SEABIRDS FOUND DEAD ON NEW ZEALAND BEACHES IN 1986 AND A REVIEW OF *Pachyptila* SPECIES RECOVERIES SINCE 1960

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ABSTRACT

In 1986, 4594 kilometres of coast were patrolled and 14 462 dead seabirds were found. Three new species for the Beach Patrol Scheme were the White-naped Petrel (*Pterodroma cervicalis*), the White-capped Noddy (*Anous minutus*) and the White Tern (*Gygis alba*). Four species found in greater numbers in 1986 than previously were the Yellow-nosed Mollymawk (*Diomedea chlororhynchus*), Narrow-billed Prion (*Pachyptila belcheri*), Short-tailed Shearwater (*Puffinus tenuirostris*) and Stewart Island Shag (*Leucocarbo carunculatus chalconotus*).

A summary is given of the coastal and monthly distributions for each species of *Pachyptila* found between 1960 and 1986. The Fairy Prion (*P. turtur*), a New Zealand resident, was found most frequently mainly in February and between July and November. By comparison, the other five species, all migrants to New Zealand, were picked up mainly during July-August.

INTRODUCTION

This paper records the results of the Ornithological Society of New Zealand's (OSNZ) Beach Patrol Scheme for 1986 and reviews *Pachyptila* species recovered since 1960. All sections of coast were patrolled (see Powlesland & Imber 1988), except Fiordland. In total, 664 Beach Patrol Cards and five Specimen Record Cards were submitted in 1986.

Kilometres "travelled" are the total lengths of coast actually patrolled, whereas kilometres "covered" are the lengths of coast patrolled monthly. Hence, if 1 km of beach is patrolled twice in one month, 2 km have been travelled but only 1 km covered per month.

The taxonomic nomenclature is that of Kinsky (1970, 1980), except that I have followed Imber (1985) for the White-naped Petrel and the Kerguelen Petrel (*Lugensa brevirostris*).

RESULTS AND DISCUSSION

In 1986, the total length of coast travelled was 4594 km along which 14 462 seabirds were found dead by 286 OSNZ members and their friends. The average number of birds per kilometre of coast covered was 3.45 (Table 1). Both the total distance travelled and the number of birds found were greater than the respective averages of 3994 km and 10 747 birds per year recorded over the previous 15 years 1971-1985). Further, the average number of birds per kilometre (3.45) was greater than that for the previous 15 years (3.15). A summary of the number of birds per kilometre covered per coast for each month is presented in Table 1. Coastal and monthly totals of uncommon species (less than 12 specimens) are given in Table 2, while for more common species (at least 12 specimens), coastal totals are presented in Table 3 and monthly totals in Table 4.

TABLE 1 — Numbers of dead seabirds recovered and kilometres covered on each coast in 1986

COAST	CODE		MONTH												TOTAL		BIRDS/KM /COAST
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	KM	BIRDS	
AUCKLAND WEST	AW	KM	213	245	180	214	219	192	189	268	203	186	199	186	2494		
		BIRDS	493	278	114	122	574	96	240	5699	315	322	455	380		9088	3.64
TARANAKI	TA	KM	6	22	2	23	8	22	16	2	5	36	13	4	159		
		BIRDS	25	4	2	10	12	15	6	2	3	27	12	4		122	0.77
WELLINGTON WEST	WW	KM	6	47	11	33	38	22	24	82	58	41	29	9	400		
		BIRDS	12	600	34	83	249	17	76	736	112	100	120	16		2155	5.39
AUCKLAND EAST	AE	KM	96	26	24	31	21	54	34	76	14	25	52	23	476		
		BIRDS	484	22	45	40	21	93	18	347	28	31	71	103		1303	2.74
BAY OF PLENTY	BP	KM	17	26	9	8	8	2	3	58	13	6	18	22	190		
		BIRDS	63	31	8	8	6	2	1	878	33	6	43	36		1115	5.89
EAST COAST NI	EC	KM	8	6	8	8	3	15	8	8	13	15	12	12	116		
		BIRDS	9	15	9	12	0	8	1	2	8	26	20	7		117	1.01
WAIRARAPA	WA	KM	-	1	3	6	-	6	-	-	-	-	-	-	16		
		BIRDS	-	3	3	3	-	3	-	-	-	-	-	-		12	1.33
WELLINGTON SOUTH	WS	KM	-	-	-	1	22	9	33	26	7	1	13	1	113		
		BIRDS	-		-	0	27	13	85	105	14	6	19	2		271	2.40
NORTH COAST SI	NC	KM	-	-	-	-	1	23	-	1	1	5	5	-	36		
		BIRDS	-	-	-	-	2	8	-	0	1	3	5	-		19	1.89
WESTLAND	WD	KM	-	4	-	-	5	4	2	4	-	4	1	-	24		
		BIRDS	-	0	-	-	0	0	4	1	-	0	1	-		6	0.25
CANTERBURY NORTH	CN	KM	6	6	1	-	-	6	6	6	2	6	11	6	56		
		BIRDS	8	12	2	-	-	2	6	7	7	10	15	13		82	1.46
CANTERBURY SOUTH	CS	KM	-	-	-	-	1	1	-	-	2	-	-	-	4		
		BIRDS	-	-	-	-	3	2	-	-	9	-	-	-		14	3.50
OTAGO	OT	KM	7	6	3	10	14	13	11	7	7	6	10	14	108		
		BIRDS	17	9	19	17	18	12	6	2	12	5	16	18		151	1.40
SOUTHLAND	SD	KM	-	1	-	-	1	-	-	-	-	-	-	-	2		
		BIRDS	-	3	-	-	4	-	-	-	-	-	-	-		7	3.50
TOTAL KILOMETRES TRAVELLED			394	434	281	346	384	373	348	634	354	357	396	293	4594		
TOTAL KILOMETRES COVERED			359	390	241	334	341	369	326	538	325	331	363	277	4194		
TOTAL BIRDS RECOVERED			1111	977	236	295	916	271	443	7779	542	536	777	579		14462	
BIRDS/KM COVERED/MONTH			3.09	2.51	0.98	0.88	2.69	1.73	1.36	14.46	1.67	1.62	2.14	2.09			3.45

TABLE 2 — Seabirds of which 1 to 11 specimens were found in 1986

SPECIES OR SUBSPECIES	NUMBER FOUND	COAST(S)	MONTH(S)
Megadyptes antipodes	11	OT(10),SD.	MAR(3),APR,MAY(6),DEC.
Eudyptula minor albosignata	9	BP,CN(7),CS.	MAR,JUN,JUL(2),AUG,SEP,NOV(2),DEC.
Eudyptes spp.*	1	OT.	JUN.
pachyrhynchus	1	OT.	DEC.
Diomedia exulans	9	AW(8),WS.	APR(3),MAY(2),JUN,JUL,AUG,NOV.
epomophora	5	AW(4),OT.	MAY,SEP(2),OCT,NOV.
melanophrys	3	AW(3).	JUL(2),DEC.
chlororhynchos	5	AW(2),AE(3).	APR,JUN,AUG(2),SEP.
bulleri	8	AW(4),AE,EC,WS(2).	MAY,JUN,JUL(2),AUG(2),SEP(2).
*cauta subspp.**	6	AW(4),WS,OT.	JAN,APR(3),JUL,DEC.
salvini	2	AW(2).	OCT(2).
Pterodroma inexpectata	10	AW(9),WW.	FEB,MAR(2),APR,JUN,NOV(3),DEC(2).
neglecta	1	AW.	MAR.
pycrofti	1	BP.	AUG.
nigripennis	10	AW(4),WW,AE(3),BP(2).	JAN(6),FEB(2),MAR,APR.
cervicalis	1	AE.	JAN.
Procellaria cinerea	6	AW(3),AE,BP(2).	JAN,JUL,AUG(2),SEP,NOV.
parkinsoni	7	AW,AE(2),BP(4).	JAN(4),FEB(2),AUG.
westlandica	3	AW(2),WS.	JAN,JUL,DEC.
aequinoctialis	3	AW(2),AE.	JAN,FEB,OCT.
Puffinus gavia/huttoni	3	WW(2),WS.	MAY,AUG,SEP.
Garrodia nereis	1	WS.	AUG.
Phaethon lepturus	2	AE(2).	JAN(2).
Phalacrocorax spp.*	4	AW(2),AE,CN.	JAN,FEB,JUN,SEP.
carbo	11	AW(3),WW(2),AE,EC(3),OT(2).	APR,MAY(3),JUN,JUL,AUG(2),SEP(2),NOV.
sulcirostris	5	AW,BP(3),WS.	FEB(2),JUN,AUG,DEC.
brevirostris	9	AW(3),WW,WS,OT(4).	JAN,FEB,APR,JUN(2),JUL,AUG,SEP,NOV.
Stercorarius *skua lonnbergi*	2	AW,BP.	MAR,AUG.
parasiticus	1	AW.	AUG.
Larus bulleri	9	WW,EC(3),OT(5).	JAN(3),FEB(3),APR(2),JUL.
Hydroprogne caspia	5	AW(2),WW(2),AE.	JAN(2),APR,MAY,JUL.
Sterna spp.*	3	AW(2),OT.	FEB,OCT,NOV.
albifrons sinensis	1	AE.	FEB.
fuscata	4	AW(3),WW.	JAN(4).
Anous minutus	2	AW,AE.	JAN(2).
Gygis alba	1	WW.	MAY.
Procelsterna cerulea	1	AW.	DEC.
TOTAL	166		

* species or subspecies was not identified by the patroller.

Unusual finds

Despite the operation of the Beach Patrol Scheme since 1939, new species are recorded in most years. Three new species were found in 1986, one from the family Procellariidae and two from the family Sternidae. A White-naped Petrel was picked up at Karikari Bay, Northland (AE) in January. Dowding (1987) provided a description and measurements of this specimen.

Two White-capped Noddies were found in January, one on Muriwai Beach (AW) and the other on Karikari Bay (AE). Six live White-capped Noddies have previously been seen around New Zealand: two at Kaipara Harbour (AW), one in October 1953 (Sibson 1955) and the other in August 1964 (Sibson 1965); one at Farewell Spit (NC) in January 1961 (Edgar 1962); one at Spirits Bay (AE) in January 1965 (MacDonald 1965); one at Whangarei Heads (AE) in February 1965 (Robb & Robb 1965); and one at the Taieri River mouth (OT) in April 1977 (Westerskov 1977). In addition, one dead bird was found at Houhora Harbour (AE) in March 1975 (Edgar 1975). At least four of these birds were seen after gale force northerly winds.

The White-capped Noddy is distributed throughout the tropical and subtropical Atlantic and Pacific Oceans, breeding on islands throughout this range. In the New Zealand region it breeds on some of the Kermadec Islands. On the Meyer Islets laying occurs from October to January (Soper 1969), with the young leaving the nest in January-April. During the non-breeding season, the noddies return at dusk to roost at or near their nesting sites (Harrison 1983).

TABLE 3 — Coastal distribution of dead seabirds more commonly found in 1986

SPECIES OR SUBSPECIES	COASTS														TOTAL BIRDS
	AW	TA	WW	AF	BP	EC	WA	WS	NC	WD	CN	CS	OT	SD	
Eudyptula minor subspp.*	328	12	60	244	30	3	4	7	5		8	1	14	3	719
Diomedea spp.*	11	-	4	-	-	-	-	3	-	-	-	1	-	-	19
chrysostoma	39	-	-	-	1	-	-	-	-	-	-	-	-	-	40
cauta cauta	18	5	1	1	-	-	-	1	1	-	-	-	-	-	27
Phoebetria palpebrata	12	-	1	-	-	-	-	-	-	-	-	-	-	-	13
Macronectes spp.*	18	1	6	-	-	-	-	2	1	1	-	-	-	-	29
Fulmarus glacialoides	31	-	1	1	1	-	-	-	-	-	-	-	-	-	34
Daption capense	26	-	5	14	11	-	-	8	-	1	1	-	1	-	67
Lugensa brevirostris	100	1	32	3	2	-	-	-	-	-	-	-	-	-	138
Pterodroma spp.*	3	-	-	2	17	-	-	-	-	-	-	-	-	-	22
macroptera	31	1		15	14	-	-	-	-	-	-	-	-	-	61
lessonii	58	1	1	-	3	-	-	1	-	-	-	-	-	-	64
cookii	5	-	-	27	1	-	-	-	-	-	-	-	-	-	33
Halobaena caerulea	38	-	6	1	12	-	-	-	-	-	-	-	-	-	57
Pachyptila spp.*	653	11	391	28	7	-	-	15	-	-	1	1	1	-	1108
vittata	173	-	31	1	-	-	-	1	-	-	-	-	-	-	206
salvini	272	-	30	6	9	-	-	1	-	2	-	-	-	-	320
desolata	946	-	25	46	3	2	-	3	-	-	-	-	1	-	1026
belcheri	1269	2	123	6	8	-	-	2	-	-	-	-	-	-	1410
turtur	2880	12	662	210	198	5	-	35	-	-	1	-	2	-	4005
crassirostris	7	-	1	-	7	-	-	1	-	-	-	-	-	-	16
Puffinus spp.*	21	-	11	2	1	-	-	2	-	-	-	3	-	-	40
carneipes	34	1	-	42	15	1	-		-	-	-	-	-	-	93
bulleri	75	3	19	39	9	4	2	1	-	-	-	-	-	-	152
griseus	434	15	71	166	34	40	1	17	-	-	1	2	16	2	799
tenuirostris	490	19	187	61	2	3	-	1	-	-	-	-	-	-	763
gavia	333	6	70	122	137	9	2	4	1	-	-	-	5	-	689
huttoni	4	1	7	2	3	-	-	3	-		8	-	-	-	28
assimilis	18	-	-	16	4	-	-	-	-	-	-	-	-	-	38
Pelagodroma marina	8	1	-	2	5	-	-	-	-	-	-	-	-	-	16
Pelecanoides urinatrix	170	-	307	82	500	1	-	103	5	2	-	-	-	-	1170
Sula bassana	240	10	12	61	16	9	1	2	1	-	-	-	-	-	352
Phalacrocorax varius	16	-	1	11	8	-	-	-	-	-	2	-	-	-	38
Leucocarbo carunculatus chalconotus	-	-	-	-	-	-	-	-	-	-	-	-	25	1	26
Stictocarbo punctatus	2	-	1	1	-	-	-	3	2	-	8	5	28	-	50
Larus dominicanus	184	11	58	45	18	25	2	31	2	-	7	-	19	-	402
novaehollandiae	44	6	9	21	25	3	-	14	1	-	32	-	12	-	167
Sterna striata	27	3	10	7	-	5	-	1	-	-	5	-	1	-	59
TOTALS	9018	122	2143	1285	1101	110	12	262	19	6	74	13	125	6	14296

* Species or subspecies was not identified by the patroller.

TABLE 4 — Monthly distribution of dead seabirds more commonly found in 1986

SPECIES OR SUBSPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL BIRDS
Eudyptula minor subspp.*	311	66	33	46	23	51	21	45	29	28	31	35	719
Diomedea spp.*	-	-	-	5	4	1	1	3	1	2	1	1	19
chrysostoma	1	1	1	1	-	3	4	10	9	8	1	1	40
cauta cauta	-	1	-	5	-	3	4	5	1	2	2	4	27
Phoebetria palpebrata	-		-	1	1	1	1	1	-	4	2	2	13
Macronectes spp.*	-	1	1	-	-	4	4	7	-	3	7	2	29
Fulmarus glacialoides	3	1		-	-	1	1	1	7	15	3	2	34
Daption capense	-	-	-	-	-	-	7	26	9	6	9	10	67
Lugensa brevirostris	1	1	-	-	1	-	2	42	58	25	7	1	138
Pterodroma spp.*	1	-	1	-	1	-	-	13	1	1	2	2	22
macroptera	14	1	2	2	5	7	1	10	5	7	1	6	61
lessonii	2	2	1	1	7	5	5	11	6	9	9	6	64
cookii	10	-	2	3	-	-	-	-	-	-	1	14	33
Halobaena caerulea	4	1	-	-	-	1	2	41	2	5	1	-	57
Pachyptila spp.*	14	217	9	20	27	14	19	528	92	80	71	17	1108
vittata	-	-	-	-	-	-	1	188	5	11	1	-	206
salvini	-	-	-	-	-	2	5	298	9	6	-	-	320
desolata	1	-	-	-	16	10	24	950	21	3	1	-	1026
belcheri	-	-	-	-	3	3	21	1351	21	7	4	-	1410
turtur	41	330	12	16	9	8	81	3026	127	108	181	66	4005
crassirostris	-	-	-		-	-	1	9	-	6	-	-	16
Puffinus spp.*	8	7	1	1	6	1	9	4	3	-	-	-	40
carneipes	25	7	13	10	3	5	3	1	-	-	8	18	93
bulleri	36	28	12	6	8	4	1	1	3	14	24	15	152
griseus	190	47	10	17	86	26	8	1	6	48	192	168	799
tenuirostris	94	5	1	3	587	24	1	1	-	1	27	19	763
gavia	114	83	27	28	35	13	28	220	19	37	46	49	689
huttoni	3	2	-	1	1	2	2	5	2	5	3	2	28
assimilis	8	-	-	2	-		2	5	1	-	9	11	38
Pelagodroma marina	2	2	-	-	-	-	-	-	-	2	4	6	16
Pelecanoides urinatrix	51	9	3	6	12	20	133	810	50	15	31	30	1170
Sula bassana	44	38	16	27	16	6	15	73	17	36	33	31	352
Phalacrocorax varius	8	2	4	3	3	2	2	5	2	4	2	1	38
Leucocarbo carunculatus chalconotus	7	4	2	1	4	3	2	-	1	1	1	-	26
Stictocarbo punctatus	1	3	8	5	2	2	-	6	11	3	3	6	50
Larus dominicanus	37	66	53	47	42	31	14	43	9	16	25	19	402
novaehollandiae	39	22	7	16	8	4	4	17	3	8	17	22	167
Sterna striata	11	15	8	7		3	-	4	-	5	3	3	59
TOTALS	1081	962	227	280	900	260	429	7761	530	531	766	569	14296

* Species or subspecies was not identified by the patroller.

A White Tern was found on Otaki Beach (WW) in May. There are records of five other White Terns on the New Zealand mainland; Waipu (AE) in 1883, Ettrick (OT) in March 1945, Bethell's Beach (AW) in May 1960, inland Pakotai (Northland) in May 1964, and Palmerston North in June 1972, (Sibson 1978). These stragglers were probably blown south by northerly gales.

The White Tern breeds on many islands throughtout the tropical and subtropcial regions of the Indian and Pacfic Oceans. It breeds from October to March on the Kermadec Islands in the New Zealand region (Serventy *et al.* 1971). Outside the breeding season it disperses to pelagic waters (Harrison 1983).

A Kermadec Petrel (*Pterodroma neglecta*) which came ashore between Maunganui Bluff and Glink's Gully (AW) in March is the second recorded for the Beach Patrol Scheme. The first was picked up on Muriwai Beach (AW) in April 1981 (Powlesland 1983). This species' nearest breeding localities are at the Kermadec Islands on Macauley Island (B.D. Bell pers. comm.) and the Herald Islets (Falla *et al.* 1979). Considering that breeding occurs throughout the year on the Herald Islets (Falla *et al.* 1979), it is interesting that only two birds have been found on New Zealand beaches. Presumably it takes exceptionally strong north-easterly winds to blow these birds as far south as new Zealand.

Two White-tailed Tropicbirds (*Phaethon lepturus*) were found in January 1986, one on Waikuku Beach (AE) and the other at Great Exhibition Bay (AE). Previously, eight specimens have been found by patrollers: 1973, BP, January: 1979 (3), TA and AW (2), February (2) and June; 1983 (3), AW (3), March, April and May; 1985, AE, December. This species breeds on islands in the tropical Atlantic, Indian and Pacific Oceans, with New Caledonia being the nearest breeding locality to New Zealand (Serventy *et al.* 1971, Harrison 1983). It is a regular though rare visitor to the eastern coasts of Australia, with the stragglers that reach New Zealand possibly being blown south by cyclones.

A Little Tern (*Sterna albifrons*) was found on Access Bay, Firth of Thames (AE) in February 1986, the fifth specimen to be found by patrollers. The records for the other specimens are: 1975, CS, October; 1978, AW, November; 1980, AW, December and 1982, AE, April. This tern is a regular summer migrant to New Zealand. Details about the numbers of Little Terns seen annually and their seasonal and geographical distribution in the country have been provided by Powlesland (1984).

Species found in greater numbers in 1986 than in any previous years were Yellow-nosed Mollymawk, Narrow-billed Prion, Short-tailed Shearwater and Stewart Island Shag. Five Yellow-nosed Mollymawks were found on Auckland West (2) and Auckland East (3) beaches in April, June, August (2) and September. Although Yellow-nosed Mollymawks were occasionally seen at sea about northern New Zealand in the 1970s, it was not until 1980 that the first beach-wrecked specimen was found (Veitch 1982). Three Yellow-nosed Mollymawks were found in 1981 and one in most subsequent years.

All six *Pachyptila* species were found in large numbers in 1986 (Table 3). The recovery of 1410 Narrow-billed Prions (*P. belcheri*) is the highest annual total for this species, 1326 in 1974 being the previous highest total. Generally, fewer than 100 specimens are found each year. The 1986 totals for the other *Pachyptila* species are their second (*desolata* and *crassirostris*) or third (*vittata, salvini* and *turtur*) highest annual totals. Most of the 1986 prions were picked up from Auckland West and Wellington West beaches (Table 3) in August (Table 4). Wrecks of prions are relatively frequent along the North Island west coast in winter and these are discussed in the prion review section.

The 1986 total of Short-tailed Shearwaters was 763, just surpassing the previous highest annual total of 755 in 1968. Usually 100-200 specimens of this shearwater are found each year. Most of the 1986 Short-tailed Shearwaters were recovered from North Island west coast beaches (91%) (Table 3) in May (77%) (Table 4). This shearwater winters in the northern Pacific Ocean, returning in late September to its many breeding islands about south-eastern Australia, in Bass Strait and around Tasmania (Serventy *et al.* 1971). Like other migrant shearwaters, Short-tailed Shearwaters have a short laying period, from about 19 November to 2 December for this species. The eggs hatch in late January and the chicks leave from about mid-April to early May (Serventy *et al.* 1971). Thus, the wreck of Short-tailed Shearwaters on New Zealand beaches in 1986 coincided with the departure of the birds to their Northern Hemisphere wintering grounds. As young birds, particularly recent fledglings, would be most prone to starvation or exhaustion, it was probably mainly these inexperienced foragers which were beach-wrecked.

In most years fewer than ten Stewart Island Shags are found. However, 26 were picked up in 1986; the previous highest annual total was 19 in 1979. All but one of the 1986 birds were found on Otago beaches (Table 3). Birds were recovered in most months, with the greatest numbers being in summer and early winter (Table 4). The cause of this apparently increased mortality is unknown. However, it occurred over several months and therefore was probably not caused by storms. Scarcity of food is a more likely explanation.

Miscellaneous birds

Birds other than seabirds recovered in 1986 totalled 176. There were 34 magpies, 20 Rock Pigeon, 15 Black Swan, 10 Starling, nine each of Cattle Egret and unidentified passerine species, seven each of Mallard and Kingfisher, six Tui, five each of White-faced Heron and Australasian Harrier, four each of Pukeko, Pied Stilt, Blackbird and Indian Myna, three each of domestic geese, duck species, Variable Oystercatcher and Silvereye, two each of Grey Duck, domestic turkeys, South Island Pied Oystercatcher and Song Thrush, and one each of White Heron, Australasian Bittern, Canada Goose, Western Weka, oystercatcher species, New Zealand Dotterel, Banded Dotterel, Bar-tailed Godwit, Turnstone, Knot, Red-necked Stint, Morepork and Skylark.

REVIEW OF *Pachyptila* RECOVERIES 1960-1986

The following is a summary of the coastal and monthly distributions of the *Pachyptila* species found by patrollers during the past 27 years. In total, 74 505 prions (*Pachyptila* spp.) were found, of which 13 504 were not identified to species. The remaining 61 001 birds comprised six species (Table 5).

The Kolmogorov-Smirnov one-sample test (Siegel 1956, p. 47) was used to test whether the pattern of recovery for each species (Figures 1 & 2) differed from the theoretical situation whereby an equal number of birds were found each month.

BROAD-BILLED PRION *P. vittata*

The Broad-billed Prion is confined to the subtropical convergence zone and nests mainly on islands situated in or adjacent to it (Harper 1980). In the New Zealand region it is a common prion, nesting in vast numbers at the Chatham Islands, on islets in Foveaux Strait and at The Snares. Elsewhere, it nests on Gough and Tristan da Cunha Islands in the South Atlantic Ocean and St Paul Island in the Southern Indian Ocean (Harper 1980).

TABLE 5 — Rate of recovery (number of prions found per 100 km of beach covered) of six species of *Pachyptila* on each coast in 1960-1986

SPECIES	AW	TA	WW	AE	BP	EC	WA	WS	NC	WD	CN	CS	OT	SD	OI	Total
P. vittata	4.8	1.1	19.5	0.5	0.1	0.3	1.5	1.2	1.0	1.4	1.5	8.7	0.4	19.4	3.5	5.8
P. salvini	21.3	1.8	16.3	0.3	0.3	0.7	-	0.7	0.3	1.6	0.3	0.3	0.1	1.7	-	12.0
P. desolata	17.8	1.0	3.8	1.2	0.9	1.9	-	0.5	-	2.3	0.2	0.6	0.1	0.3	0.4	8.7
P. belcheri	13.9	2.5	6.1	0.6	1.4	0.6	0.5	1.0	0.3	0.9	0.6	3.5	0.1	1.1	0.2	7.4
P. turtur	85.1	14.6	84.6	16.2	15.7	19.0	16.3	22.4	19.6	3.1	9.1	6.4	2.6	7.1	8.4	55.5
P. crassirostris	0.1	0.1	0.1	0.1	0.3	0.2	0.6	0.9	-	-	0.2	0.3	-	-	0.2	0.2

Richdale (1965) studied the breeding biology of the Broad-billed Prion at Whero Island in Foveaux Strait. Large numbers of birds return to the island in July to dig or clean out burrows. After mating they remain at sea for several weeks while the female forms an egg. Laying occurs between late August and mid-September, and hatching about mid-October. Most nestlings have left the breeding islands by the end of December. The species is sedentary, birds being present about the breeding islands throughout the year, but noticeably fewer are evident for the first two months after breeding (Richdale 1965).

During 1960-1986 patrollers found 3979 Broad-billed Prions. Fewer than 100 were picked up during most years, but 1385 were found in 1961 and 1175 in 1974. Overall, the average rate of recovery was 3.45 birds per 100 km of coast covered. Of the coastal regions, Wellington West had the greatest rate of recovery (19.5 birds/100 km of coast covered), followed by Southland (19.4) and Canterbury South (8.7) (Table 5). The Southland result is to be expected, given the large numbers breeding on Foveaux Strait islands. The high rate of recovery from Wellington West beaches results largely from a wreck in 1974. Of the 1175 Broad-bills picked up during that year, 80% were found on Wellington West beaches. Why only seven Broad-bills have been found on Otago beaches (0.4 birds/100 km), when further north 137 have been found on Canterbury South beaches (8.7 birds/100 km) is not known.

The recovery of so many Broad-bills wrecked on North Island west coast beaches suggests that large numbers disperse from their nesting islands into

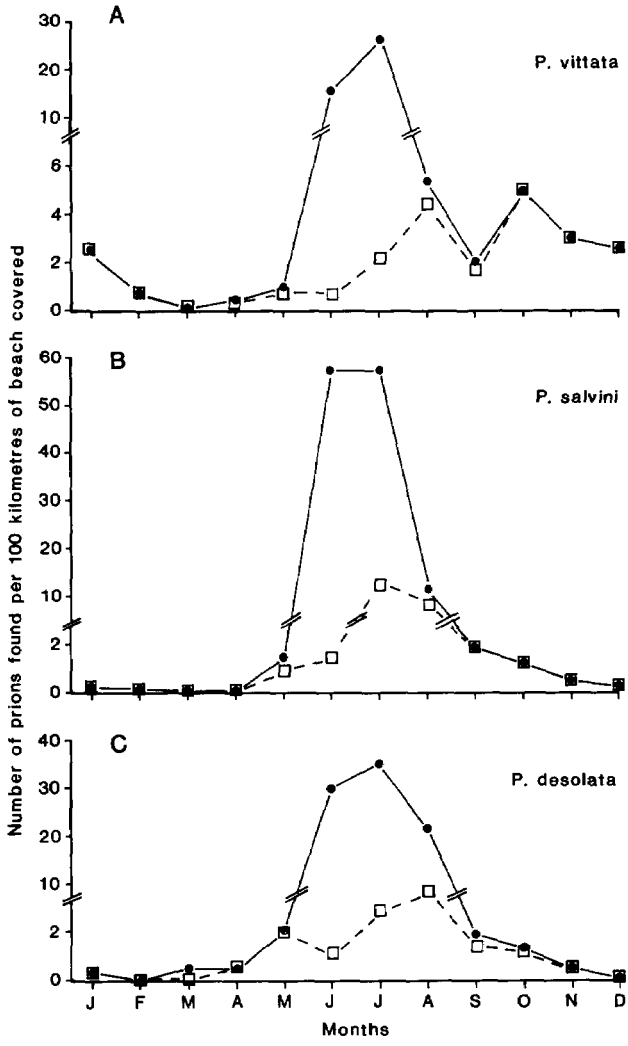

FIGURE 1 — Monthly rate of recovery (number found dead per 100 km of beach covered) of *Pachyptila vittata*, *P. salvini* and *P. desolata* during 1960-1986 (circles) and durig all but wreck years (squares).

the Tasman Sea after the breeding season (Harper 1980). Alternatively, southwest gales may force Broad-bills into the Tasman Sea from the subtropical convergence zone to the south of the Tasman Sea, as apparently happened in 1961 (M. J. Imber, pers. comm.)

The monthly rate of recovery of Broad-billed Prions changed significantly during the year ($p<0.01$; Figure 1A), being greatest in winter and least in late summer-autumn. When the data for 1961 and 1974 were deleted (years in which 500 or more *vittata* were found in any month), the monthly rate of recovery of Broad-bills still changed significantly during the year ($p<0.01$; Figure 1A). However, the period of peak mortality was then in late-winter-spring. The main cause of the wrecks in 1961 and 1974 was considered to be food shortages which left the birds with bodily reserves too low to sustain them during a subsequent period of persistent westerly winds (Bull & Boeson 1963, Veitch 1976).

SALVIN'S PRION *P. salvini*

This prion's breeding range is restricted to islands in the Southern Indian Ocean, where it nests on Marion Island and Prince Edward Island, and on East, Hog, Possession, Penguin and Apostle Islands of the Crozet Archipelago (Harper 1980, 1985; Jouventin *et al.* 1984). Salvin's Prions first return to the Crozet Islands in mid-September, laying between mid-November and early December. The young hatch in January and leave their nests after about 60 days (Jouventin *et al.* 1985). After the breeding season, this prion deserts the Crozet Islands (Jouventin *et al.* 1985), but it returns occasionally to its colonies on Marion Island (Mendelsohn 1981).

Patrollers usually find fewer than 100 Salvin's Prions annually. However, 1307 birds were recovered in 1970 and 5228 in 1974. During 1960-1986, 8148 Salvin's Prions were found at an average rate of 12.0 birds per 100 km of beach covered. The species has been found on all coasts except Wairarapa. Most Salvin's Prions were found on Auckland West beaches (21.3 birds per 100 km of coast covered) and Wellington West beaches (16.3) (Table 5). These high rates of recovery resulted from wrecks in July 1970 and June-July 1974, when 6459 (79% of the total found) were recovered.

The monthly rate of recovery of Salvin's Prion changes significantly through the year ($p<0.01$; Figure 1B). Most were found in winter. Even when the data for years in which wrecks of *salvini* occurred were deleted from the analysis (years in which 500 or more prions were found in any month: 1970, 1974), the monthly rate of recovery of Salvin's Prions changed significantly ($p<0.01$) and the period of peak mortality was still in winter (Figure 1B). Most of the *P. salvini* found on New Zealand beaches have been emaciated fledglings which had left their nests 3-4 months previously (Harper 1980)

ANTARCTIC PRION *P. desolata*

The Antarctic Prion is abundant in subantarctic waters, breeding on at least nine widely distributed archipelagoes about Antarctica (Harper 1980). In the South Atlantic Ocean it nests on the South Orkneys, South Georgia, South Sandwich Islands and Bouvet Island, and in the South Indian Ocean on Kerguelen and Heard Islands. In the New Zealand region (Southern Ocean) it nests on Macquarie Island, the Auckland Islands and Scott Island. Although these nesting islands are widely separated, their populations of Antarctic Prions have similar breeding schedules (Harper 1980). The birds at Signy Island,

South Orkneys, return in late October (Tickell 1962). Eggs are laid there mainly from mid to late December, and the young leave the burrows from mid-March to early April (Tickell 1962). The birds then disperse throughout the cooler waters of the Southern Ocean, except for the central South Pacific Ocean, where food is scarce (Harper 1985).

Generally, fewer than 50 Antarctic Prions have been found annually during the past 17 years. However, the two highest annual totals of 3186 in 1974 and 1026 in 1986 are in marked contrast to this pattern. From 1960 to 1986, 5896 prions were picked up at a rate of 8.7 birds per 100 km of beach covered. Nearly 90% of all Antarctic Prions have been found on Auckland West beaches, giving a rate of 17.8 birds found per 100 km of beach covered (Table 5).

The monthly rate of recovery of the Antarctic Prion varies significantly ($p<0.01$) and is much the same as that for Salvin's Prion, most birds being found in winter (Figure 1C). When the data for years in which wrecks of *desolata* occurred (years in which 500 or more were found in any month: 1974, 1975, 1986) were deleted from the analysis, the monthly rate of recovery still changed significantly ($p<0.01$). However, the period of peak mortality changed slightly, from June-July to August (Figure 1C).

Harper (1980) considered that most of the Antarctic Prions beach-wrecked here came from Macquarie Island and the Auckland Islands. Although the earliest records of fledgling *P. desolata* on New Zealand beaches are in mid-March (Harper 1980), very soon after leaving their burrows, most birds have been found in winter after persistent westerly winds. This suggests that the birds came from the subantarctic zone and were driven north into the Tasman Sea and on to our beaches by south or southwest gales.

NARROW-BILLED PRION *P. belcheri*

Although a few Narrow-billed Prions nest on East Islands of the Crozet Islands (Jouventin *et al.* 1984), most nest at Kerguelen Island in the Southern Indian Ocean (Harper 1985), on the Falkland Islands in the South Atlantic Ocean (Strange 1980) and on Isla Noir off southern Chile in the South Pacific Ocean (Clark *et al.* 1984). After an absence of six months, the birds return to New Island, in the Falklands, in early September and lay during the first three weeks of November. The young leave the colonies from mid-February to early March (Strange 1980). Narrow-billed Prions from southern South America disperse westward into the South Pacific, but do not reach New Zealand (Harper 1980). However, those from Kerguelen Island migrate eastward, adults being found on West Australian beaches from May to September. The younger birds travel further east and are commonly found on New Zealand beaches (Harper 1980).

In total, 5044 Narrow-billed Prions have been found by patrollers from 1960 to 1986, giving an overall rate of 7.4 birds per 100 km of beach covered. From 1970 to 1986, about 50 birds were found each year, with as few as eight in 1971 and 14 in 1977. Wrecks of Narrow-billed Prions occurred in 1974 (1326) and 1986 (1410), these being the highest annual totals. As for *P. desolata*, the majority of *P. belcheri* (82%) have been picked up from Auckland West beaches, the average being 13.9 birds per 100 km of beach covered (Table 5).

As for *P. salvini* and *P. desolata*, the majority of *P. belcheri* (92%) have been found on New Zealand beaches in winter (Figure 2A), their monthly

rate of recovery varying significantly ($p<0.01$). Similarly, when the data for years in which wrecks of *belcheri* were deleted from the analysis (years in which 500 or more *belcheri* were found in any month: 1974, 1984, 1986), the period of peak mortality still occurred in winter ($p<0.01$, Figure 2A).

FAIRY PRION *P. turtur*

The Fairy Prion has a circumpolar distribution. It breeds on Marion Island, Roche Quille near St Paul Island, the Crozet Islands, Prince Edward Island and Kerguelen Island in the South Indian Ocean, on Beauchene Island (Falklands) and Bird Island (South Georgia) in the South Atlantic Ocean, and on Tasmania and the Bass Strait Islands in the South Pacific Ocean

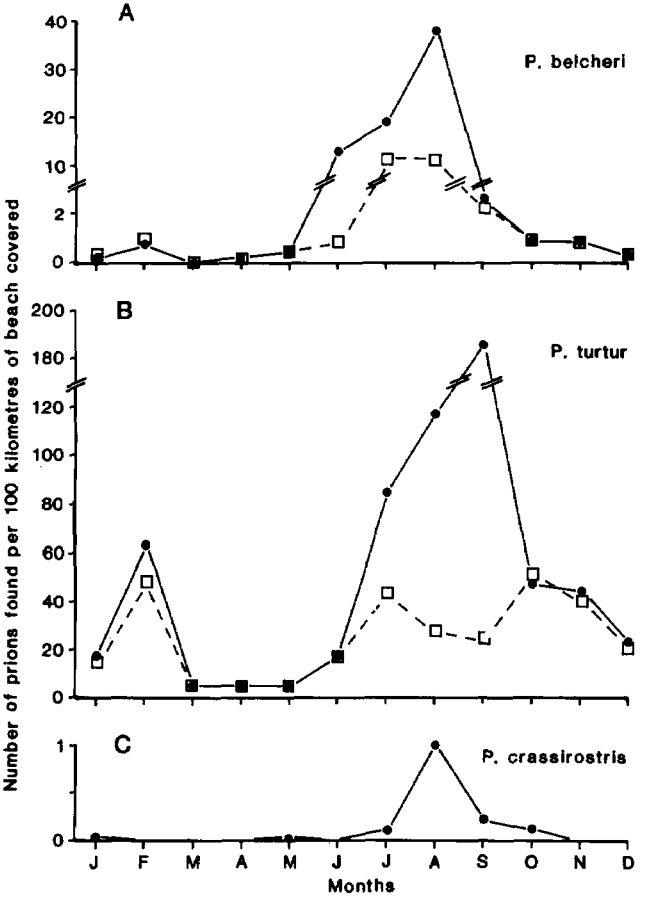

FIGURE 2 — Monthly rate of recovery (number found dead per 100 km of beach covered) of *Pachyptila belcheri*, *P. turtur* and *P. crassirostris* during 1960-86 (circles) and during all but wreck years (squares).

(Harper 1980, Prince & Croxall 1983, Jouventin *et al.* 1984, Williams 1984, J.- C. Stahl pers. comm.). In the New Zealand region it is particularly numerous, nesting on the Antipodes Islands, islets off Macquarie Island, the Snares, Chatham Islands, Poor Knights Islands, Trio Islands, Stephens Island, Brothers Islands, Motunau Island, Open Bay Island, and islets off Stewart Island, Akaroa and Otago (Harper 1985). The timing of the breeding cycle alters with latitude. For example, those on the Poor Knights Islands (35° 28'S) off Whangarei lay a fortnight earlier than those further south on Whero Island (46° 55'S) in Foveaux Strait (Harper 1980). Fledglings from the Poor Knights leave their nests in early January, whereas those from Whero Island do so in February and early March. During the non-breeding season (March-August), these birds generally remain within the New Zealand region, the largest concentrations being east of Northland and in the Cook Strait-South Taranaki Bight and Foveaux Strait areas (Harper 1985, J. A. F. Jenkins, pers. comm.).

During 1960-1986, patrollers found 37 833 Fairy Prions. Usually 500-1000 prions were picked up annually from 1970 to 1983, but in the last three years 3912, 10 929 and 4005 were found. The two highest annual totals of Fairy Prions were 10 929 in 1985 and 5118 in 1975. Nearly 90% of the Fairy Prions were picked up from Auckland West and Wellington West beaches. Overall, the average rate of recovery was 55.5 birds per 100 km of coast covered. Of the coastal regions, Auckland West (85.1 birds/100 km of coast covered) and Wellington West (84.6) had the greatest rates of recovery (Table 5).

The monthly rate of recovery of the Fairy Prion changed markedly during the year ($p<0.01$), large numbers being found in February and from July to November (Figure 2B). Even when the data for years in which wrecks of Fairy Prions occurred were deleted from the analysis (years in which 1000 or more *turtur* were found in any month: 1975, 1976, 1984, 1985, 1986), the monthly rate of recovery changed significantly through the year ($p<0.01$) and the periods of peak mortality remained the same. The February peak in recoveries coincides with the dispersal of fledglings to sea. Strong winds in late January and February kill many young prions before they can develop foraging skills and accumulate fat reserves (Harper 1985). Although many nestlings from southern localities apparently fledge after February, few beach-wrecked Fairy Prions were found in autumn (Figure 2B).

The second and greater peak in recoveries occurred over winter and spring. Rough seas and poor food supplies at this time and the depletion of fat reserves when battling persistent westerly winds probably contribute to these deaths (Harper 1985). Occasionally, such conditions result in wrecks numbering thousands of birds on North Island west coast beaches. Most of these beach-wrecked Fairy Prions are probably immatures, as has been established for a few other seabird species (Imber 1984, Harper & Fowler 1987). This is to be expected considering that only about 6% of Fairy Prion fledglings survive to adulthood (Harper 1985).

FULMAR PRION *P. crassirostris*

The Fulmar Prion is the rarest of the prion species. Populations occur at the Chatham Islands, on the Western Chain of The Snares and on the Bounty and Auckland Islands in the New Zealand region. The only other population

is on Heard Island in the South Indian Ocean (Harper 1980). The population associated with each island is not large, and the birds do not seem to disperse far from their breeding sites (Harper 1980). Information about the breeding schedule of the Fulmar Prion is sparse, but it apparently lays in mid-November and the nestlings go to sea between mid-February and mid-March (Harper 1985).

Fulmar Prions were first reported by patrollers in 1970. Since then 101 have been found, 79 of them in the last two years. Overall, the average rate of recovery has been 0.2 birds per 100 km of coast covered. The sedentary habit and rarity of this species are probably the main reasons why so few have been found. Of the coastal regions, Wellington South has had the greatest rate of recovery (0.9 birds per 100 km of coast covered) (Table 5). This recovery rate is due to 21 Fulmar Prions being found there in 1985 after two days of gale-force winds over an area extending from the Chatham Islands to much of New Zealand's east coast (Powlesland 1987).

Almost all the Fulmar Prions were recovered in the period July-October (Figure 2C), the monthly recovery rate changing significantly ($p<0.01$). Presumably, this pattern relates to the incidence of severe storms forcing some birds on to New Zealand shores.

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E & O E

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OBITUARY

C. F. PARKIN

1903-1988

Many who were lucky enough to stay on Little Barrier Island between 1943 and 1958 will remember with affection Charlie Parkin and his wife, May.

A Geordie from Sunderland, Charlie left England as a seaman-boy and fell in love with New Zealand, where he could always be near the sea. In 1932 he and May were married. During many adventures together, they rode pushbikes from Auckland to Wellington and back. (Just imagine the state of the roads at that time.) They also lived for 5 years on an old oil hulk in the Hauraki Gulf.

On Little Barrier Island Charlie and May were dedicated custodians for 15 years, waging war on the cats as best they could and steadily amassing a wealth of information about their unique island.

One of Charlie's most notable contributions to ornithology was the study of a pair of Stitchbirds at a nest which K. V. Bigwood had found. The nest was 7 metres above ground in a position awkward for photography. With the skill of a sailor-bushman, Charlie erected scaffolding without causing undue interference and built a hide on top. One of Bigwood's resulting colour photographs may be seen as plate 47 in Gordon Williams's *Birds of New Zealand* (Reed 1963). When Bigwood had to depart, Charlie carried on with the observation of the nest. Some of the photographs which he took appeared in *Notornis* 6 pp. 233-236.

King's College boys who took part in trips of exploration to Little Barrier in 1946, 1947, 1948 and 1952 happily recall the warmth of the welcome they received from the Parkins, and especially May's sumptous cooking as a change from their Spartan camp-tucker.

The Ornithological Society extends sympathy to May, who now lives at Hector, near Westport. Our precious offshore islands need resident guardians such as Charles and May Parkin.

R. B. Sibson