Numbers of waders in New Zealand 1994–2003

Ian Southey

DOC RESEARCH & DEVELOPMENT SERIES 308

Published by
Science & Technical Publishing
Department of Conservation
PO Box 10420, The Terrace
Wellington 6143, New Zealand

DOC Research & Development Series is a published record of scientific research carried out, or advice given, by Department of Conservation staff or external contractors funded by DOC. It comprises reports and short communications that are peer-reviewed.
Individual contributions to the series are first released on the departmental website in pdf form. Hardcopy is printed, bound, and distributed at regular intervals. Titles are also listed in our catalogue on the website, refer www.doc.govt.nz under *Publications*, then *Science & technical*.

ISSN 1176–8886 (hardcopy)
ISSN 1177–9306 (web PDF)
ISBN 978–0–478–14575–5 (hardcopy)
ISBN 978–0–478–14576–2 (web PDF)

This report was prepared for publication by Science & Technical Publishing; editing and layout by Amanda Todd, and distribution maps by Arawana Ltd. Publication was approved by the General Manager, Research and Development Group, Department of Conservation, Wellington, New Zealand.

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A B S T R A C T

Populations of waders, especially migratory species, tend to be in decline worldwide, and there has been concern for some time about the status of some endemic species in New Zealand. Counts of waders in estuaries throughout New Zealand were made during summer (November–December) and winter (June–July) from November 1994 to June 2003, and compared with results from the previous decade. Populations of most species that breed in New Zealand appeared to be stable or increasing, but banded dotterels (*Charadrius bicinctus bicinctus*) had clearly declined. No species of Arctic migrant appeared to have increased in number, and only eastern bar-tailed godwits (*Limosa lapponica baueri*) and pectoral sandpipers (*Calidris melanotos*) appeared to have arrived in similar numbers to the previous decade; numbers of the other species had declined, some substantially. There were disproportionate local gains and losses between sites in several species that suggest local habitat change. In winter, lesser knots (*Calidris canutus*) had become much more concentrated on Manukau Harbour and turnstones (*Arenaria interpres*) seemed to have moved away from Southland. Species that depend on a small number of sites nationally, especially wrybill (*Anarhynchus frontalis*) and lesser knot, are particularly vulnerable to changes at their wintering sites. Some declines in Arctic migrants clearly reflect problems elsewhere on their routes, but there is growing recognition internationally that impacts on non-breeding sites are critical. Consequently, recent changes to coastal environments in New Zealand are of concern.

Keywords: New Zealand, waders, count results, population trends

Southey, I. 2009: Numbers of waders in New Zealand 1994–2003. *DOC Research & Development Series 308*. Department of Conservation, Wellington. 70 p.

1. Introduction

There has been a long history of counting waders in New Zealand. Following a period of exploration and discovery during the 1940s, regular counts were established by the Ornithological Society of New Zealand (OSNZ) at a number of sites. Since 1960, counts have been undertaken twice a year (Veitch & Habraken 1999). From 1983 to 1994, OSNZ widened this work by initiating a national wader count scheme. The aims of this project were to determine the numbers and distribution of waders at coastal sites within New Zealand, and seasonal changes in the distribution and numbers of waders (Sagar et al. 1999). This project improved our knowledge of population sizes and distributions of waders, and included species that had not previously been studied in this way. It also provided an excellent baseline for assessing changes in the distribution and abundance of waders in New Zealand.

OSNZ also coordinated large-scale banding schemes on two New Zealand breeding waders—banded dotterels *Charadrius bicinctus bicinctus* (Pierce 1999) and pied stilts *Himantopus himantopus leucocephalus* (summarised in Dowding & Moore 2004)—which have considerably clarified the movement patterns of these previously understudied species and have improved the interpretation of counts. The banding of Arctic migrants (Riegen 1999) has also continued and has been integrated into a flyway-wide programme (Anon. 2001; Milton 2003). Leg flagging, another marking technique, has allowed much of the migratory pathways and staging sites along the flyway to be traced for eastern bar-tailed godwits (*Limosa lapponica bauerí*) and lesser knots (*Calidris canutus*). This has shown that those species that regularly winter in New Zealand probably undertake some of the longest and most spectacular continuous flights known (Gill et al. 2005) and has highlighted the massive energetic demands involved in preparation for and recovery from these migrations.

Worldwide, populations of wader species tend to be in decline, particularly those of the long-distance migrants (Zöckler et al. 2003). In New Zealand, there has been concern for some time about the less common endemic species, such as the wrybill (*Anarhynchus frontalis*) and New Zealand dotterel (*Charadrius obscurus*). To date, the research and management of these species, which has been coordinated by the Department of Conservation, has focused mainly on their breeding sites (Dowding & Murphy 2001). The counts made by OSNZ can be used to monitor these populations, particularly when they flock after breeding, providing an assessment of the effectiveness of this management and indicating areas of concern. For the Arctic-breeding waders, counts at their southern hemisphere wintering sites have been the primary form of population monitoring. An increased global interest in these species is now beginning to allow local trends to be placed in context with the wider populations.

In this report, the numbers and distribution of waders in New Zealand between November 1994 and June 2003 have been considered using available counts made by OSNZ. These have been compared with the results of Sagar et al. (1999) for the period November 1983 to June 1994, and an attempt has been made to discuss the trends in an ecological context.

2. Methods

This work was a continuation of Sagar et al.'s (1999) study, and essentially followed the same methodology during the period from November 1994 to June 2003. Censuses were carried out by experienced amateur ornithologists, largely at sites at which counts had previously been made. Place names for the sites counted are shown in Fig. 1. Coverage of sites in different regions was uneven over the period of this study (Table 1), as the results are from regional projects rather than a national scheme, such as was undertaken during the previous decade. Counts were not available for less common species at Farewell Spit over a 7-year period (November 1994 to November 2000), and few counts were returned from sites in the Far North and Southland regions, which are remote and have few active OSNZ members.

As far as possible, summer counts were made in November and winter counts in June or occasionally July. However, when no other data were available, counts that had been made at other times were used. The timing of these summer and winter counts matched the timing of long-running census programmes in the Firth of Thames and Manukau Harbour, and coincided with periods of relative stability in the numbers of Arctic migrants (Veitch 1999; Veitch & Habraken 1999).

To obtain reliable population estimates, all sites and habitats need to be monitored (Sagar et al. 1999). Since the participants had detailed local knowledge, the counts generally achieved this and also tracked any changes in the locations of roosts over time. In tidal areas, counts were made at high tide, when waders congregate on roosts and can be counted more easily. Experienced counters were placed at the largest roost sites, where possible, to ensure more accurate counting of the larger flocks (Underhill & Prŷs-Jones 1994). A bigger concern is the potential to miss flocks entirely (Underhill & Prŷs-Jones 1994), as birds may move between adjacent harbours to roost (Veitch & Habraken 1999). However, observers attempted to account for this by monitoring bird movements during the count period to detect departing flocks (Tony Habraken, OSNZ, pers. comm.). Longer term flock movements between sites, which especially occur with lesser knots (as detected by banding; Phil Battley, OSNZ, pers. comm.), cannot be accounted for in this way. Censuses were synchronised as much as possible to avoid missing or repeatedly counting such birds, but in some regions the pool of observers was too small to manage this entirely. Consequently, the census results are actually an index rather than a total count (Underhill & Prŷs-Jones 1994). However, by including many sites and large proportions of populations, they should give a reasonable indication of population changes over time.

An important part of this work was to compare these results with those summarised by Sagar et al. (1999) for the previous 10 years. Distributions and relative abundances over the past 20 years were compared. Differences in coverage between the two studies generally precluded comparisons of total counts for species, but where numbers for species at specific sites were given by Sagar et al. (1999) they have been compared with the results from this study. Other sites that were not mentioned by Sagar et al. (1999) but that had similar numbers of birds were also tabulated. Some sites were grouped into OSNZ regions

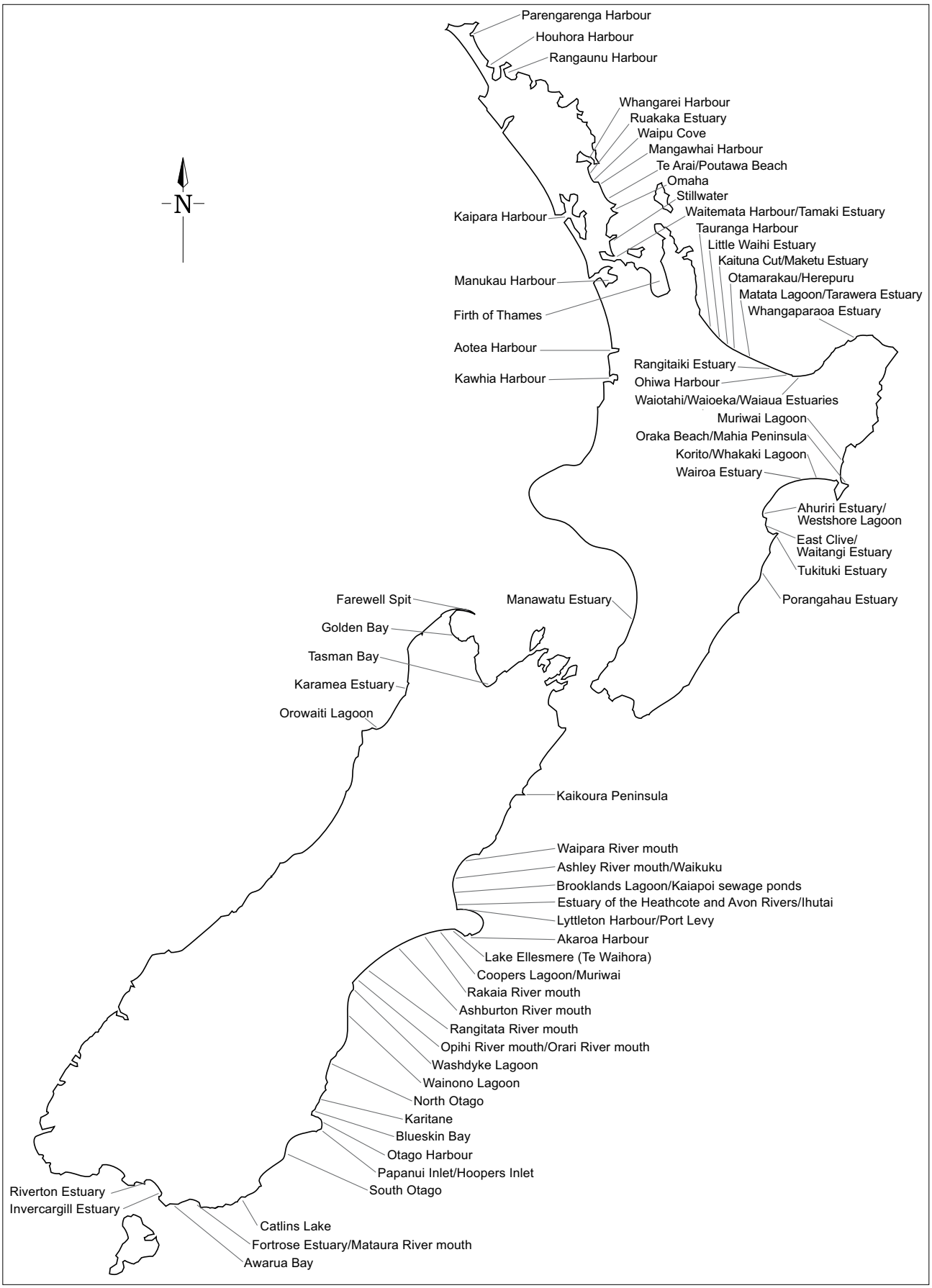

Figure 1. Locations and names of sites in New Zealand where waders were counted between November 1994 and June 2003.

TABLE 1. NUMBER OF WADER COUNTS MADE AT NEW ZEALAND SITES BETWEEN NOVEMBER 1994 AND JUNE 2003. SITES ARE LISTED BY ADMINISTRATIVE REGIONS OF THE ORNITHOLOGICAL SOCIETY OF NEW ZEALAND.

SITES COVERED	NUMBER OF COUNTS	
	WINTER	SUMMER
Far North		
Parengarenga Harbour, Houhora Harbour, Rangaunu Harbour	2	2 (1 in Jan 1996)
Northland		
Whangarei Harbour, Ruakaka Estuary, Waipu Cove	9	10
Northland/Auckland		
Kaipara Harbour	9	10
Auckland*		
Mangawhai Harbour	5	6
Omaha	1	3
Waitemata Harbour/Tamaki Estuary	4	4
Auckland/South Auckland		
Manukau Harbour	9	10
South Auckland		
Firth of Thames	9	10
Bay of Plenty*		
Tauranga Harbour, Little Waihi Estuary, Kaituna Cut/Maketu Estuary, Matata Lagoon/Tarawera Estuary, Ohiwa Harbour	6	6
Waikato		
Aotea Harbour, Kawhia Harbour	9	9
Gisborne/Wairoa		
Muriwai Lagoon, Oraka Beach/Mahia Peninsula, Korito/Whakaki Lagoon, Wairoa Estuary	8	8
Hawke's Bay		
Ahuriri Estuary, Westshore Lagoon, East Clive, Waitangi Estuary, Tukituki Estuary	8	8
Porangahau estuary	8	7
Manawatu		
Manawatu Estuary	0	1
Marlborough		
Kaikoura Peninsula	1	0
Nelson		
Farewell Spit, Golden Bay, Tasman Bay	3+5†	3+7†
Canterbury*		
Estuary of the Heathcote and Avon Rivers/Ihutai, Lyttelton Harbour, Lake Ellesmere (Te Waihora)	6	8
Mouth of the Ashley River/Rakahuri, Brooklands Lagoon, Washdyke Lagoon, mouth of the Waipara River, Wainono Lagoon (Lake Ki-Wainono)	4+	6+
Otago		
Otago Harbour, Otago Peninsula	2	1
North Otago, Blueskin Bay, South Otago, Catlins Lake	1	1
West Coast		
Karamea Estuary, Orawaiti Lagoon	1	1
Southland		
Invercargill Estuary, Awarua Bay	2	2 (1 in Feb 1996)
Fortrose Estuary	1	1
Riverton Estuary/Aparima	0	1 (in Feb 1996)

* 4–13 smaller sites not always regularly counted.

† Part counts.

(Table 1) to show differences in the way counts changed between seasons in different parts of the country. Differences between counts were analysed using *t*-tests computed for samples with unequal variances (Kaps & Lamberson 2004).

Population estimates were made for the more common species. These were calculated using counts from all sites during the non-breeding season (winter for New Zealand breeding species and summer for Arctic migrants). To do this, missing counts were replaced with the site average for those counts that were taken during this 10-year period, following Sagar et al. (1999). Population trends between the 1994–2003 and 1983–1994 periods have been presented as the percentage change since the original count (i.e. the difference between the two counts divided by the initial count for specific site averages or summed site averages). Comparisons between summer and winter counts are simply proportions, usually of the overall site averages, expressed as percentages.

For each species, count data are presented for the sites where it was most abundant and a distribution map is given for the season in which it was most abundant; the only exceptions to this are spur-winged plover and black-fronted dotterel, which were poorly monitored by these counts. For some species, maps are also given for the alternate season to illustrate seasonal changes in distribution.

3. Results

3.1 COVERAGE

In total, 39 species of waders and two categories of hybrids were recorded in these counts (listed in Appendix 1), although many of these were uncommon. Most species of the more common waders were concentrated at relatively few sites during their non-breeding season, and good coverage was achieved for most of these sites. Complete series of counts were obtained from Kaipara, Manukau and Whangarei Harbours, the Firth of Thames, and, for the more common species, Farewell Spit, allowing population trends of these species to be monitored. The only possible exception was turnstones (*Arenaria interpres*), which have important sites in the more remote Far North and Southland regions, where they were counted twice only. Variable oystercatchers (*Haematopus unicolor*) and New Zealand dotterels were not very well covered because they are widely dispersed, with localised populations that may vary independently (Dowding & Chamberlin 1991).

3.2 EFFECTIVENESS

There has been no replication and little checking of the accuracy of census counts of waders in New Zealand, and concerns about count accuracy have been expressed (Riegen & Dowding 2003). During 3 years of the period of this project, there was a national wrybill census in addition to the counts reported here (Riegen & Dowding 2003). In 2 of the 3 years, the differences between counts were small, and all of the mid-points were close to the 10-year count average for this period (Table 2). A census of the northern New Zealand dotterel in October 2004 showed a 13% increase since 1996 at sites counted on both occasions (John Dowding, OSNZ, pers. comm.). Even though no more than a quarter of that number of birds was counted between 1994 and 2003, a similar level of increase (10%) was detected by these counts over a similar time period. While some individual counts may deviate, there is reason to believe that most counts generally do reflect population sizes reasonably well and certainly should indicate trends over several years.

TABLE 2. COMPARISON OF WRYBILL (*Anarhynchus frontalis*) COUNTS UNDERTAKEN BY THE ORNITHOLOGICAL SOCIETY OF NEW ZEALAND (OSNZ) AND THE NATIONAL WRYBILL CENSUS (RIEGEN & DOWDING 2003).

YEAR	OSNZ COUNT	NATIONAL WRYBILL CENSUS	DIFFERENCE
1994*	4197	5111	+22%
2001	4409	4143	–6%
2002	4372	4650	+6%

* Taken from Sagar et al. (1999).

TABLE 3. SUMMARY OF COUNTS AND POPULATION ESTIMATES OF WADER SPECIES BREEDING IN NEW ZEALAND BETWEEN NOVEMBER 1994 AND JUNE 2003.
Population estimates were derived from the winter counts and cover only those sites from which at least one count was returned (SEM = standard error of the mean). Population estimates for 1983–1994 are from Sagar et al. (1999). Separate estimates are made for the North Island (NI) and South Island (SI) populations of the New Zealand dotterel.

SPECIES	MEASURE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	MEAN	SEM	ESTIMATE 1983–1994
Pied oystercatcher	Winter count		92387	85821	78789	102001	89622	77153	72999	62338	89939	83450	3955	
	Summer count	17998	18768	19872	24926	15723	17695	16505	14026	10132	15480	17113	1228	
	Population estimate		100131	92853	80164	110060	93383	81587	83537	73481	96253	90161	3811	112675
Pied stilt	Winter count		19591	18811	21648	13756	13486	15286	14542	8892	18079	16010	1299	
	Summer count	5528	2743	5956	5869	2383	5203	4860	4304	4029	2949	4382	419	
	Population estimate		20110	21441	22000	17343	15719	18541	20837	14409	22008	19156	937	27906
Banded dotterel	Winter count		6220	6296	5357	2990	4835	5304	3034	2759	4121	4546	460	
	Summer count	749	335	1371	915	178	603	748	643	431	161	613	116	
	Population estimate		7335	6960	5551	5083	5437	5984	5852	5491	5406	5900	253	10843
Wrybill	Winter count		3483	4245	5066	4558	5005	3459	4409	4372	5732	4481	244	
	Summer count	114	73	235	195	164	189	57	459	135	150	177	36	
	Population estimate		3618	4641	5201	4793	5229	3853	4771	4798	6018	4769	240	3880
Variable oystercatcher	Winter count		1513	875	1434	1141	1572	1965	1039	1034	1378	1328	113	
	Summer count	1176	414	942	1110	1093	1064	785	1027	1218	1262	1009	79	
	Population estimate		1780	1741	1672	1829	2087	2540	2126	2110	2358	2027	99	3413
Spur-winged plover	Winter count		1005	1592	2216	834	737	941	571	856	1104	1095	169	
	Summer count	625	802	686	751	592	596	547	517	492	664	627	32	
	Population estimate		1211	1684	2294	1088	924	1352	1338	1544	1711	1461	136	
New Zealand dotterel	Winter count		369	248	318	253	433	333	271	334	347	323	20	
	Summer count	224	128	210	261	253	263	200	266	279	186	227	15	
	Population estimate NI		487	416	409	396	503	418	440	517	515	456	16	944
	Population estimate SI		24	20	27	24	24	24	24	25	25	24	1	26
Black-fronted dotterel	Winter count		34	214	11	48	40	102	0	3	91	60	23	
	Summer count	6	17	5	10	1	10	17	2	5	6	8	2	
	Population estimate		34	214	11	52	40	103	68	68	93	76	20	321
Black stilt and hybrids	Winter count		32	27	25	21	14	21	25	10	14	21	2	
	Summer count	1	1	1	3	0	3	1	11	1	6	3	1	
	Population estimate		33	27	25	24	15	22	30	15	17	23	2	68

3.3 NEW ZEALAND BREEDING WADERS

Counts and population estimates for each New Zealand breeding wader species are summarised in Table 3.

3.3.1 Pied oystercatcher (*Haematopus ostralegus finschi*)

In winter, between 62 338 and 102 001 pied oystercatchers (*Haematopus ostralegus finschi*) were counted (Table 3; Fig. 2). The average winter count, 83 450, is a little higher than the 83 017 recorded by Sagar et al. (1999), and comparison of specific sites shows an estimated 14% increase overall. Based on winter counts, the most important harbours are Manukau Harbour, the Firth of Thames and Kaipara Harbour (Table 4; Fig. 2). These are the same sites as reported by Sagar et al. (1999), but each had higher average counts in this study. At other important sites (Farewell Spit, Golden Bay, Tasman Bay and the Estuary of the Heathcote and Avon Rivers/Ihutai), however, numbers have declined or stabilised (Table 4), and there has been no definite overall increase during the period of this study (Fig. 3).

Summer counts were typically much lower than winter counts, with between 10 132 and 24 926 birds counted (21% of the winter total) (Fig. 4). The summer population consisted mainly of non-breeding birds. The degree of change in numbers between seasons varied along the country (Table 4). The biggest differences were in the harbours from the Auckland isthmus to Whangarei (17%), and the smallest differences were in the Canterbury and Otago regions (38%). In the Southland region, the seasonal trend was reversed, with more birds (363%) being counted at coastal sites in summer than in winter.

TABLE 4. TEN-YEAR AVERAGES OF PIED OYSTERCATCHER (*Haematopus ostralegus finschi*) COUNTS.
Data are presented for New Zealand sites where more than 2000 birds on average were counted in winter between 1995 and 2003, or that had comparative data in Sagar et al. (1999) and other counts mentioned in the text. Winter counts are compared with those from the previous decade (Sagar et al. 1999); *=$P<0.05$. n=the number of counts from which the average was calculated, SEM = standard error.

SITE	SUMMER 1994–2003			WINTER 1995–2003			WINTER 1983–1994		
	COUNT	SEM	*n*	COUNT	SEM	*n*	COUNT	SEM	*n*
Manukau Harbour	4296	514	10	29334	1938	10	25707*	3501	11
Firth of Thames	3555	767	10	17834	2174	10	12618*	3414	11
Kaipara Harbour	2950	706	10	17794	2302	10	13554*	3910	9
Farewell Spit	1632	253	10	5855	1410	10	7443*	1363	11
Estuary of the Heathcote and Avon Rivers/Ihutai	175	80	8	3284	202	6	3006	646	11
Kawhia Harbour	461	353	9	2485	281	9			
Tasman Bay	751	80	10	1747	388	8	2304*	518	11
Golden Bay	571	202	10	1513	111	8	3052*	1393	8
Whangarei Harbour	218	57	10	1362	229	9			
Canterbury region	1210	202	8	4190	250	6			
Otago region	1154		1	1989	713	1			
Southland region	3409	335	2	939	587	2			

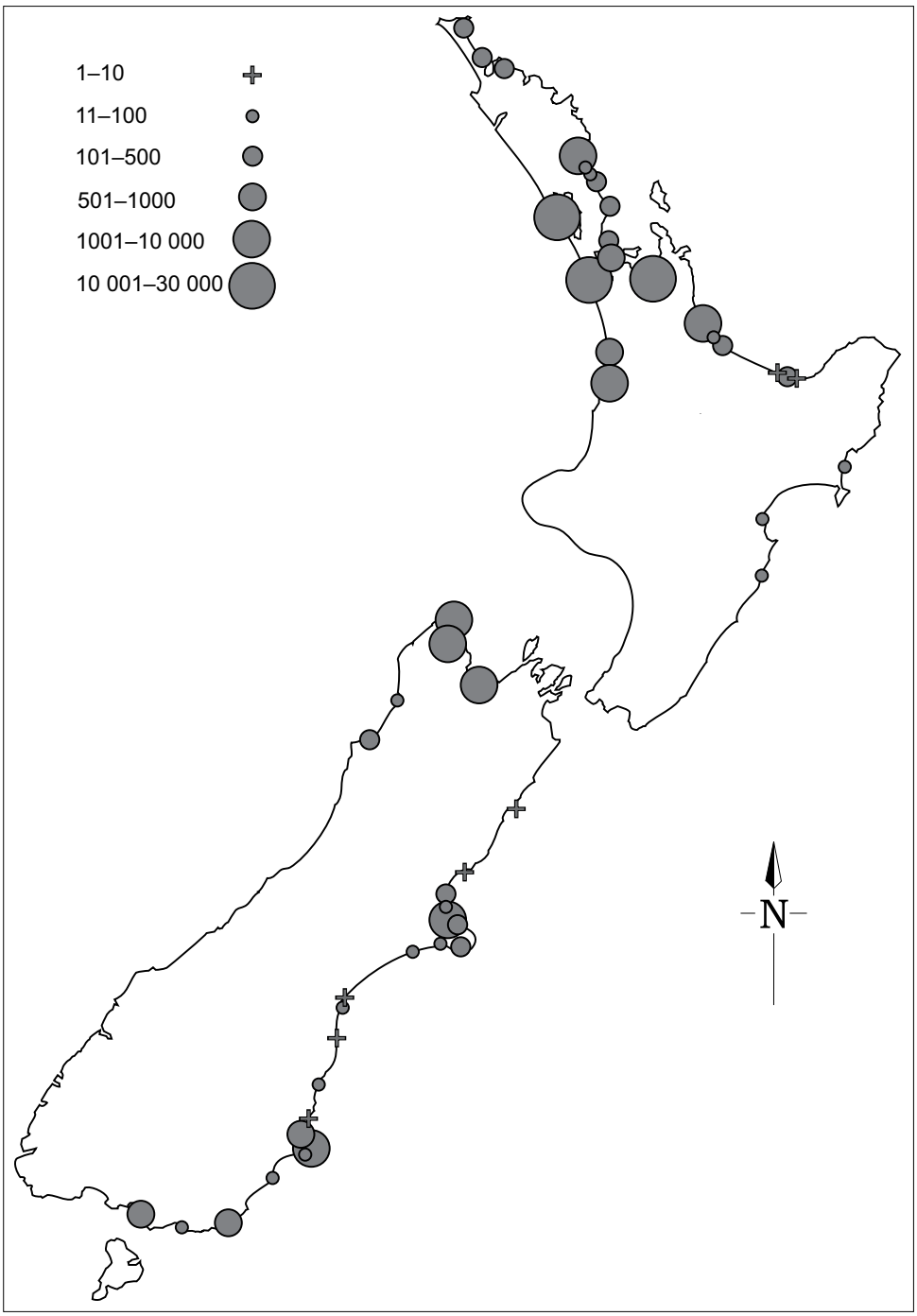

Figure 2. The distribution and abundance of pied oystercatchers (*Haematopus ostralegus finschi*) in New Zealand during winter between 1995 and 2003. Only sites with at least one bird, on average, are shown.

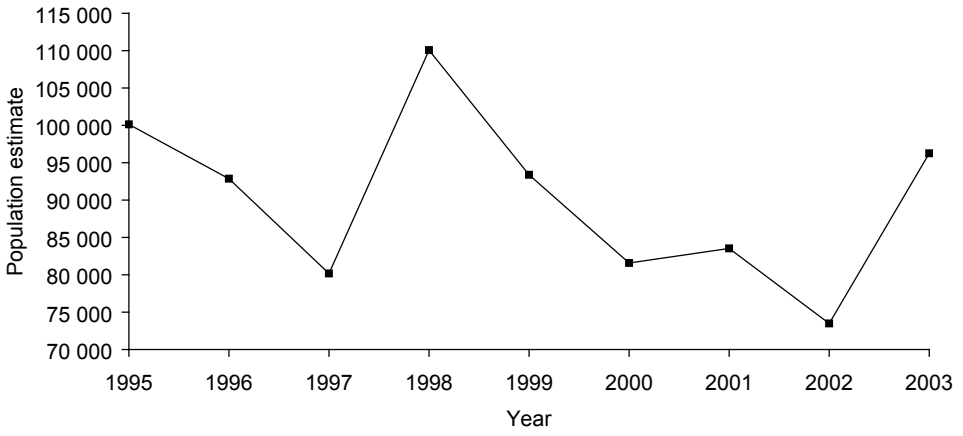

Figure 3. Population estimates for the pied oystercatcher (*Haematopus ostralegus finschi*) in New Zealand during winter between 1995 and 2003.

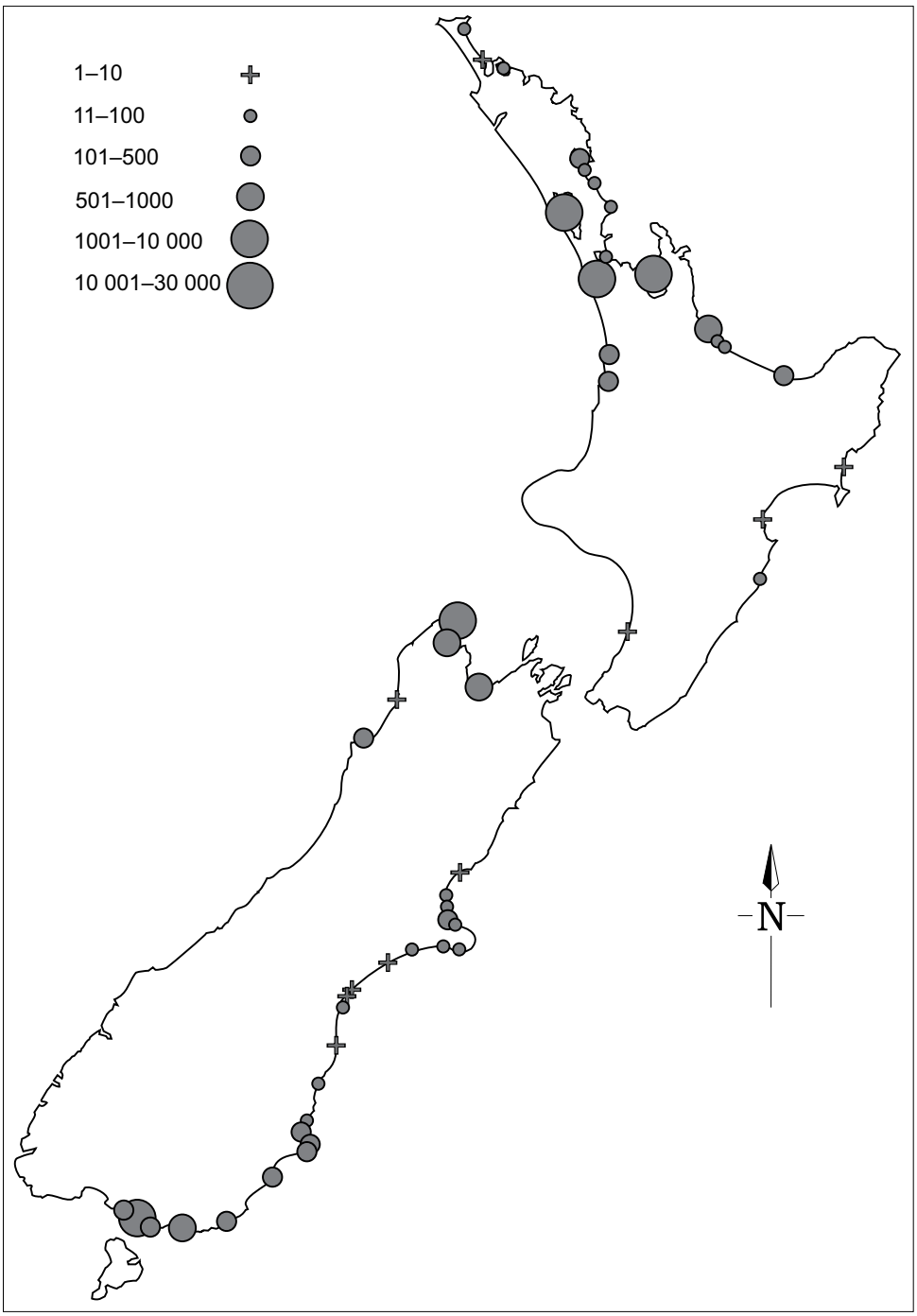

Figure 4. The distribution and abundance of pied oystercatchers (*Haematopus ostralegus finschi*) in New Zealand during summer between 1994 and 2003. Only sites with more than one bird, on average, are shown.

3.3.2 Pied stilt (*Himantopus himantopus leucocephalus*)

The winter counts of pied stilts (*Himantopus himantopus leucocephalus*) ranged from 8892 to 21 648 birds (Table 3; Fig. 5). The average total count of 16 010 birds is a little lower than that of the previous decade (Sagar et al. 1999), but numbers at most significant sites increased by 22% overall (Table 5). The low counts at Farewell Spit and Golden Bay, even in winter (Table 5), seem remarkable given the high numbers of other species at these sites. Many pied stilts live inland and are essentially sedentary, particularly in the northern North Island. Therefore, they may not be well monitored by these counts, as the numbers frequenting the coast may depend on whether rainfall or drought are affecting feeding habitats inland (Veitch 1999).

Over summer, 2383–5956 birds (average 4382) remained at the count sites (Fig. 6). Across all sites, this is about 30% of the winter population. There were, however, marked local differences between sites in the proportions recorded (Table 5). Counts of southern populations (Lake Ellesmere (Te Waihora), and the Otago and Southland regions) were actually higher (167%) over the summer, whereas in the harbours of the Auckland isthmus, summer counts were substantially lower (15%) than winter counts.

TABLE 5. TEN-YEAR AVERAGES OF PIED STILT (*Himantopus himantopus leucocephalus*) COUNTS.
Data are presented for New Zealand sites where more than 300 birds on average were counted in winter between 1995 and 2003, or that had comparative data in Sagar et al. (1999) and other counts mentioned in the text. Winter counts are compared with those from the previous decade (Sagar et al. 1999); * = $P < 0.05$. *n* = the number of counts from which the average was calculated, SEM = standard error.

SITE	SUMMER 1994–2003			WINTER 1995–2003			WINTER 1983–1994		
	COUNT	SEM	*n*	COUNT	SEM	*n*	COUNT	SEM	*n*
Manukau Harbour	681	79	10	3981	376	9	3348*	256	11
Firth of Thames	611	111	10	3908	376	9	3452*	347	11
Kaipara Harbour	404	47	10	3591	401	9	2651*	304	10
Parengarenga Harbour	37	37	3	1078	217	3	688	55	8
Ahuriri Estuary	178	63	8	853	183	8	605*	99	11
Lake Ellesmere (Te Waihora)	1202	272	8	683	157	6	548*	66	11
Whangarei Harbour	119	38	10	422	72	9	418	55	9
Tauranga Harbour	32	8	6	357	90	6	441	69	11
Golden Bay	1	1	8	71	7	8			
Farewell Spit	6	2	10	29	7	9			
Otago region	484	0	1	300	52	2			
Southland region	276	91	2	194	76	2			

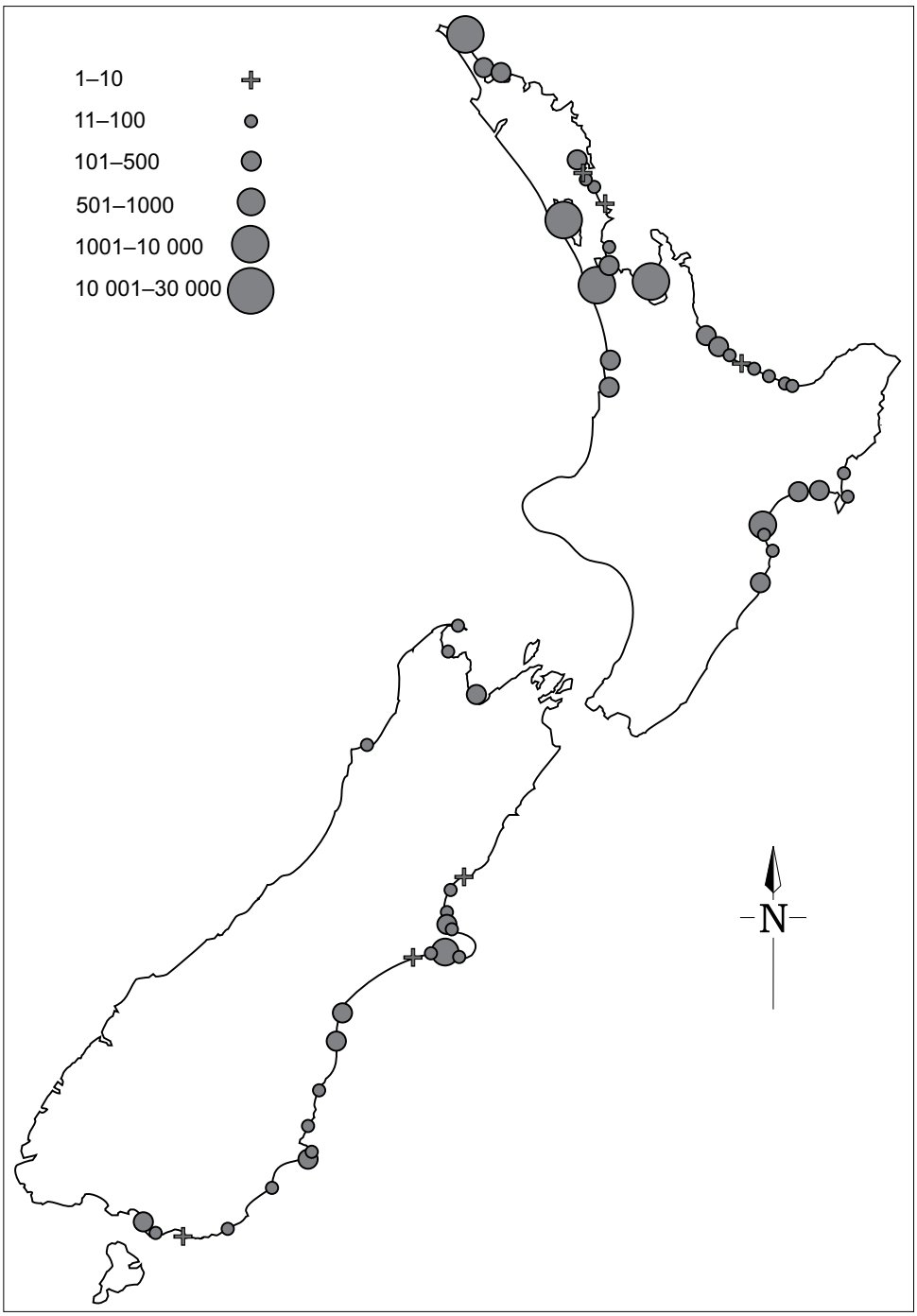

Figure 5. The distribution and abundance of pied stilts (*Himantopus himantopus leucocephalus*) in New Zealand during winter between 1994 and 2003. Only sites with more than one bird, on average, are shown.

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