74
<i>Halobaena caerulea</i>	0	0	0	0	0	2	0	15	17	5	0	0	41
<i>Pterodroma cookii</i>	3	2	0	2	0	1	0	0	0	0	20	12	40
<i>P. inexpectata</i>	15	3	4	1	10	0	0	2	0	1	1	4	41
<i>P. macroptera</i>	19	5	1	0	6	9	9	2	4	1	1	6	63
<i>P. lessonii</i>	6	1	0	5	8	7	3	2	5	10	2	2	51
<i>Pelagodroma marina</i>	6	1	0	0	1	0	0	0	3	1	1	5	18
<i>Eudyptula minor</i>	96	60	59	23	343	265	819	1343	379	79	26	25	3517
<i>Morus serrator</i>	35	7	20	17	11	11	20	24	28	30	28	49	280
<i>Phalacrocorax varius</i>	5	2	8	0	0	2	6	5	9	8	2	1	48
<i>Stictocarbo punctatus</i>	1	12	20	1	1	3	4	7	2	10	3	0	64
<i>Larus dominicanus</i>	69	53	46	31	28	35	30	19	13	14	39	12	389
<i>L. novaehollandiae</i>	12	12	2	0	2	3	4	3	4	6	6	6	60
<i>Sterna striata</i>	8	3	5	0	1	2	0	4	4	1	4	5	37
Total	720	373	229	134	904	1024	3218	3805	1752	593	584	694	14030

total (cf. 39 in 1984 and 15 in 1989); five Fiordland crested penguins (*Eudyptes pachyrhynchus*), their 2nd highest annual total (cf. seven in 1990); and 25 black-billed gulls (*Larus bulleri*), the 7th highest annual total (highest was 44 in 1978).

For the three species with large wrecks in 1998, the 4480 common diving petrels recovered was their highest annual total recorded in the beach patrol scheme and was eight times the 25-year average. Their previous highest totals were 3593 in 1975 and 1190 in 1986. The 2363 fluttering shearwaters recovered was their 2nd highest annual total (cf. 2391 in 1985) and the 3517 blue penguins recorded was their 3rd highest annual total (cf. 5386 in 1985 and 4737 in 1974).

Other species recovered in high numbers in 1998 (Table 8) included: 48 pied shags (*Phalacrocorax varius*), their 3rd highest annual total (after 54 in 1987 and 50 in 1989) and their highest annual recovery rate (1.44/100 km); 10 white-chinned petrels (*Procellaria aequinoctialis*), their 3rd highest annual total (cf. 14 in 1983 and 11 in 1988); 40 Cook's petrels (*Pterodroma cookii*), their 5th highest annual

total (highest is 93 in 1981); and 62 southern Buller's albatrosses (*Thalassarche bulleri*), their highest total but exceeded the following year by the collection of 74 birds, mostly on Southland beaches.

Several petrel species were collected in high numbers in 1999 (Table 12): the three Pycroft's petrels (*Pterodroma pycrofti*) was the 2nd equal highest annual total (cf. five in 1971); Kerguelen petrels reached their 2nd highest annual total (331 cf. 600 in 1984); Antarctic petrels (*Thalassoica antarctica*) reached their 3rd highest annual total (10 cf. 77 in 1978 and 18 in 1991); and the 438 blue petrels was their 3rd highest annual total (cf. 881 in 1984 and 530 in 1985). The total of 16 Fulmar prions (*Pachyptila crassirostris*) recovered has been exceeded only once (63 birds in 1985) and the 424 Antarctic fulmars found comprised their 3rd largest annual total (cf. 642 in 1975 and 471 in 1978).

Albatrosses also washed ashore in high numbers. White-capped/Shy albatrosses (*Thalassarche cauta/steadii*) came ashore in their 3rd highest annual numbers (35 cf. 66 in 1968 and 38 birds in 1983), light-mantled sooty albatrosses

Table 9 Length (km) of coastline patrolled in each region in 1999 and numbers of dead seabirds recovered.

Coast	Code	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total km	No. Birds	Birds /km
Auckland East	AE	3	0	4	4	3	3	0	3	15	16	12	15	78	130	1.67
Auckland West	AW	26	46	30	18	38	68	77	57	50	50	56	46	562	1588	2.83
Bay Of Plenty	BP	2	1	7	0	0	0	6	8	8	0	31	8	71	570	8.03
Canterbury North	CN	4	2	2	2	0	2	0	5	2	6	0	0	25	42	1.68
East Coast NI	EC	3	4	10	10	9	10	8	6	9	9	7	0	85	82	0.96
North Coast SI	NC	9	5	5	2	3	3	10	4	5	8	27	0	81	155	1.91
Northland East	NE	59	38	65	43	69	65	48	42	50	45	72	67	663	1827	2.76
Northland West	NW	97	81	51	91	131	68	65	128	94	107	124	114	1151	3444	2.99
Outlying Islands	OI	0	0	0	0	0	6	6	0	0	35	10	0	57	54	0.95
Otago	OT	3	4	5	8	2	6	4	7	18	12	3	4	76	65	0.86
Southland	SD	11	7	34	14	26	11	16	16	31	14	13	11	204	835	4.09
Taranaki	TA	2	12	0	0	7	1	15	20	12	5	3	11	88	376	4.27
Wairarapa	WA	3	3	0	0	4	0	1	4	0	0	0	0	15	13	0.87
Westland	WD	3	0	0	10	0	0	0	0	0	1	0	0	14	16	1.14
Wellington South	WS	10	4	4	5	6	5	6	7	8	0	1	23	79	96	1.22
Wellington West	WW	8	17	20	6	12	13	30	21	27	20	9	11	194	387	1.99
Total km patrolled		243	224	237	213	310	261	292	328	329	328	368	310	3443		
Total birds recovered		779	568	389	378	729	186	727	2310	1238	820	849	707		9680	
Recovery rate (birds/km)		3.21	2.54	1.64	1.77	2.35	0.71	2.49	7.04	3.76	2.50	2.31	2.28			2.81

(*Phoebastria palpebrata*) also (18 cf. 36 in 1975 and 20 in 1983). The 19 wandering albatrosses (*Diomedea exulans* agg.) recovered were the most since 1976 and the 6th highest annual total since the start of the beach patrol scheme while 11 black-browed/Campbell albatrosses (*Thalassarche melanophrys/impavida*) comprised the highest number found since 1979.

Also in 1999, 606 common diving petrels washed ashore, the 8th highest annual total for the species, Cape pigeons (*Daption capense*) were unusually numerous (130, their 5th highest annual total) and thin-billed prions likewise (389, 6th highest annual total).

Species recovered in low numbers

Six species were recovered in numbers that were much lower than their 25-year averages. Only one Antarctic fulmar was found by beach patrollers in 1997, the lowest annual total for this species since 1977, and 14 giant petrels (*Macronectes* spp.), their

second lowest annual total since 1966. Seven Cook's petrels and 16 little shearwaters (*Puffinus assimilis*) recovered in 1997 were the lowest totals since 1972 and 1976 respectively.

No little black shags (*Phalacrocorax sulcirostris*) were found in 1998; the last time this occurred was in 1982, also a strong El Niño year (NIWA 2002).

Except for the seven birds found in 1994, the total of 10 white-faced storm petrels (*Pelagodroma marina*) found in 1999 was the lowest annual total since eight were reported in 1973.

Recoveries of banded birds

Twenty-one banded seabirds were reported on beach patrol cards.

A wandering albatross, banded as a chick on 10 Nov.1982 on Bird Island, South Georgia, was found dead on Dargaville Beach (NW) on 11 Oct.1997.

Of three southern giant petrels (*Macronectes giganteus*), one banded as a chick in April 1999 at Laurie Island (South Orkney Islands) and found by

Table 10 Numbers, location and month of recovery of seabirds of which <15 specimens were found in 1999. * Species not identified by the patroller

Species	No.	Coast(s)	Month(s)
<i>Diomedea/Thalassarche</i> spp.*	10	AW (2), NW (2), NC, SD, WA, WS (2), WW	Jan (2), Feb, Jul, Sep (2), Oct (2), Dec (2)
<i>Diomedea epomophora/sanfordi</i>	6	NW, OI (5)	Sep, Oct (4), Nov
<i>Thalassarche salvini</i>	1	CN	Jan
<i>T. melanophrys/impavida</i>	11	AW, NW (10)	Jun, Aug (2), Sep, Oct (7)
<i>Puffinus</i> spp.**	14	AW (2), NW (9), BP, WW (2)	Jan (4), Feb (3), Mar, Aug, Sep (3), Oct, Nov
<i>P. pacificus</i>	1	NE	Feb
<i>P. gavia/huttoni</i>	2	WW (2)	Aug (2)
<i>Procellaria cinerea</i>	4	BP (3), TA	Jul, Nov (3)
<i>P. parkinsoni</i>	12	NE (7), NW (5)	Feb (6), Aug, Oct (2), Dec (3)
<i>P. westlandica</i>	1	WW	Jul
<i>P. aequinoctialis</i>	6	NW (6)	Jan, Feb, Sep (3), Dec
<i>Macronectes halli</i>	8	NW (8)	Aug, Sep (2), Oct (5)
<i>Macronectes giganteus</i>	6	AW, NE, SD, WS, WW (2)	May, Jul, Aug, Oct, Nov, Dec
<i>Thalassoica antarctica</i>	10	AW, NW, SD (7), TA	Aug (2), Sep (7), Oct
<i>Pterodroma</i> spp.*	1	WW	Dec
<i>P. pycrofti</i>	3	NE (3)	Feb (3)
<i>P. leucoptera</i>	1	NW	Nov
<i>P. nigripennis</i>	2	NE (2)	Jan (2)
<i>Oceanites oceanicus</i>	1	NE	Jan
<i>O. nereis</i>	2	BP (2)	Aug, Sep
<i>Pelagodroma marina</i>	10	AW, NE (4), NW (4), TA	Feb, Mar, Aug, Sep (4), Oct, Dec (2)
<i>Fregata tropica</i>	1	BP	Feb
<i>Megadyptes antipodes</i>	8	OT (3), SD (4), WS	Feb, Mar (2), Apr (2), May, Jul, Sep
<i>Eudyptes pachyrhynchus</i>	1	SD	Apr
<i>Phaethon lepturus</i>	1	NE	Jan
<i>Phalacrocorax</i> spp.*	1	SD	Apr
<i>P. sulcirostris</i>	4	NE, NW (3)	Jan (2), Feb (2)
<i>P. melanoleucos</i>	9	AW (2), AE, NE, EC, NC, OT, WS, WW	Mar, Jun, Sep (2), Oct, Nov, Dec (3)
<i>Leucocarbo onslowi</i>	2	OI (2)	Jun, Oct
<i>Catharacta skua lonnbergi</i>	1	NW	Dec
<i>Stercorarius pomarinus</i>	1	NW	Sep
<i>Larus bulleri</i>	13	EC (2), NC, SD (9), WW	Jan, Feb (2), Mar (4), Jun, Aug, Sep, Oct (2), Dec
<i>Sterna</i> spp.*	2	AW (2)	Jun (2)
<i>S. caspia</i>	8	AW, NW (7)	Feb (6), Aug, Nov
Total	164		

J. Dent on Muriwai Beach (AW) on 24 Aug .1999; a second, found by L. Howell on East Beach, Aupouri Peninsula (NE) on 3 Nov 1999, had been banded as a fledgling in March 1999 at Cormorant Island (Antarctic Peninsula); and a third, found on White Beach (AW) by J. & S. Rowe on 30 Dec.1999, had been banded as an adult female on Marion Island, Indian Ocean, in 10 Nov.1984.

A banded common diving petrel was picked up by A. McDougall on Te Hapua Beach (WW) on 8 Jul.1999 after having been captured as a chick on the Sugarloaf Islands, New Plymouth (TA) and transferred to Mana Island (WW) in December 1997. This was the first recovery of any birds from the Mana Island diving petrel translocations (G. Taylor unpubl.).

A banded sooty shearwater was found by M. Graham on Muriwai Beach (AW) on 10 May 1998 having been banded as a chick at Kauwahaia Island (AW) one month earlier.

Beach patrollers recorded six dead 'blue' penguins carrying flipper bands. R. Cotter found one on Petone Beach (WS) on 12 Jan.1997 which had been banded as a juvenile at Eastbourne (Wellington Harbour) (WS) three days earlier. Three adults banded at Oamaru in November-December 1998 were recovered dead – at Hampden Beach (OT) on 9 Apr.1999 by T. Morrison, and two by A..Wright on Pilots Beach (OT) on 13 Aug.1999. Another banded blue penguin was found by J. Morrison on 13 Aug.1999 on St Clair Beach (OT), but no band details were noted. A 'white-flipped' penguin was recovered by B. Elliot on the Kaikoura Peninsula (CN) in January 1998 one month after it had been banded as a chick at Motunau Island (CN).

Two banded yellow-eyed penguins were found; one, banded as a juvenile at Highcliff (OT) in October 1992, was retrieved by M. Etnier and L. Nagaoka at Boulder Beach (OT) on 20 Apr.1997 and L. Esler found one dead on Ocean Beach, Bluff (SD)

Table 11 Coastal distribution of commonly-found (>15) dead seabirds in 1997. * Aggregate of 4 "wandering albatross" species (species not identified by patroller);** species not identified by the patroller

Species	Coast																Total
	AW	AE	NW	NE	BP	TA	WW	EC	WA	WS	NC	WD	CN	OT	SD	OI	
<i>Diomedea "exulans" agg.*</i>	0	0	16	2	1	0	0	0	0	0	0	0	0	0	0	0	19
<i>Thalassarche cauta/steadii</i>	1	0	14	0	0	3	2	0	1	1	1	0	0	0	12	0	35
<i>T. chrysostris</i>	4	0	10	1	0	1	1	0	0	0	0	0	0	0	0	0	17
<i>T. bulleri/platei</i>	3	0	5	0	0	0	0	0	0	1	0	0	0	0	65	0	74
<i>Phoebastria palpebrata</i>	6	0	9	0	0	2	0	0	0	1	0	0	0	0	0	0	18
<i>Puffinus carneipes</i>	4	34	15	99	11	0	0	0	0	0	1	0	0	0	0	0	164
<i>P. bulleri</i>	22	10	38	61	57	4	7	3	0	0	3	0	0	0	0	1	206
<i>P. griseus</i>	88	5	208	214	196	10	10	10	1	1	10	4	1	2	377	17	1154
<i>P. tenuirostris</i>	34	3	45	54	2	3	4	4	1	0	7	4	1	1	9	0	172
<i>P. gavia</i>	89	7	463	160	11	53	23	1	1	6	14	2	1	1	1	0	833
<i>P. huttoni</i>	14	0	5	4	2	3	2	1	1	0	0	0	2	0	0	0	34
<i>P. assimilis</i>	0	1	9	12	5	1	0	0	0	0	0	0	0	0	2	1	31
<i>Pelecanoides urinatrix</i>	44	9	135	241	65	19	50	0	0	6	2	0	0	0	35	0	606
<i>Lugensa brevirostris</i>	118	1	146	5	7	30	19	0	0	0	2	0	0	0	3	0	331
<i>Daption capense</i>	35	0	50	8	3	8	10	1	0	8	0	0	0	02	4	1	130
<i>Fulmarus glacialisoides</i>	119	0	201	2	0	17	42	0	0	0	3	1	0	0	37	2	424
<i>Macronestres spp. **</i>	4	0	5	1	0	3	1	0	0	0	0	0	0	0	2	0	16
<i>Pachyptila spp. **</i>	99	0	181	14	0	28	35	0	0	2	4	0	2	0	0	5	370
<i>P. turtur</i>	323	2	767	66	16	60	85	1	0	11	40	0	2	2	44	1	1420
<i>P. crassirostris</i>	12	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	16
<i>P. belcheri</i>	139	0	160	28	17	29	14	0	0	2	0	0	0	0	0	0	389
<i>P. desolata</i>	28	0	15	5	2	4	7	0	0	0	0	0	0	0	2	0	63
<i>P. salvini</i>	40	0	41	0	14	1	2	0	0	1	0	0	0	0	0	0	99
<i>P. vittata</i>	30	1	55	1	0	3	11	0	0	0	0	0	0	0	33	0	134
<i>Halobaena caerulea</i>	158	2	138	7	71	36	17	0	0	1	0	0	0	0	5	3	438
<i>Pterodroma cookii</i>	2	6	2	12	3	1	0	0	0	0	0	0	0	0	1	0	27
<i>P. inexpectata</i>	3	0	13	0	0	0	0	0	0	0	1	0	0	0	25	0	42
<i>P. macroptera</i>	4	2	18	41	10	1	0	1	0	0	1	0	0	0	0	0	78
<i>P. lessonii</i>	40	0	60	1	3	7	1	00	0	0	0	0	0	0	2	0	114
<i>Eudyptila minor</i>	22	31	240	645	50	7	6	6	5	10	29	0	5	14	24	14	1108
<i>Morus serrator</i>	49	5	171	43	7	15	3	10	1	5	5	0	0	0	1	0	315
<i>Phalacrocorax carbo</i>	0	1	0	1	0	1	0	14	0	2	0	0	1	0	0	0	20
<i>P. varius</i>	2	7	7	14	3	0	0	0	0	0	8	0	1	0	1	0	43
<i>Leucocarbo chalconotus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	5	12	0	17
<i>Stictocarbo punctatus</i>	0	0	0	0	0	0	0	0	0	1	6	4	9	16	28	0	64
<i>Larus dominicanus</i>	18	1	126	41	5	9	19	27	0	18	14	0	12	7	71	1	369
<i>L. novaehollandiae</i>	5	1	10	15	0	5	2	0	0	12	0	1	4	11	9	1	76
<i>Sterna striata</i>	16	0	7	7	2	9	1	0	1	0	1	0	0	0	6	0	50
Total	1575	129	3385	1805	563	373	376	79	12	91	152	16	41	61	811	47	9516

in April 1998 which had been banded as a chick in February 1993 at Codfish Island (SD).

Of two banded Australasian gannets reported by beach patrollers, one was found dead on Pukehina Beach (BP) by S. Kadri on 13 Jan.1999 having been banded as a chick on Bush Island (AE) in December 1979, while the other was found on Ninety Mile Beach in May 1999, having been banded as an adult at Farewell Spit (NC) in December 1994.

Two banded southern black-backed gulls (*Larus dominicanus*) were found dead on Wellington Harbour beaches (WS) by R. Cotter, both of which had been banded as chicks on nearby Somes Island. All three banded red-billed gulls (*Larus*

novaehollandiae) picked up on Kaikoura Peninsula beaches (CN) by B. Elliot had been banded as chicks at Kaikoura Peninsula colonies.

Causes of seabird mortality

Most birds found by beach patrollers are assumed to have washed ashore after dying of starvation, injury or fatigue, caused by a series of prolonged onshore winds. The wrecks in 1998 and 1999 appear to be associated with major fluctuations in the marine environment, in particular a strong El Niño event in 1997/98 and the rapid change to La Niña conditions in 1999 (NIWA 2002). There is much scope for further research to investigate correlations between changes in the physical and biotic

Table 12 Monthly distribution of commonly-found (>15) dead seabirds in 1999. * Aggregate of 4 "wandering albatross" species (species not identified by patroller);** species not identified by the patroller

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<i>Diomedea "exulans" agg. *</i>	0	0	0	0	2	0	1	2	2	8	4	0	19
<i>Thalassarche cauta/steadii</i>	0	0	2	3	4	2	5	4	3	5	4	3	35
<i>T. chrysostoma</i>	0	0	0	0	0	1	5	6	2	2	1	0	17
<i>T. bulleri/platei</i>	0	0	0	2	2	2	4	4	58	2	0	0	74
<i>Phoebetria palpebrata</i>	0	0	0	0	0	2	0	6	6	3	1	0	18
<i>Puffinus carneipes</i>	57	19	12	4	10	0	2	8	0	8	31	13	164
<i>P. bulleri</i>	21	31	17	5	8	5	0	1	2	13	69	34	206
<i>P. griseus</i>	29	21	10	6	360	6	5	2	3	26	328	358	1154
<i>P. tenuirostris</i>	111	36	5	1	2	1	1	1	1	0	2	11	172
<i>P. gavia</i>	50	82	29	17	19	15	47	335	91	50	48	50	833
<i>P. huttoni</i>	2	0	1	0	2	0	1	2	5	10	4	7	34
<i>P. assimilis</i>	3	5	3	1	1	0	2	1	3	1	9	2	31
<i>Pelecanoides urinatrix</i>	246	21	4	2	4	4	54	111	51	16	75	18	606
<i>Lugensa brevirostris</i>	0	0	0	0	0	5	26	195	86	13	3	3	331
<i>Daption capense</i>	0	1	1	0	0	10	18	30	34	22	7	7	130
<i>Fulmarus glacialisoides</i>	0	0	0	0	0	9	23	24	78	217	53	20	424
<i>Macronestres spp. **</i>	0	0	1	0	0	1	3	3	0	3	2	3	16
<i>Pachyptila spp. **</i>	5	3	1	0	4	8	45	122	81	71	19	11	370
<i>P. turtur</i>	22	22	7	0	10	6	134	875	209	74	41	20	1420
<i>P. crassirostris</i>	0	0	0	0	0	0	1	6	9	0	0	0	16
<i>P. belcheri</i>	0	1	0	0	2	3	156	175	44	5	3	0	389
<i>P. desolata</i>	0	0	0	0	1	6	16	23	10	5	0	2	63
<i>P. salvini</i>	0	0	0	0	0	2	55	14	15	13	0	0	99
<i>P. vittata</i>	8	0	0	2	8	1	3	20	75	9	4	4	134
<i>Halobaena caerulea</i>	0	0	0	0	0	4	49	149	187	42	3	4	438
<i>Pterodroma cookii</i>	8	6	1	1	0	0	0	0	1	0	7	3	27
<i>P. inexpectata</i>	5	1	1	1	18	0	2	5	1	0	2	6	42
<i>P. macroptera</i>	15	9	1	1	9	10	1	6	6	5	8	7	78
<i>P. lessonii</i>	1	1	0	0	1	4	3	24	39	33	5	3	114
<i>Eudiptula minor</i>	91	168	198	273	196	39	12	45	23	22	27	14	1108
<i>Morus serrator</i>	21	27	19	11	10	4	10	39	31	56	48	39	315
<i>Phalacrocorax carbo</i>	0	1	2	1	1	4	2	0	4	4	0	1	20
<i>P. varius</i>	3	6	3	2	7	1	2	0	5	3	5	6	43
<i>Leucocarbo chalconotus</i>	0	1	2	0	0	0	2	3	3	2	1	3	17
<i>Stictocarbo punctatus</i>	8	1	11	5	2	4	10	7	8	4	1	3	64
<i>Larus dominicanus</i>	41	67	35	24	33	15	17	32	26	37	20	22	369
<i>L. novaehollandiae</i>	9	3	12	7	6	6	5	13	3	3	2	7	76
<i>Sterna striata</i>	8	7	2	5	5	0	0	3	4	5	3	8	50
Total	764	540	380	374	727	180	722	2296	1209	792	840	692	9516

environment in the seas near New Zealand during El Niño and La Niña phases and the mortality patterns of seabirds washed up on beaches during these periods.

Occasionally, observers reported seabird mortality caused by human activity. For example, 26 birds had obviously been snared by fishing lines. A wandering albatross was found with a hook in its beak, a southern Buller's albatross had a large fish hook stuck in its throat with line attached, a flesh-footed shearwater had nylon fishing line protruding from its bill, a sooty shearwater had a fish hook in its bill, and two pied shags had fishing line protruding from their throats.

Some birds were tangled in fishing line e.g., one fluttering shearwater and three Australasian gannets. A black shag which had died after it

become foul hooked by a nylon fishing line, was clearly scavenging an eel caught on the line because the line was tightly entangled around the carpal joint of its wing and a 30 cm long eel was lodged between its wing and neck.

Gulls appear especially vulnerable. Five southern black-backed gulls, five red-billed gulls and three black-billed gulls were recovered tangled in, or hooked by, fishing line.

Ten seabirds, including a white-capped albatross, were found dead on beaches after having been entangled in fishing nets. Four freshly dead black shags were found close together on East Clive Beach (EC) with severed wings and headless flesh-footed shearwater, sooty shearwater and black shag also; the patrollers thought these birds had all been caught

Table 13 Non-seabirds found on New Zealand beaches 1997-99

Species	Common name	1997	1998	1999
<i>Acridotheres tristis</i>	myna	2	2	2
<i>Alauda arvensis</i>	skylark	1	1	1
<i>Anarhynchus frontalis</i>	wrybill	0	0	1
<i>Anas gracilis</i>	grey teal	0	1	0
<i>A. platyrhynchos</i>	mallard	26	39	16
<i>A. platyrhynchos/superciliosa</i>	mallard or grey duck	0	1	2
<i>A. rhynchotis variegata</i>	New Zealand shoveler	1	0	0
<i>A. superciliosa</i>	grey duck	7	7	3
<i>Anas</i> sp.	duck sp.	8	3	2
<i>Anser anser</i>	feral goose	7	6	7
<i>Anthus novaeseelandiae</i>	New Zealand pipit	3	3	1
<i>Ardea novaehollandiae</i>	white-faced heron	1	0	2
<i>Botaurus poiciloptilus</i>	Australasian bittern	1	0	0
<i>Branta canadensis</i>	Canada goose	0	3	0
<i>Carduelis carduelis</i>	goldfinch	2	8	0
<i>C. chloris</i>	greenfinch	0	1	0
<i>Charadrius bicinctus</i>	banded dotterel	1	0	1
<i>C. obscurus</i>	New Zealand dotterel	1	1	1
<i>Circus approximans</i>	Australasian harrier	7	3	3
<i>Columba livia</i>	rock pigeon	2	10	10
<i>Cyanoramphus novaeseelandiae</i>	red-crowned parakeet	1	0	0
<i>Cygnus atratus</i>	black swan	11	28	12
<i>Emberiza citrinella</i>	yellowhammer	0	1	0
<i>Fringilla coelebs</i>	chaffinch	0	0	1
<i>Gallinallus australis hectori</i>	buff weka	1	0	1
<i>Gallus gallus</i>	domestic fowl	1	0	1
<i>Gymnorhina tibicen</i>	Australian magpie	60	40	68
<i>Haematopus ostralegus finschi</i>	South Is pied oystercatcher	5	6	14
<i>H. unicolor</i>	variable oystercatcher	3	6	6
<i>Haematopus</i> sp.	oystercatcher sp.	0	2	0
<i>Halcyon sancta vagans</i>	New Zealand kingfisher	1	0	1
<i>Hemiphaga novaeseelandiae</i>	New Zealand pigeon	2	5	4
<i>Himantopus himantopus leucocephalus</i>	Australasian pied stilt	0	3	5
<i>Hirundo tahitica</i>	welcome swallow	0	0	1
<i>Limosa lapponica baueri</i>	eastern bar-tailed godwit	0	2	0
<i>Meleagris gallopavo</i>	turkey	3	0	3
<i>Nestor meridionalis</i>	kaka	1	2	0
<i>Ninox novaeseelandiae</i>	morepork	0	0	1
<i>Passer domesticus</i>	house sparrow	1	5	2
<i>Phasianus colchicus</i>	pheasant	1	3	3
<i>Platalea regia</i>	royal spoonbill	4	1	6
<i>Porphyrio porphyrio melanotus</i>	pukeko	4	11	5
<i>Prosthemadera novaeseelandiae</i>	tui	2	3	3
<i>Rallus philippensis</i>	banded rail	1	0	0
<i>Streptopelia</i> sp./ <i>Columba</i> sp.	pigeon or dove sp.	0	2	0
<i>Sturnus vulgaris</i>	starling	2	3	5
<i>Tadorna variegata</i>	paradise shelduck	1	6	7
<i>Tringa incana</i>	wandering tattler	0	1	0
<i>Turdus merula</i>	blackbird	6	12	7
<i>T. philomelos</i>	song thrush	0	3	3
<i>Vanellus miles novaehollandiae</i>	spur-winged plover	5	2	2
<i>Zosterops lateralis</i>	silveryeye	0	1	0
Total		186	237	213

in nets by nearby fishers. An adult pied shag was also found tangled in a fishing net.

Other causes of mortality include poisoning, shooting and attacks by mammalian predators. For example, a juvenile red-billed gull was found dead

on Awatoto Beach with a large head wound, possibly caused by a predator, but it may also have been shot. Twenty-three southern black-backed gulls washed up on Titahi Bay (WW) on 13 Nov.1998 and were considered to be victims of a

gull poisoning campaign on nearby Mana Island. Two banded blue penguins found dead on Pilot's Beach (OT) had been killed by a ferret and six freshly shot southern black-backed gulls were retrieved from Kauri Mountain/Ocean Beach (NE).

Forty-eight oiled seabirds were reported on beach patrol cards between 1997 and 1999. A minor oil spill apparently occurred near Tokerau Beach on or before 11 Aug. 1998 as 45 birds washed ashore with oil on their plumage. Some birds were very oiled and others just had spots of oil on their plumage. Two fluttering shearwaters and one little shearwater were found covered in oil on Ninety-Mile Beach on 28 Aug. 1999.

Miscellaneous birds

In addition to the seabirds picked up on beaches, patrollers found 636 non-seabirds of 52 species in 1997-99 (Table 13). These comprised 186 birds from 36 species in 1997, 237 birds from 38 species in 1998 and 213 birds from 37 species in 1999. Australian magpies (*Gymnorhina tibicen*) were the most common non-seabird encountered on beaches. Unusual records included a banded rail (*Rallus philippensis*) found at Bethell's Beach (AW) by A. Tennyson and a wandering tattler (*Tringa incana*) found on Rabbit Island, Nelson (NC) by T. Worthy.

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