SEABIRDS FOUND DEAD ON NEW ZEALAND BEACHES IN 1984 AND A REVIEW OF FULMAR RECOVERIES SINCE 1960

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ABSTRACT

In 1984, 5076 kilometres of coast were patrolled and 14 224 dead seabirds were found. A new species for the Beach Patrol Scheme was a Bird of Providence *(Pterodroma solandri)*. Four species found in greater numbers in 1984 than previously were the Black Petrel *(Procellaria parkinsoni)*, White-faced Storm Petrel *(Pelagodroma marina)*, Australasian Gannet *(Sula bassana)* and Pied Shag *(Phalacrocorax varius)*. A wreck of mainly Kerguelen Petrels *(Lugensa brevirostris)*, Blue Petrels *(Halobaena caerulea)* and Fairy Prions *(Pachyptila turtur)* occurred in August along the western coast and the northern half of the eastern coast of the North Island.

A summary is given of the coastal and monthly distributions for each of four genera of fulmar *(Macronectes, Fulmarus, Thalassoica* and *Daption)* found during the 1960-1983 period. The most frequently found fulmar was the Antarctic Fulmar *(Fulmarus glacialoides)*, a consequence of wrecks numbering hundreds of birds in 1975 and 1978.

INTRODUCTION

This paper records the results of the Ornithological Society of New Zealand's Beach Patrol Scheme for 1984. All sections were patrolled except Wairarapa and Fiordland. Some beaches on the Chatham Islands were patrolled and the results are given under the heading Outlying Islands. In total, 680 Beach Patrol Cards and 43 Specimen Record Cards were submitted. Conventions used are the same as in previous reports (see Powlesland 1983), except that I have followed the nomenclature suggested by Imber (1985a) for the Kerguelen Petrel *(Lugensa brevirostris)*.

RESULTS AND DISCUSSION

In 1984, the total length of coast travelled was 5076 km and 14 224 seabirds were found dead by 272 members of the Ornithological Society of New Zealand and their friends. The average number of birds per kilometre of coast covered was 3.06 (Table 1). The total distance travelled and the number of birds found in 1984 were much greater than the averages of 3961 km and 10 211 birds per year respectively for the previous 10 years (1974-1983). The average number of birds found per kilometre in 1984 (3.06) was, however, very similar to that for the previous 10 years (3.02). Table 1 also gives the kilometres covered and the number of seabirds found per month and in total for the various coasts, plus the number of birds picked up per kilometre covered for each coast. Table 2 gives the coastal and monthly distributions of the less commonly found seabirds

TABLE 1 — Numbers of dead seabirds recovered and kilometres covered on each coast in 1984

COAST	CODE		MONTH JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL KM	TOTAL BIRDS	BIRDS/KM /COAST
AUCKLAND WEST	AW	KM	178	178	180	206	172	189	214	243	200	224	208	207	2399		
		BIRDS	428	358	187	187	205	156	148	4600	413	255	908	560		8405	3.50
TARANAKI	TA	KM	9	12	29	-	19	10	15	15	7	5	2	11	125		
		BIRDS	40	20	21	-	19	16	6	162	8	12	1	45		350	2.80
WELLINGTON WEST	WW	KM	34	42	21	18	55	83	46	94	17	51	42	42	545		
		BIRDS	335	202	11	10	91	103	47	333	19	325	281	135		1892	3.47
AUCKLAND EAST	AE	KM	62	48	70	48	80	6	40	61	36	55	32	48	586		
		BIRDS	97	95	250	64	96	9	30	442	79	53	128	146		1489	2.54
BAY OF PLENTY	BP	KM	1	5	36	2	5	10	65	24	25	-	25	13	211		
		BIRDS	1	9	65	4	3	13	95	141	174	-	311	88		904	4.28
EAST COAST NI	EC	KM	9	8	4	8	9	7	10	17	11	16	27	10	136		
		BIRDS	16	2	1	5	3	7	9	11	30	86	79	16		265	1.95
WELLINGTON SOUTH	SW	KM	2	62	1	3	5	3	25	48	4	17	3	-	173		
		BIRDS	2	37	2	0	5	1	12	36	6	12	4	-		117	0.68
NORTH COAST SI	NC	KMS	-	-	-	1	1	2	-	-	-	25	4	-	33		
		BIRDS	-	-	-	1	9	4	-	-	-	9	4	-		27	0.82
WESTLAND	WD	KM	3	5	6	4	3	5	3	2	-	3	15	4	53		
		BIRDS	0	0	0	1	0	0	0	2	-	0	6	0		9	0.17
CANTERBURY NORTH	CN	KM	1	4	3	18	3	11	17	28	22	14	6	4	131		
		BIRDS	1	21	11	17	3	14	8	55	60	23	17	13		243	1.85
CANTERBURY SOUTH	CS	KM	7	8	8	37	12	9	6	15	8	8	8	8	134		
		BIRDS	20	25	18	65	35	25	38	40	47	26	14	19		372	2.78
OTAGO	OT	KM	5	7	8	7	5	8	6	5	8	13	-	-	72		
		BIRDS	0	18	7	1	0	2	5	3	4	3	-	-		43	0.60
SOUTHLAND	SD	KM	6	1	-	-	-	3	-	-	7	-	2	2	21		
		BIRDS	28	1	-	-	-	2	-	-	5	-	4	5		45	2.14
OUTLYING ISLANDS	OI	KM	-	-	-	-	-	-	-	-	-	-	10	16	26		
		BIRDS	-	-	-	-	-	-	-	-	-	-	22	41		63	2.42
TOTAL KILOMETRES TRAVELLED			346	384	390	364	393	371	480	678	375	450	426	419	5076		
TOTAL KILOMETRES COVERED			317	380	357	352	369	346	447	552	345	431	384	365	4645		
TOTAL SEABIRDS RECOVERED			968	788	573	355	469	352	398	5825	845	804	1779	1068		14224	
BIRDS/KM COVERED/MONTH			2.95	2.07	1.61	1.01	1.27	1.02	0.89	10.55	2.45	1.87	4.63	2.93			3.06

(1-15 birds in 1984), and Tables 3 and 4 give the same information for the more commonly found seabirds.

Unusual finds

A new record for the Beach Patrol Scheme is the Bird of Providence, a specimen of which was found between Maunganui Bluff and Glinke's Gully, west of Dargaville (AW), in September (Table 2). The only other record of this species in New Zealand was of a bird picked up on Muriwai Beach in January 1921 (Falla 1933). The Bird of Providence breeds on Lord Howe Island and in 1985 a small breeding colony was discovered on Philip Island, off Norfolk Island (Hermes 1985). Formerly it bred on Norfolk Island, but the depredations of introduced pigs and harvesting by the islanders caused the extinction of the population (Schodde *et al.* 1983). This petrel is a winter breeder, laying in May and the young fledging in November (Fullagar 1985). During the breeding season small numbers of this petrel have been regularly seen in the northern Tasman Sea (Cheshire & Jenkins 1981). It is noteworthy that only two Birds of Providence have been found on New Zealand beaches, even though more than 96 000 pairs breed about 1300 km away (Fullagar 1985). Presumably, they do not range widely to the east of Lord Howe Island.

Four species, the Black Petrel, White-faced Storm Petrel, Australasian Gannet and Pied Shag, were found in greater numbers in 1984 than in previous years. Thirty-nine Black Petrels were found, mainly on Auckland East beaches (Table 3). The previous highest total was 22 in 1981. Most of the 1984 birds were picked up in May, the month when many young leave their burrows (Imber 1985b). Fifty-five White-faced Storm Petrels were picked up in 1984, whereas the previous highest annual total was 25 in both 1976 and 1977. Most of the 1984 birds were on Auckland West (21) and Canterbury South (19) beaches. Seventeen were found in August-September, the period when this storm petrel returns to the New Zealand region to breed.

Generally, 100-200 Australasian Gannets are found each year, but 406 were found in 1984. The previous highest total was 303 in 1975. Most of the gannets (281) were picked up from Auckland West beaches. Although gannets were found in all months (Table 4), January-March and October-December were the periods of highest mortality. Gannet chicks leave North Island colonies during March-May (Robertson 1985) and so a peak in mortality might be expected then, not in January-March as occurred in 1984. Likewise, there is no obvious reason for the increased mortality in October-December 1984. In a few years' time, when more information is available about the ages of beach-wrecked gannets, a review of recoveries will show whether the peak periods of gannet mortality relate to the species' breeding biology.

Thirty-eight Pied Shags were found in 1984, whereas the previous highest annual total was 37 in 1981. Most of the 1984 birds were found on Auckland West and Auckland East beaches (Table 3). There was no obvious seasonal pattern in recoveries (Table 4).

While not the highest annual totals, three species were found in greater numbers than usual in 1984. In 1984, 213 White-headed Petrels *(Pterodroma lessonii)* were picked up, whereas the highest annual total was 278 in 1975. Almost all of the 1984 birds were on Auckland West and Wellington West beaches,

TABLE 2 — Seabirds of which 1 to 15 specimens were found in 1984

SPECIES OR SUBSPECIES	NUMBER FOUND	COAST(S)	MONTH(S)
Megadyptes antipodes	5	WW,CS(3),OT.	FEB,MAR,APR,MAY,JUL.
Eudyptes pachyrhynchus	3	AW,CS(2).	MAR(2),DEC
sclateri	1	CS.	APR.
Diomedea exulans	10	AW(8),CN,CS	FEB,MAR,APR,MAY,JUN,SEP,NOV(2),DEC(2).
epomophora	2	AW,WW.	FEB,MAY.
melanophrys	6	AW(4),BP(2).	FEB,APR(2),JUL,AUG,DEC.
chlororhynchos	1	AW.	APR.
bulleri	4	AW(2),BP,SD.	JUN,SEP(2),OCT.
cauta subspp.*	15	AW(11),TA,WW,WS,SD.	JAN,FEB,MAR,MAY,JUN(3),JUL(3),AUG(4),DEC.
salvini	3	WW,WS,EC.	FEB,OCT,NOV.
Phoebetria palpebrata	7	AW(6),TA	FEB,APR,AUG(2),NOV(2),DEC.
Fulmarus glacialoides	13	AW(7),WW,EC(2),CN(2),CS.	JUN,AUG,SEP(4),OCT(3),NOV(2),DEC(2).
Pterodroma spp.*	7	AW(5),AE,OI.	JAN(2),APR,MAY(2),DEC(2).
solandri	1	AW.	SEP.
mollis	1	BP.	NOV.
pycrofti	2	AW,WW.	APR(2).
leucoptera	1	AE.	DEC.
Pachyptila crassirostris	3	BP,EC,CN.	AUG,SEP,OCT.
Procellaria spp.*	1	SD.	JAN.
cinerea	8	AW(5),WW,BP(2).	JAN,SEP,OCT,NOV(2),DEC(3).
westlandica	4	AW(3),WW.	OCT(3),NOV.
aequinoctialis	9	AW(9).	JAN(2),FEB(4),JUN,SEP(2).
Puffinus gavia/huttoni	2	WW(2).	AUG,OCT.
Oceanites oceanicus	2	AW,AE.	MAY.
Garrodia nereis	1	WA.	JUL.
Phaethon rubricauda	1	AW.	APR.
Phalacrocorax spp.*	7	AW(3),AE(2),NC,CN.	MAR,APR,MAY,JUN,JUL,NOV,DEC.
sulcirostris	3	AW,AE,EC.	JUL,AUG,OCT.
brevirostris	8	AW,AE(2),BP(2),EC,NC,CN.	FEB,APR,JUN(2),JUL(2),NOV(2).
Leucocarbo carunculatus onslowi	1	OI.	DEC.
Stictocarbo punctatus featherstoni	2	OI(2).	DEC(2).
Stercorarius skua lonnbergi	3	AW,AE,WW.	APR,JUN,OCT.
parasiticus	3	AW,EC,CS.	FEB,APR,JUN.
longicaudus	2	AW(2).	FEB,MAR.
Larus spp.*	4	EC,CN(2),OT.	FEB,APR(2),DEC.
Hydroprogne caspia	8	AE(4),TA,WW,EC,CS.	FEB,JUN(4),JUL,AUG,OCT.
Sterna albostriata	1	CS.	DEC.
fuscata	1	AW	AUG.
Procelsterna cerulea	2	AW(2)	MAR(2).
TOTAL	158		

• Species or subspecies could not be identified by the patroller.

especially in August-December, when White-headed Petrels are returning to their breeding sites (Antipodes Islands, Auckland Islands and Macquarie Island) and laying (Warham 1985a).

Usually patrollers find about 200 Buller's Shearwaters *(Puffinus bulleri)* each year, but they picked up 423 in 1984, mainly from Auckland West (211) and Auckland East (91) beaches. The highest annual total was 470 in 1978. Many of the Buller's Shearwaters were found in October-December (Table 4), the period just after their return from the North Pacific Ocean to the Poor Knights Islands to breed (Harper & Imber 1985).

In 1984, 532 Black-backed Gulls *(Larus dominicanus)* were picked up, whereas the highest annual total was 616 in 1978. Many of them were found on Auckland West (216) and Wellington West (110) beaches. About twice as many birds were found per month from February to June as during the rest of the year. Possibly, the increased deaths in autumn were mainly of young birds, which leave the colonies in February-March (Fordham 1964). Some patrollers noticed that more of the Black-backed Gulls found during this period had been shot than at other times of the year.

Wreck

A feature of the 1984 results was a wreck of Kerguelen Petrels, Blue Petrels and Fairy Prions in August. At the same time, large numbers of Antarctic Prions *(Pachyptila desolata)*, Narrow-billed Prions *(P. belcheri)* and Fluttering Shearwaters *(Puffinus gavia)* were picked up (Table 4). The birds were found in August after about a week of strong to gale force southerly to south-westerly winds in the central Tasman Sea and westerly winds on to the North Island coast (P. Bruce, New Zealand Meteorological Service, pers. comm.). Jenkins & Greenwood (1984) noted Blue Petrels off the North Island coast in July, but they saw no Kerguelen Petrels.

The 1984 wreck was not confined to New Zealand coasts. In June-July exceptional numbers of Grey-headed Albatrosses *(Diomedea chrysostoma)*, Antarctic Fulmars, Kerguelen Petrels and Blue Petrels were wrecked on western and eastern beaches of South Africa (P. G. Ryan, pers. comm.). Along the southern coast of Australia, from Perth to Victoria, thousands of petrels were blown inland and washed ashore during early August (Carter 1984). Most of these petrels were Kerguelen Petrels and Blue Petrels.

Twice as many Kerguelen Petrels and Blue Petrels were picked up from New Zealand beaches in 1984 as in 1981, the previous year with greatest numbers of both species. The proportion that each of these species formed of their combined total was not significantly different in these two years; Blue Petrels made up 59% of the 1481 birds in 1984 and 55% of 623 in 1981 (chi-squared = 3.36, $p > 0.05$).

Most of the New Zealand beach-wrecked petrels were picked up from Auckland West, Taranaki and Wellington West beaches: 80% of the Kerguelen Petrels and 87% of the Blue Petrels. Whereas in 1981 no Blue Petrels and only five Kerguelen Petrels were found on Auckland East and Bay of Plenty beaches, in 1984 104 Blue Petrels and 100 Kerguelen Petrels were found there.

Both petrels nest on subantarctic islands of the South Atlantic and Indian Oceans; in addition Blue Petrels breed about Macquarie Island and on the

TABLE 3 — Coastal distribution of the seabirds more commonly found dead in 1984

SPECIES OR SUBSPECIES	COASTS AW	TA	WW	AE	BP	EC	WS	NC	WD	CN	CS	OT	SD	DT	TOTAL BIRDS
Eudyptula minor subspp.*	492	23	106	185	28	4	5	4	-	6	7	5	1	8	874
albosignata	-	-	1	-	-	-	1	1	-	10	8	-	-	-	21
Diomedea spp.*	9	-	10	-	-	-	4	-	-	1	-	-	1	1	26
chrysostoma	26	1	3	1	-	-	-	-	-	-	-	-	-	-	31
cauta cauta	11	-	5	-	-	-	-	-	-	-	-	-	1	-	17
Macronectes spp.*	27	-	3	-	-	-	2	-	-	3	-	-	-	1	36
Daption capense	53	-	19	9	5	2	4	-	-	8	20	1	1	-	122
Lugensa brevirostris	390	36	53	14	86	1	2	-	1	16	1	-	-	-	600
Pterodroma macroptera	47	-	2	21	4	-	-	-	-	-	-	-	-	-	74
lessonii	181	2	27	1	-	1	-	-	-	1	-	-	-	-	213
inexpectata	28	-	2	-	1	-	-	-	-	-	5	-	1	-	37
cookii	11	1	-	26	-	-	-	-	-	-	-	-	-	-	38
nigripennis	12	1	1	2	-	1	-	-	-	-	-	-	-	-	17
Halobaena caerulea	661	47	55	16	88	3	1	-	-	8	1	-	1	-	881
Pachyptila spp.*	310	39	616	10	1	6	8	-	-	4	3	1	10	13	1021
vittata	41	5	18	1	-	-	-	-	-	1	36	-	2	-	104
salvini	84	5	19	6	-	1	-	-	-	3	-	-	-	-	118
desolata	329	11	12	6	6	2	-	-	-	-	2	-	-	1	369
belcheri	623	12	49	9	10	4	4	-	1	8	23	-	-	-	743
turtur	2775	40	457	363	105	96	21	6	-	24	15	3	4	3	3912
Procellaria parkinsoni	8	-	-	31	-	-	-	-	-	-	-	-	-	-	39
Puffinus spp.*	9	2	17	3	-	-	-	2	-	-	-	-	-	-	33
carneipes	27	-	2	99	19	-	-	-	-	-	-	-	-	-	147
bulleri	211	7	29	91	58	21	4	-	-	-	1	1	-	-	423
griseus	462	26	81	99	271	60	8	2	3	13	16	5	7	9	1062
tenuirostris	136	15	24	13	5	2	-	-	-	-	12	1	3	1	212
gavia	526	31	33	173	56	3	6	1	-	4	8	-	-	1	842
huttoni	19	-	30	5	1	-	-	1	-	15	3	-	-	-	74
assimilis	19	1	12	23	26	-	-	-	-	-	-	-	-	1	82
Pelagodroma marina	21	-	1	6	6	-	-	-	2	-	19	-	-	-	55
Pelecanoides urinatrix	201	6	45	99	49	3	6	-	-	-	1	-	3	1	414
Sula bassana	281	13	14	57	30	10	-	-	1	-	-	-	-	-	406
Phalacrocorax carbo	3	1	4	5	-	3	2	-	-	-	-	-	-	-	18
varius	15	-	-	18	3	-	-	-	-	2	-	-	-	-	38
Stictocarbo punctatus	-	1	-	3	-	1	-	1	-	23	121	15	2	-	167
Larus dominicanus	216	7	110	55	14	24	31	5	1	25	36	5	2	1	532
novaehollandiae	23	7	10	15	15	2	5	2	-	55	1	2	-	2	139
bulleri	-	-	1	-	1	3	-	-	-	3	12	2	3	-	25
Sterna striata	39	7	9	11	7	3	-	-	-	2	10	-	-	16	104
TOTALS	8326	347	1880	1476	895	256	114	25	9	235	361	41	42	59	14066

* Species or subspecies could not be identified by patroller.

southern tip of South America (Brothers 1984, Clark *et al.* 1984, Mougin 1975, Watson 1975).

Adults of both species visit burrows intermittently all winter (Brothers 1984, Imber 1984) and therefore seem to be relatively sedentary. On Possession and East Islands in the Crozet group, Kerguelen Petrels laid within a few days of 10 October in 1968 (Mougin 1969) and within a week of 15 October in 1981 (Jouventin *et al.* 1985). Similarly, Blue Petrels lay in October on Marion and Prince Edward Islands and in late October at the Iles Crozet (Imber 1985b, Jouventin *et al.* 1985). Thus, as most Kerguelen Petrels and Blue Petrels on New Zealand beaches are found in August-September (Table 4, Powlesland 1983), when adults are courting and mating on the nesting islands, most of the beach-wrecked birds are likely to be non-breeders. Indeed, examination of the moult and feather wear of these beach-wrecked petrels shows that most are non-breeders, many being first-year birds (Imber 1984).

As well as the large number of petrels, 2682 Fairy Prions were found in August (Table 4). In total, 3912 Fairy Prions were found in 1984. Only in 1975 have more Fairy Prions been found in a year: 5118. In August 1984 the species was found at a greater rate on Auckland West beaches (7.3 per kilometre of beach travelled) than on Auckland East (4.7) or Wellington West beaches (0.4).

Miscellaneous birds

Miscellaneous birds recovered in 1984, but not considered to be seabirds, totalled 256. There were 62 magpies, 21 Mallards, 15 each of Rock Pigeons and Blackbirds, 14 Starlings, 13 Black Swans, 10 Variable Oystercatchers, eight each of Paradise Shelducks and Pukekos, six each of Canada Geese and Indian Mynas, five each of domestic geese and Grey Ducks, four each of New Zealand Shovelers, Australasian Harriers, Pheasants, domestic fowl and Pied Stilts, three each of duck species, passerine species, Skylarks, New Zealand Pipits, North Island Fantails, and Chaffinches, two each of White-faced Herons, Cattle Egrets, domestic turkeys, Buff Wekas, South Island Pied Oystercatchers, Banded Dotterels, Welcome Swallows, Song Thrushes and House Sparrows, and one each of North Island Brown Kiwi, Reef Heron, Brown Quail, California Quail, New Zealand Dotterel, Bar-tailed Godwit, Knot, New Zealand Pigeon, Shining Cuckoo, New Zealand Kingfisher, Goldfinch and Redpoll.

FULMAR RECOVERIES 1960-1983

The term fulmar, as in Imber (1985a), refers to the genera *Macronectes, Fulmarus, Thalassoica, Daption* and *Pagodroma*. No Snow Petrels *(Pagodroma nivea)* have been found by beach patrollers. The following is a summary of the coastal and monthly distributions of the fulmars found in the 24 years 1960-1983. To test whether the annual pattern of recovery for each species, depicted in Figure 1, differed from the theoretical situation whereby an equal number of birds were found each month, the Kolmogorov-Smirnov one-sample test was used (Siegel 1956, p.47).

GIANT PETREL (*Macronectes* spp.)

Two species are present about New Zealand (Falla *et al.* 1979), but they were not distinguished by patrollers. In general, the Northern Giant Petrel *(M. halli)* breeds and feeds north of the Antarctic Convergence, and the Southern Giant Petrel *(M. giganteus)* does so south of the convergence (Serventy *et al.* 1971,

TABLE 4 — Monthly distribution of the seabirds more commonly found dead in 1984

SPECIES OR SUBSPECIES	MONTH JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL BIRDS
Eudyptula minor subspp.*	197	125	143	49	65	29	24	92	34	21	37	58	874
albosignata	1	5	4	2	1	1	-	1	2	-	2	2	21
Diomedea spp.*	1	4	1	-	1	2	3	3	1	2	6	2	26
chrysostoma	1	-	-	1	3	6	7	6	2	4	-	1	31
cauta cauta	2	3	-	2	3	1	-	2	-	1	2	1	17
Macronectes spp.*	-	2	-	-	2	10	2	5	7	4	-	4	36
Daption capense	1	2	-	-	1	10	7	34	24	16	17	10	122
Lugensa brevirostris	-	-	-	-	-	1	6	378	199	10	-	6	600
Pterodroma macroptera	9	7	10	6	3	1	5	19	3	-	6	5	74
lessonii	11	7	3	4	10	10	3	23	21	33	65	23	213
inexpectata	11	13	1	-	1	-	1	2	1	1	6	-	37
cookii	3	5	13	4	-	-	-	-	-	-	4	9	38
nigripennis	2	1	4	8	1	-	-	-	-	-	-	1	17
Halobaena caerulea	1	-	-	-	-	5	16	721	109	14	11	4	881
Pachyptila spp.*	183	108	3	5	29	31	13	245	55	166	143	40	1021
vittata	13	2	1	3	12	3	15	39	8	4	2	2	104
salvini	-	-	-	-	10	8	5	86	6	3	-	-	118
desolata	3	-	-	4	21	5	10	299	13	6	3	5	369
belcheri	-	-	-	1	5	4	38	662	17	5	9	2	743
turtur	83	53	2	1	23	23	92	2682	141	183	383	246	3912
Procellaria parkinsoni	-	2	8	1	21	-	-	3	-	-	2	2	39
Puffinus spp.*	-	4	2	2	6	1	1	4	2	3	6	2	33
carneipes	9	10	53	13	6	3	1	2	-	-	28	22	147
bulleri	38	36	73	11	29	6	-	1	11	44	121	53	423
griseus	54	48	13	22	25	7	4	1	9	57	559	262	1062
tenuirostris	100	23	8	8	26	11	-	2	3	8	8	15	212
gavia	75	83	41	38	18	12	37	220	52	69	130	67	842
huttoni	7	5	-	2	1	-	-	18	5	16	15	5	74
assimilis	7	3	8	1	9	6	14	13	2	3	5	11	82
Pelagodroma marina	3	4	-	-	4	-	1	5	12	3	11	12	55
Pelecanoides urinatrix	43	17	6	3	23	6	27	147	21	31	39	51	414
Sula bassana	37	52	57	31	15	19	7	21	13	35	72	47	406
Phalacrocorax carbo	1	2	1	1	-	2	-	3	3	1	-	4	18
varius	1	2	8	1	1	2	1	7	4	1	5	5	38
Stictocarbo punctatus	7	24	14	37	16	14	9	14	14	7	6	5	167
Larus dominicanus	39	80	56	56	55	72	33	28	24	28	28	33	532
novaehollandiae	5	29	17	10	6	11	4	21	8	4	15	9	139
bulleri	6	2	3	-	-	2	-	1	3	2	2	4	25
Sterna striata	7	9	11	11	8	12	1	2	4	5	17	17	104
TOTALS	961	772	564	338	460	336	387	5812	833	790	1765	1048	14066

* Species or subspecies could not be identified by patroller.

Harrison 1983). In the New Zealand region, *M. giganteus* nests on islands off Antarctica and on Macquarie Island (Warham 1985b). The Northern species nests on Macquarie Island; Motuhara and the Sisters in the Chatham Islands; Antipodes Island; Rose, Ocean and Adams Islands of the Auckland Island group; Campbell Island; and Nelly Island in Port Pegasus of Stewart Island (Warham 1985b).

Both species, particularly their fledglings, disperse widely from the nesting colonies during the non-breeding season. Immatures spend their first 2-3 years at sea, ranging downwind and northward as far as 10°S in cool-water zones off western America and Africa, and regularly reach the tropics elsewhere (Harrison 1983). Thus, both species frequent New Zealand's coastal waters and are beach-wrecked. However, in May-June the Southern Giant Petrel is scarce in New Zealand waters; beach-wrecked specimens are usually found from July to December (Warham 1985b).

In total, 711 Giant Petrels have been found at a rate of 1.31 birds per 100 km of beach covered from 1960 to 1983. The highest rate of recovery was from beaches of Outlying Islands (2.09), mostly Chatham Island beaches (Table 5). Mainland beaches on which Giant Petrels were most often found were Auckland West (1.85) and Southland (1.65).

The monthly rate of recovery changed significantly during the year, from a low of 0.31 birds in February to a high of 2.96 birds in July ($p < 0.01$) (Fig. 1). The period of greatest mortality (June-September) is well after the fledglings of Northern Giant Petrels have left their colonies in February (Warham 1985b), but it coincides with an influx into New Zealand coastal waters of fledgling Southern Giant Petrels, which leave their nesting colonies in March-April. Of 77 banded Southern Giant Petrels found on New Zealand beaches, mostly from colonies in the southern Atlantic Ocean, 72.7% were found in June-September and 89.6% were less than a year old. Only 13 dead Northern Giant Petrels banded as nestlings have been found on New Zealand beaches. Of these birds, 45.5% were found in June-September and 46.2% were less than a year old.

ANTARCTIC FULMAR *(Fulmarus glacialoides)*

During summer, this fulmar's range extends only a short distance north of the Antarctic pack ice (Oliver 1955). Antarctic Fulmars breed on the Antarctic continent and offshore at Bouvetoya, Peter I Island, South Shetland, South Orkney, South Sandwich and Balleny Islands (Robertson & Kinsky 1985). In winter they move north from the pack ice to about 45°S, but some birds frequently disperse into the subtropics following cold currents north along the western coasts of South America, South Africa and Australia (Harrison 1983, Robertson & Kinsky 1985). Before 1970 patrollers had found only nine beach-wrecked Antarctic Fulmars but since then they have regularly straggled to New Zealand waters, 10-20 birds being picked up in most years.

From 1960 to 1983, 1343 Antarctic Fulmars were found at a rate of 2.48 birds per 100 km of beach covered. Nearly 82% of these birds were picked up in two wrecks: 639 in 1975 and 458 in 1978. Auckland West had the highest rate at 4.73 birds per 100 km of beach covered. The next highest were Taranaki with 2.78 birds per 100 km of beach covered and Wellington West with 1.86 (Table 5).

TABLE 5 — Rate of recovery (number found per 100 km of beach covered) of four genera of fulmars on each coast during 1960-1983

	COAST														
SPECIES	AW	TA	WW	AE	BP	EC	WA	WS	NC	WB	CN	CS	OT	SD	CI
Macronectes spp.	1.85	0.96	0.92	0.84	0.14	0.96	1.44	1.32	0.36	0.62	1.23	1.36	0.60	1.65	2.09
Fulmarus glacialoides	4.73	2.76	1.86	-	0.05	0.58	-	0.43	1.80	0.41	0.35	0.08	0.07	1.65	0.46
Thalassoica antarctica	0.29	0.14	0.07	0.01	-	-	-	-	-	-	-	-	-	0.44	-
Daption capense	3.27	2.34	2.35	0.78	0.82	0.96	1.30	4.39	0.36	0.67	1.29	3.92	0.43	2.76	0.23

The monthly rate of recovery of Antarctic Fulmars changed markedly during the year ($p < 0.01$). Fewer than 0.5 birds per 100 km of beach covered were found each month from December to July, but the rate was much greater from August to November, with a peak in September of 15.7 birds (Fig. 1). As the birds lay in late November to mid-December and the young fledge in mid-March (Robertson & Kinsky 1985), the spring peak in mortality is not the result of recently fledged young dying about our coasts. Most of the birds found in September and October died during the 1975 and 1978 wrecks. It seems that most of these fulmars were first-year birds and that the spring peak in mortality stems from a combination of the birds being weakened by poor food supplies in winter and being subjected to severe storms (see Veitch 1980, Imber 1984).

ANTARCTIC PETREL *(Thalassoica antarctica)*

This species has a circumpolar distribution, breeding at several widely scattered sites on the Antarctic continent and nearby islands. Birds return to their nesting sites in October, the eggs are laid in late November and early December, and the chicks leave in late February (Serventy *et al* 1971). After breeding, Antarctic Petrels disperse around the continent in the zone of pack ice and icebergs, seldom venturing north beyond 50°S. To date, patrollers have found only 81 Antarctic Petrels, the first in 1973, and 73 were picked up in 1978.

During 1960-1983, 0.15 Antarctic Petrels were picked up for every 100 km of beach covered. They have been found on beaches of only five coastal regions (65 on AW, 4 on TA, 6 on WW, 1 on AE and 5 on SD), the highest rate of recovery being from Southland beaches (Table 5). The monthly rate, as shown in Figure 1, changes significantly through the year ($p < 0.01$) to an abrupt September peak because of the 1978 wreck. At this time hundreds were seen from Preservation Inlet, Fiordland, to Stewart Island (Barlow 1979), well north of their usual range.

CAPE PIGEON *(Daption capense)*

Beach patrollers did not distinguish between the two subspecies of Cape Pigeon found on New Zealand beaches. The Cape Pigeon *(D. c. capense)* breeds on the Antarctic continent and its neighbouring islands and on many subantarctic islands in the southern Indian and Atlantic Oceans (Sagar 1985). Outside the

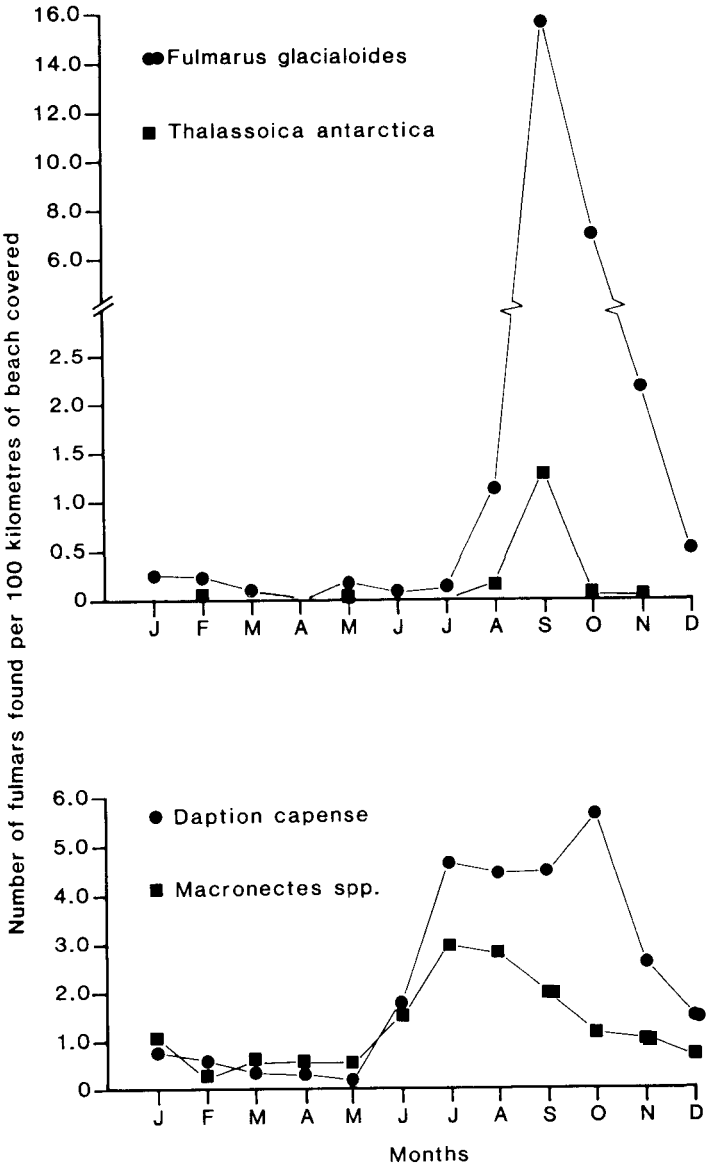

FIGURE 1 — Monthly rate of recovery (number found dead per 100 km of beach covered) of four genera of fulmars during 1960-1983

breeding season it has a circumpolar distribution, ranging north to about 25° S, but some disperse as far as the equator up the cool Humbolt Current (Harrison 1983). The Snares Cape Pigeon (*D. c. australe*) nests on The Snares, on the Antipodes, Bounty and Campbell Islands, and on Beacon Rock of the Auckland Islands (Sagar 1979, Kinsky 1980). At The Snares, eggs are laid in November and the chicks leave their nests in mid-February (Sagar 1979). The breeding season of *D. c. capense* is 2-4 weeks later than that of *D. c. australe* at The Snares (Sagar 1979). Observations of the Snares Cape Pigeon by Horning & Horning (1974) show that some birds remain near The Snares in the non-breeding season.

During 1960-1983, patrollers found 1311 Cape Pigeons. About 50 birds were found in most years from 1970 to 1983, the highest annual total being 306 in 1975. Overall, the average rate of recovery was 2.42 birds per 100 km of coast covered. Of the coastal regions, Wellington South had the greatest rate of recovery (4.39), followed by Canterbury South (3.92), Auckland West (3.27) and Wellington West (2.35) (Table 5).

Figure 1 shows that the monthly rate of recovery for the Cape Pigeon changed during the year ($p < 0.01$). In summer and autumn few Cape Pigeons were picked up, but the rate of recovery increased five-fold in winter and remained at that level through to October, after which it decreased markedly in November-December. The high rate of recovery in winter-spring may be the result of an influx of Cape Pigeons into New Zealand coastal waters from higher latitudes. The marked drop in numbers from October to December coincides with when the birds move back to their colonies to lay in November-December.

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