

Distribution and numbers of waders in New Zealand, 2005–2019

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Abstract: The results of biannual national wader counts done during winter (June–July) and early summer (November–December) by the Ornithological Society of New Zealand (OSNZ)/Birds New Zealand from 2005 to 2019 are compared with similar counts done in 1983 to 1994. Although the national wader counts continued 1995–2004 the coverage was insufficient to enable comparable analyses; however, reference is made to some sites that were counted continuously since 1983. At least 1,567 counts at 74 sites nationally resulted in 3,977,228 waders of 39 species being counted. The numbers of most species have declined since the 1983–1994 surveys, particularly evident in the northern hemisphere migrants, with the numbers of some species down by 50% or more. Such changes in numbers are likely to be a true reflection of the declining populations rather than changes in the counting effort. Some native species are faring better, mostly as a result of numerous community-led wader protection projects for northern New Zealand dotterels (*Charadrius obscurus aquilonius*) and variable oystercatchers (*Haematopus unicolor*).

Riegen, A.C.; Sagar, P.M. 2020. Distribution and numbers of waders in New Zealand, 2005–2019. *Notornis* 67(4): 591–634.

Keywords: Charadriiformes, census, sandpiper, plover, dotterel, oystercatcher, population trend

INTRODUCTION

Coastal tidal flats are under increasing pressure globally from human-induced development, habitat loss, and pollution; no more so than on the East Asian-Australasian Flyway (EAAF) where, since the early 1980s, approximately 65% of estuarine and tidal flat habitat in the Yellow and Bohai Seas between China and the Korean Peninsula have been lost to development (Murray

et al. 2015). These East Asian tidal flats along with those in Japan are essential for many Arctic and sub-Arctic breeding waders on the EAAF, such as the bar-tailed godwit (*Limosa lapponica*) and red knot (*Calidris canutus*). Although there is now some monitoring of waders in those countries on an annual basis, estimating population sizes at those sites is difficult because factors including turnover rates (the rate at which birds arrive and depart on migration) need to be considered. Therefore, it is more useful to monitor numbers of waders during the non-breeding season at sites where

Received 4 July 2019; accepted 6 September 2020

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they regularly gather such as the harbours and estuaries of New Zealand and Australia. Significant population declines have occurred in most Arctic and sub-Arctic breeding wader species (Studds *et al.* 2017) and these are reflected in the New Zealand counts. New Zealand breeding waders have in most cases also suffered declines, the causes of which are not yet fully understood, but nest predation, habitat modification, and human disturbance are all significant in these losses (Dowding & Murphy 1993).

In New Zealand, the National Wader Count project was initiated in 1983 and continues to be conducted with the aim of monitoring the long-term trends in wader populations, rather than total numbers. The counts are biannual with winter counts (June–July) targeting overwintering northern hemisphere migrants and NZ-breeding species that have moved to coastal areas, and summer counts (November–December) which target northern hemisphere migrants and non-breeding native species. The results of the nationwide counts conducted 1983–1994 were reported by Sagar *et al.* (1999) and patchy counts 1994–2003 by Southey (2009). The 2004 counts were not completed nationwide; therefore, data from that year are not included in this analysis, but for the sake of completeness are included in Appendices 3 & 4. The 1983–2019 data have been used to update population estimates, in environmental impact assessments, Environment Court cases, and by those undertaking research at a range of levels.

Here we present an analysis of the numbers and distribution of waders in New Zealand during the period 2005–2019 and compare them with those for the period 1983–1994. For some locations, data obtained back to 1960 have also been included where appropriate.

STUDY AREA

There are at least 300 estuaries around the coast of New Zealand and its offshore islands (McLay 1976). Many are little more than rivermouths covering just a few hectares but there are also very large tidal harbours, such as the Kaipara Harbour at 947 km² and Manukau Harbour at 394 km². Whilst most major sites were counted biannually, some smaller estuaries were counted only occasionally. Sites that were counted on at least two occasions between 2005 and 2019 are shown in Figures 1 & 2 and Appendices 1 & 2. Chatham Islands are shown but only one count was received from there (winter 2007). Fewer sites were counted during 2005–2019 than during the earlier period, but most sites not counted were those that held very few waders in 1983–1994. Incidental counts from some of those

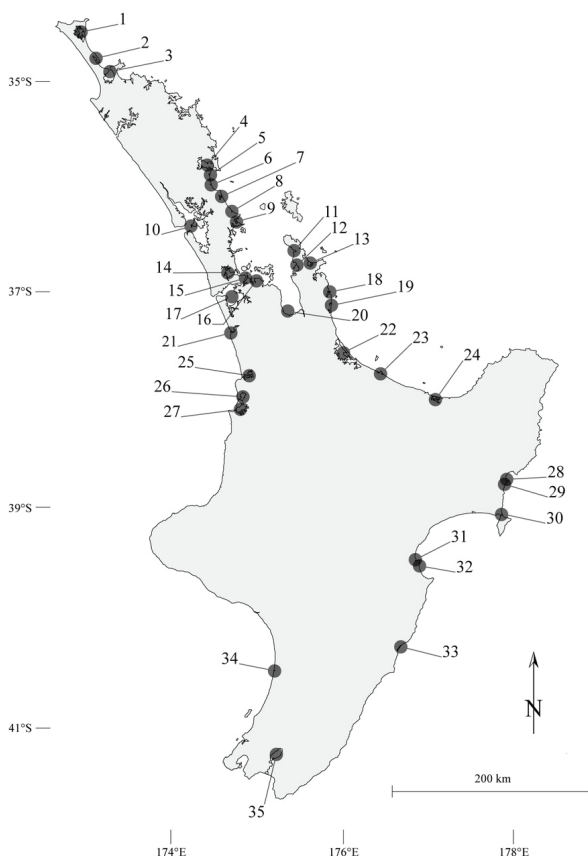


Figure 1. North Island wader sites counted on two or more occasions during wader count surveys 2005–2019. 1. Parengarenga Harbour, 2. Houhora Harbour, 3. Rangaunu Harbour, 4. Whangarei Harbour, 5. Ruakaka Estuary, 6. Waipu Estuary, 7. Mangawhai Estuary, 8. Te Arai Canal, 9. Whangateau Estuary, 10. Kaipara Harbour, 11. Colville Harbour, 12. Coromandel Harbour, 13. Whangapoua Harbour, 14. Waitemata Harbour, 15. Tamaki Estuary, 16. Manukau Harbour, 17. Clifton Rd - Whitford, 18. Tairua Harbour, 19. Opoutere Sandspit, 20. Firth of Thames, 21. Port Waikato, 22. Tauranga Harbour, 23. Maketu-Little Waihi Estuary, 24. Ohiwa Harbour, 25. Raglan Harbour, 26. Aotea Harbour, 27. Kawhia Harbour, 28. Waupoua Rivermouth, 29. Wherowhero Lagoon, 30. Mahia - Maungawhio, 31. Ahuriri Estuary, 32. Waitangi Estuary, 33. Porangahau Estuary, 34. Manawatu Estuary, 35. Lake Wairarapa.

sites recorded in *eBird* are outside the scope of this analysis. The main harbours and count sites are shown in Figures 1 & 2 but as many as 30 individual roost sites may be counted within a single harbour or estuary. Counts were made at over 300 different roost sites on a regular basis.

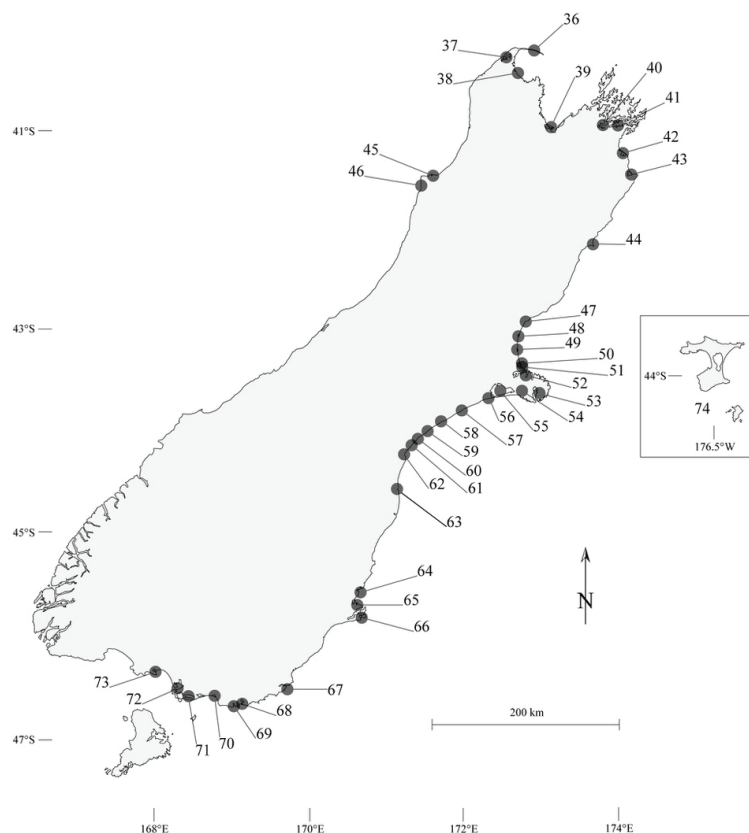


Figure 2. South Island wader sites counted on two or more occasions during wader count surveys 2005–2019. 36. Farewell Spit, 37. Westhaven Inlet, 38. Golden Bay, 39. Tasman Bay, 40. Pelorus Sound, 41. Queen Charlotte Sound, 42. Wairau Lagoon, 43. Lake Grassmere, 44. Kaikoura Peninsula, 45. Orowaiti Estuary, 46. Okari Estuary, 47. Waipara Estuary, 48. Ashley Estuary, 49. Waimakariri & Brooklands Lagoon, 50. Travis Wetland, 51. Avon-Heathcote Estuary, 52. Lyttelton Harbour, 53. Banks Peninsula, 54. Lake Forsyth, 55. Lake Ellesmere, 56. Coopers Lagoon, 57. Rakaia Rivermouth, 58. Ashburton Rivermouth, 59. Rangitata Rivermouth, 60. Spider Lagoon, 61. Opihi Rivermouth, 62. Washdyke Lagoon, 63. Lake Ki-Wainono, 64. Karitane, 65. Blueskin Bay, 66. Otago Harbour & Peninsula, 67. Catlins Lake Estuary, 68. Waikawa Harbour, 69. Haldane Estuary, 70. Fortrose Toetoes Estuary, 71. Awarua Bay, 72. New River Estuary, 73. Riverton, 74. Chatham Islands 800km east of Christchurch (52).

METHODS

Most counts were done during June–July (winter) and November–December (summer) each year 2005–2019 with the major wader sites of Whangarei Harbour, Kaipara Harbour, Manukau Harbour, Firth of Thames, Farewell Spit, Tasman Bay and

Golden Bay counted biannually from 2000, and some of these earlier results are also presented here. In addition, biannual wader counts at Manukau Harbour and Firth of Thames have been completed since 1960 and some of those results are also presented here.

The primary objective of the summer counts was to record the migratory non-breeding northern hemisphere waders, particularly bar-tailed godwit, red knot, and ruddy turnstone (*Arenaria interpres*) rather than look for rare vagrants. Not all migrants may be back in New Zealand by the count dates in November–December and some regions, in particular Nelson, also counted waders in January–February, when numbers were generally higher (Schuckard *et al.* 2020). Attempts were made to count all sites in both November and January in the mid-2000s, but this was not sustained in most areas. The Auckland regional sites of Manukau Harbour, Kaipara Harbour, and Firth of Thames were counted by up to 20 people on one day at each site. It was difficult getting sufficient people to undertake the counts during the January–February holiday period, and so those regions now only undertake the November–December counts.

The objective of the winter counts was to record New Zealand native waders, in particular South Island pied oystercatcher (*Haematopus finschi*), pied stilt (*Himantopus himantopus*), banded dotterel (*Charadrius bicinctus*), and wrybill (*Anarhynchus frontalis*), which generally gather in coastal areas during the non-breeding season. Overwintering northern hemisphere waders, which at that time of year are usually young (immature) birds, were also targeted.

The Ornithological Society of New Zealand (OSNZ), also known as Birds New Zealand, undertook the first biannual nationwide wader survey 1983–1994 with the results published in the special Wader Studies in New Zealand issue of *Notornis* in 1999 (Sagar *et al.* 1999). After 1994, some coastal OSNZ regions ceased counting waders on a regular basis whilst others continued their winter and summer counts each year. After several years, some regions that had stopped counting resumed, but it was not until 2005 that consistent national coverage resumed at most of the larger coastal wader sites. Some areas, particularly in the Far North, were not always covered well, due to limited personnel and logistical difficulties.

The counts, undertaken by teams consisting of experienced volunteer observers, were organised by regional coordinators and synchronised to minimise errors resulting from movements of birds between roost sites during a single high tide census. Counts were carried out over a range of dates within the specified months when regional organisers deemed the tide heights and time to be the most suitable. Organisers ensured that as many sites as possible were counted on the same day. A number of factors, including insufficient observers, unsuitable tides, or unsuitable weather resulted in not all sites within a region being counted on one day. Counts at a particular estuary or harbour were completed in one day where at all possible to minimise the risk of over-counting or under-counting birds that had moved.

In tidal areas, counts were made on the incoming tide and up to the predicted high tide, when waders congregate at known roosts and where they can be more easily counted. Most of the major wader roosts around New Zealand are now well known, with many sites being visited regularly throughout the year by birders, enabling organisers to make changes to the count sites when necessary.

Counts were returned to the regional organisers, who collated them before forwarding the totals to the national coordinator. Brief summaries of the annual counts were published in Birds New Zealand magazine but without any analysis. There are differences between observers in their ability to count and identify waders and this will have caused some errors in determining species totals; however,

analysis involving many sites combined should be much more robust than analysis of count data from individual sites (Hill *et al.* 1993). The same people counted many of the sites each year, so they not only knew the sites well, but their counting should have been consistent. Standardisation of counts is not possible due to the differences between roost sites and no correction factors have been included.

Observers were asked to concentrate on counting key wader species rather than searching for rarities, so some rare species may have been overlooked during censuses. Counts of rarities are of little global significance for those species. Some species were not counted comprehensively because they also occur in areas other than regular wader roost sites or are dispersed along coastlines. Species particularly affected were New Zealand dotterel, banded dotterel, wrybill (during the breeding season only), spur-winged plover (*Vanellus miles*), pied stilt, black stilt (*Himantopus novaezelandiae*), and variable oystercatcher (*Haematopus unicolor*). New Zealand dotterel post-breeding flock site counts were undertaken in a separate study, which provided a better indication of their numbers and trends (Dowding 2020).

All data quoted from the 1983–1994 surveys are from Sagar *et al.* (1999) and nomenclature follows Gill *et al.* (2010) (Appendix 5).

Where population estimates are shown they were calculated as the sum of the mean counts at all sites visited between 2005 and 2019.

RESULTS & DISCUSSION

Effort

During the 15 years of this study, waders were counted at hundreds of roost sites at a total of 71 regional sites in winter and 72 in summer. Of the 71 winter regional sites, 19 were counted 15 times, 29 were counted 10–14 times, 22 were counted 2–9 times, and one was counted once. Of the 72 summer regional sites, 19 were counted 15 times, 31 were counted 10–14 times, and 22 were counted 2–9 times in the 15 years. Appendices 1 & 2 show the distribution of these sites listed from north to south within Birds New Zealand regions.

Total number of waders

New Zealand breeding species

1. South Island pied oystercatcher (SIPO; *Haematopus finschi*)

SIPO breed inland in the South Island although some have bred on a few riverbeds of Hawke's Bay since the 1980s (Sagar 2013). From late December they leave the breeding grounds and move to the coasts (Fig. 3) with the majority migrating northwards (Sagar *et al.* 1999). Winter counts ranged

Table 1. Sites where a mean of >2,000 South Island pied oystercatcher were counted in winter and >500 in summer 2005–2019; N/A = not available.

Site	No. Counts	Mean	SD	Range	Mean 1983–1994
Winter					
Manukau Harbour	15	23,762	4,013	15,926–32,807	25,707
Kaipara Harbour	15	16,725	3,932	9,666–26,215	13,554
Firth of Thames	15	8,393	2,574	5,078–14,503	12,618
Farewell Spit	15	6,140	1,660	4,077–10,249	7,443
Golden Bay	15	4,546	2,116	1,538–8,308	3,052
Tasman Bay	15	3,947	1,252	1,285–6,091	N/A
Kawhia Harbour	15	2,717	983	1,422–5,233	N/A
Avon-Heathcote Estuary	14	2,567	922	1,359–4,726	3,006
Summer					
Manukau Harbour	15	3,912	1,198	1,487–5,545	N/A
Kaipara Harbour	15	3,404	1,301	2,260–6,981	N/A
Golden Bay	15	1,881	652	1,167–3,553	N/A
Firth of Thames	15	1,441	539	873–3,025	N/A
Farewell Spit	15	1,420	309	1,062–1,948	N/A
Tasman Bay	15	961	330	558–1,594	N/A
Avon-Heathcote Estuary	14	790	330	475–1,048	N/A
Kawhia Harbour	15	601	219	162–1,025	N/A

from 62,392 (2013) to 90,012 (2007), and averaged 77,095. Numbers nationally have been declining in recent years with 2011 being the last winter count of over 80,000 (Table 2). Over the survey period 74% on average were counted in the North Island and 64% (48,880) of the national total were in Auckland's three key sites of Kaipara Harbour, Manukau Harbour, and the Firth of Thames, with the Manukau Harbour holding the largest number in all but three years (Table 1). During the 1983–1994 period the average North Island winter count was 71% of the national total, slightly lower than the current figure.

The SIPO population increased spectacularly after 1940 when they became fully protected and much South Island tussockland was converted to pasture, mainly for sheep, and this created large areas of suitable breeding habitat (Heather & Robertson 2015). The estimated population in 1970–71 was 49,000 (Baker 1973) and by 1994 the estimated population was over 112,000 (Sagar *et al.* 1999). Oystercatchers will breed in sheep pasture but in recent years much of this land in Canterbury and Southland has been converted to dairy pasture where it is more difficult for them to breed successfully (Sagar *et al.* 2000). This has probably contributed to the decline in recent years, but they

remain New Zealand's most numerous resident wader.

The decline since the 1983–1994 survey has been noticeable at some key winter sites particularly Manukau Harbour and Firth of Thames, but with an increased number on the Kaipara Harbour (Table 1 shows some figures from 1983–94 for comparison). However, there has been much better coverage of the Kaipara Harbour during the current survey period than during 1983–1994, with more roosts detected and counted regularly and this may have a bearing on the results. The Manukau Harbour and Firth of Thames have been counted more consistently since 1960 and showed rapid increases between 1960 and the mid 1990s, with an easing in numbers since then (Fig. 4). The overall trend nationally since 2005 shows a decline of 1.2% per year (Fig. 5). The summer average was around 17,000 SIPO remaining on estuarine habitats (Table 2). These are predominantly birds aged 1–3 years old, with Auckland's three key harbours holding on average 53% of the national total. Based on the winter count figures from the 71 regional sites but excluding small sites for which data were not available, we estimate the national population in 2019 to be 79,186 birds rather than the 67,341 actually counted.

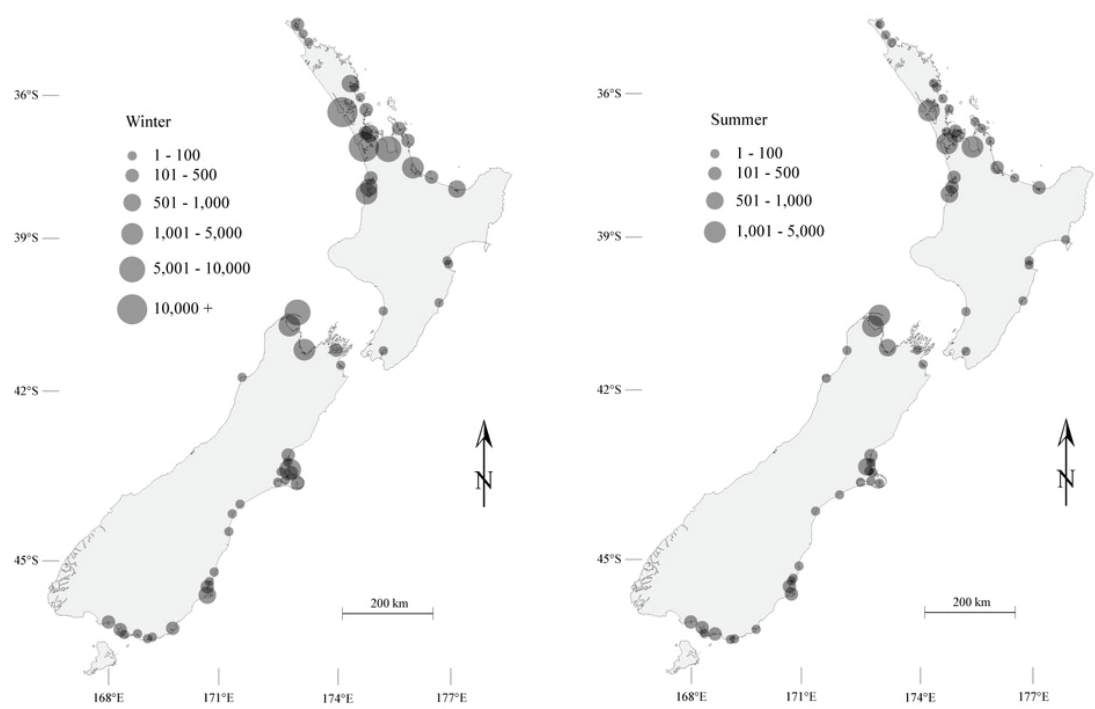


Figure 3. Distribution and mean numbers of South Island pied oystercatcher during winter and summer 2005–2019.

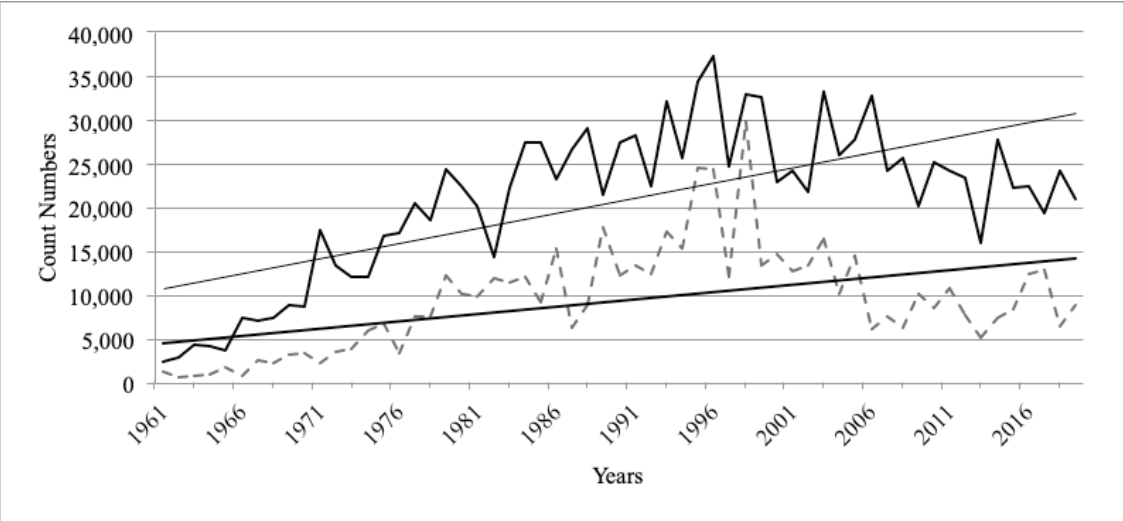


Figure 4. Winter counts of South Island pied oystercatcher in 1960–2019 for Manukau Harbour (solid line) and Firth of Thames (dashed line), with linear trendlines.

Table 2. Numbers of New Zealand breeding waders counted in New Zealand during winter and summer 2005–2019 (NI = North Island, SI = South Island). Population estimates where appropriate are shown in the species text.

Season	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean±SD
South Island pied oystercatcher																
Winter																
NI	65,531	61,490	65,829	59,589	55,700	60,380	63,995	55,330	45,026	60,310	57,506	56,723	51,360	49,738	50,148	57,310±6,180
SI	13,535	19,746	24,183	27,763	23,683	19,659	17,586	17,543	17,366	18,529	20,573	21,228	21,812	20,367	17,193,	19,784±2,935
Total	79,066	81,236	90,012	83,352	79,383	80,039	81,581	72,873	62,392	79,839	78,079	77,951	73,172	70,105	67,341	77,095±6,885
Summer																
NI	14,059	12,010	12,965	11,218	11,113	10,302	11,406	10,454	11,446	11,552	9,425	10,692	9,916	8,343	8,053	10,864±1,580
SI	6,947	6,126	7,084	6,439	5,816	6,175	5,081	5,199	5,427	5,073	6,133	6,599	9,062	5,255	6,266	6,179±1,032
Total	21,006	18,236	20,049	17,657	16,929	16,447	16,487	15,653	16,873	16,625	15,558	17,291	18,978	13,598	14,319	17,042±1,971
variable oystercatcher																
Winter																
NI	935	708	807	1,587	891	1,956	1,552	1,686	1,521	1,587	1,828	1,973	2,264	1,926	2,428	1,593±532
SI	813	911	1,031	1,373	999	1,075	1,318	1,070	1,178	1,182	1,186	1,310	1,449	1,382	1,769	1,209±241
Total	1,748	1,619	1,838	2,960	1,890	3,031	2,870	2,621	2,756	2,769	3,014	3,283	3,713	3,308	4,197	2,802±742
Summer																
NI	747	426	1,009	1,278	934	1,212	1,525	1,535	1,329	1,212	1,505	1,664	1,351	1,802	1,851	1,292±391
SI	541	605	655	811	760	683	738	778	879	959	770	819	924	842	812	772±115
Total	1,288	1,031	1,664	2,089	1,694	1,895	2,263	2,313	2,208	2,171	2,275	2,483	2,275	2,644	2,663	2,064±470
pied stilt																
Winter																
NI	11,545	12,479	11,102	13,374	11,487	13,502	15,232	13,859	12,335	12,903	14,619	14,407	15,061	16,663	13,633	13,480±1,560
SI	2,246	2,569	2,551	2,805	1,522	1,658	4,364	2,062	1,630	2,315	2,264	1,989	2,354	1,958	3,131	2,361±709
Total	13,791	15,048	13,653	16,179	13,009	15,160	19,596	15,921	13,965	15,218	16,883	16,396	17,415	18,621	16,746	15,841±1,865
Summer																
NI	2,007	1,666	1,875	2,348	2,052	2,695	2,857	2,128	2,952	2,670	2,586	2,468	1,578	2,477	3,820	2,412±572
SI	2,592	1,678	2,135	2,233	2,347	2,390	2,026	1,346	2,037	1,632	2,729	1,658	3,747	2,150	4,398	2,340±806
Total	4,599	3,344	4,010	4,581	4,399	5,085	4,883	3,474	4,989	4,302	5,315	4,126	4,742	4,627	8,218	4,713±1,116

Table 2. Continued

Season	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean±SD
New Zealand dotterel																
Winter																
NI	309	357	405	413	468	567	647	780	572	719	1,046	976	727	880	1,116	660±253
SI	74	0	96	71	82	84	79	72	57	61	9	65	50	65	60	62±26
Total	383	357	501	484	550	651	726	852	629	780	1,055	1,041	777	865	1,176	722±248
Summer																
NI	200	199	344	352	380	434	353	425	509	433	599	483	502	510	567	401±135
SI	0	5	0	5	10	0	5	1	5	0	2	3	0	0	1	2.4±2.9
Total	200	204	344	357	390	434	358	426	514	433	601	486	502	510	568	404±135
banded dotterel																
Winter																
NI	3,531	2,165	2,517	2,815	2,288	3,942	3,714	3,671	2,435	3,391	2,936	3,130	3,400	2,880	3,841	3,110±585
SI	2,663	2,789	2,632	4,005	2,880	2,310	3,651	2,305	2,008	2,469	2,549	2,863	2,030	2,270	2,200	2,642±559
Total	6,194	4,954	5,149	6,820	5,168	6,252	7,365	5,976	4,443	5,860	5,485	5,993	5,430	5,150	6,041	5,752±755
Summer																
NI	50	52	101	104	87	66	59	48	80	68	87	117	94	73	123	81±24
SI	584	434	497	566	453	207	460	362	894	435	468	486	671	205	588	487±170
Total	634	486	598	670	540	273	519	410	974	503	555	603	765	278	711	568±180
black-fronted dotterel																
Winter																
NI	23	188	17	87	98	2	94	79	29	162	87	123	93	85	14	79±54
SI	8	15	3	5	3	0	6	1	1	0	14	5	4	8	11	5.6±4.8
Total	31	203	20	92	101	2	102	47	30	162	101	128	97	93	25	84±56
Summer																
NI	6	3	6	10	6	0	11	11	9	7	20	14	12	22	19	10.5±6.5
SI	9	2	0	0	0	4	6	1	0	0	3	4	4	5	6	2.9±2.8
Total	15	5	6	10	6	4	17	12	9	7	23	18	16	27	25	13.3±7.5
wrybill																
Winter																
NI	6,073	4,808	4,042	6,135	4,597	4,612	4,941	5,768	4,766	4,055	4,062	4,587	4,686	5,237	3,629	4,800±743
SI	4	158	54	104	15	2	81	67	61	53	50	88	32	88	26	59±42
Total	6,077	4,966	4,096	6,239	4,612	4,614	5,022	5,835	4,827	4,108	4,112	4,675	4,718	5,325	3,655	4,859±752
Summer																
NI	171	179	46	255	33	58	72	193	77	117	224	77	266	92	56	128±80
SI	10	405	15	342	2	1	84	38	62	15	1	25	25	256	578	124±182
Total	181	584	61	597	35	59	156	231	139	132	225	102	291	348	634	252±202

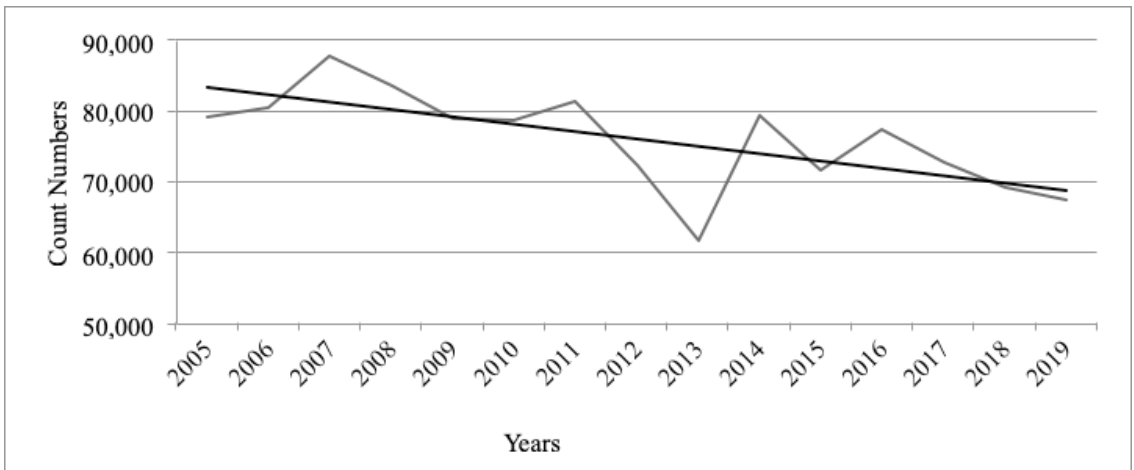


Figure 5. Winter counts of South Island pied oystercatcher in 2005–2019 with linear trendline. Lower than usual numbers counted in the Manukau Harbour and Firth of Thames account for the low 2013 total.



Figure 6. Distribution and mean numbers of variable oystercatcher during winter and summer 2005–2019.

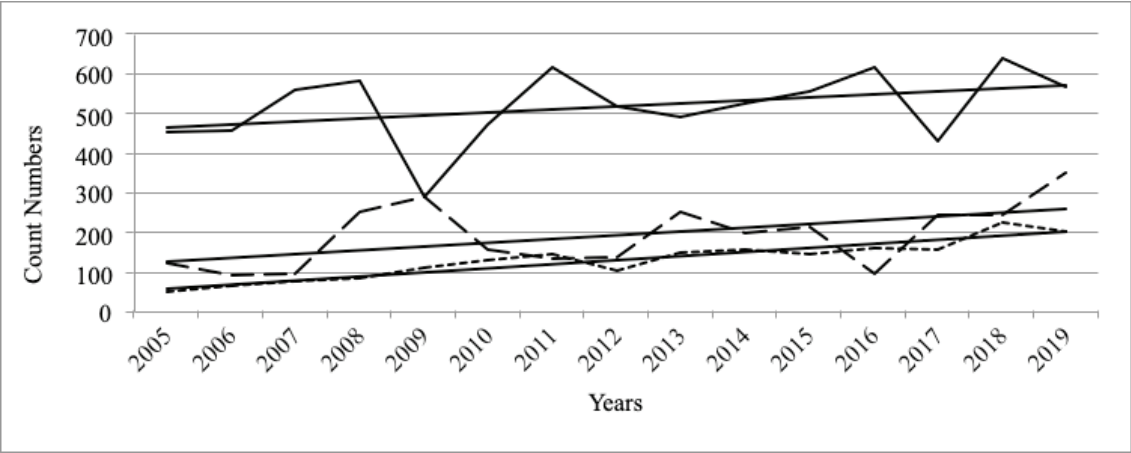


Figure 7. Winter counts of variable oystercatcher in 2005–2019 for the Nelson region with linear trendlines. Tasman Bay (solid line), Golden Bay (dashed line) & Farewell Spit (dotted line).

Table 3. Sites where a mean of >100 variable oystercatcher were counted during winter and summer, 2005–2019.

Site	No. Counts	Mean	SD	Range
Winter				
Tasman Bay	15	518	89	288–637
Ohiwa Harbour	11	226	109	0–367
Whangarei Harbour	15	205	95	40–325
Golden Bay	15	184	83	90–339
Tauranga Harbour	12	180	128	0–525
Maketu Estuary	11	167	82	10–308
Firth of Thames	15	148	45	73–261
Ruakaka & Waipu Estuaries	15	147	88	0–284
Farewell Spit	15	130	50	42–224
Manukau Harbour	15	127	44	52–189
Avon-Heathcote Estuary	15	117	43	50–218
Mangawhai Estuary	15	103	68	14–242
Summer				
Tasman Bay	15	343	78	239–513
Whangarei Harbour	14	171	69	57–280
Ohiwa Harbour	13	169	56	112–296
Golden Bay	15	157	48	73–241
Maketu Estuary	12	139	55	41–264
Tauranga Harbour	14	134	60	0–218
Mangawhai Estuary	15	114	51	14–190
Kaipara Harbour	15	109	51	44–204
Firth of Thames	15	107	28	43–147

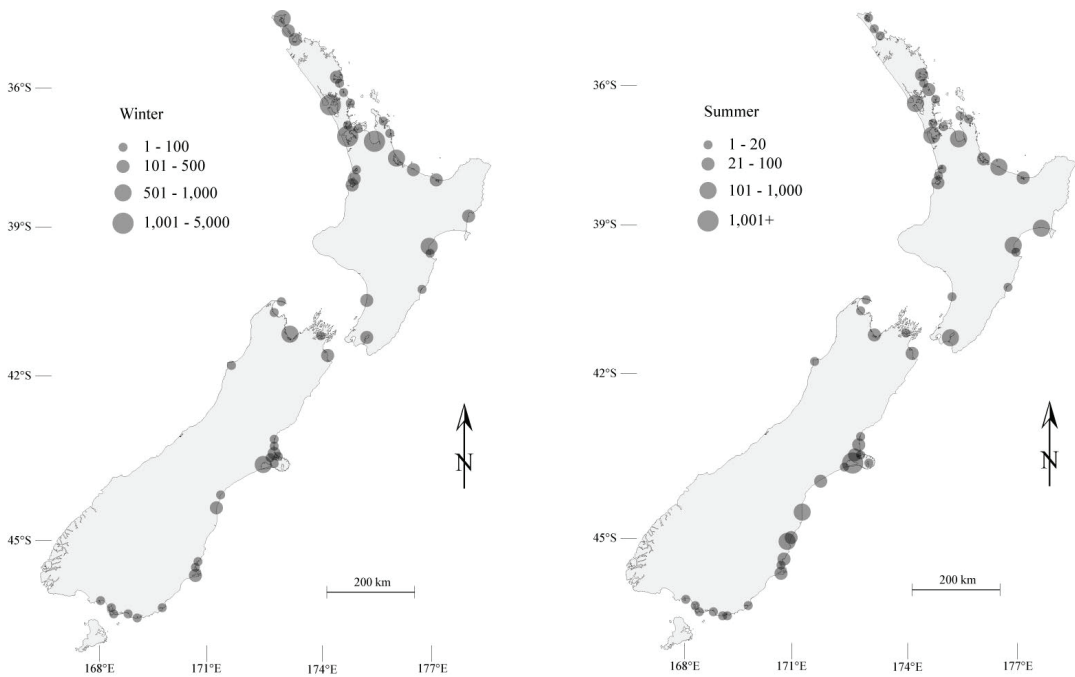


Figure 8. Distribution and mean numbers of pied stilt during winter and summer 2005–2019.

2. Variable oystercatcher (*Haematopus unicolor*)

The variable oystercatcher is a New Zealand endemic that breeds around much of the coast of North and South Islands, and Stewart Island. Many remain on territories throughout the year but there are some notable winter flocking sites (Fig. 6; Table 3). Variable oystercatchers in northern New Zealand have benefitted greatly from increased predator control and protection of nesting sites where they nest near New Zealand dotterels (Dowding & Murphy 2001). However, this does not account for the significant increases in the Tasman and Golden Bays, and Farewell Spit where little predator control is done on the coasts.

They are less numerous in the larger harbours, preferring more open coasts (Heather & Robertson 2015) and small numbers sometimes associate with roosting South Island pied oystercatchers. Many of those that stay on territories in the winter are not included in the wader counts, making estimating the population more difficult. The winter counts in 1983–1994 ranged from 1,012 (1984) to 1,849 (1989) with an average of 1,393 birds.

The winter counts in 2005–2019 ranged from 1,619 (2006) to 4,197 (2019) with an average of 2,802, an increase of 77% between the two periods. It is also worth noting that more coastal sites were covered during the 1983–1994 period and had they all been covered in the 2005–2019 period the increase would

have been even greater. In summer 2005–2019, the range was 1,031 (2006) to 2,663 (2019) with an average of 2,064 (Table 2). Most noticeable was the increased sizes of wintering flocks in Tasman Bay (288–616) with an average of 505. Ohiwa, Tauranga, and Whangarei Harbours each recorded an average of over 200 birds (Table 3). Only two sites, Waipu and Mangawhai Estuaries, had an average of over 100 during the 1983–1994 period, whereas twelve sites averaged over 100 birds during the 2005–2019 survey period. Summer counts were lower, as expected, during the breeding season. The increases from 2005–2019 in the three Nelson areas of Farewell Spit, Golden Bay and Tasman Bay are shown in Figure 7. A population estimate has not been considered due to lack of data from the many smaller sites and extensive sections of coast that variable oystercatcher inhabit.

3. Pied stilt (*Himantopus himantopus*)

Pied stilt breed throughout New Zealand except Fiordland and are rare on Stewart and Chatham Islands (Heather & Robertson 2015). They breed in coastal and inland wetlands close to water, and in wet paddocks (Pierce 1984). Birds that breed inland generally move to coastal areas from December to February and coastal breeders tend to be sedentary (Heather & Robertson 2015). Pied stilt distribution is shown in Figure 8.

Table 4. Sites with a mean of >500 pied stilt counted during winter and >300 during summer 2005–2019.

Site	No. Counts	Mean	SD	Range
Winter				
Manukau Harbour	15	3,732	687	1,995–4,927
Kaipara Harbour	15	3,528	1,216	1,475–5,933
Firth of Thames	15	3,002	815	1,985–5,111
Lake Wairarapa	8	949	490	0–1,567
Tauranga Harbour	12	876	444	0–1,549
Lake Ellesmere	15	777	540	232–2,572
Ahuriri Estuary	15	624	261	215–1,049
Parengarenga Harbour	7	549	469	0–1,275
Tasman Bay	15	531	90	398–715
Summer				
Lake Ellesmere	15	1,576	511	778–2,091
Firth of Thames	15	746	385	197–1,361
Lake Ki-Wainono	8	444	224	0–781
Manukau Harbour	15	379	193	117–802
Lake Wairarapa	10	359	165	0–585
Ahuriri Estuary	15	349	176	169–847

Because many birds that breed inland move to coastal areas, winter counts may give a reasonable estimate of the population size. The 1983–1994 survey estimated a minimum population of 28,000 birds. Because not all pied stilts move to areas that were counted, Heather and Robertson (2015), estimated the population at probably nearer 30,000 birds. The 1983–1994 winter counts ranged from 14,976 (1988) to 21,359 (1989) with an average of 17,971 birds. The winter counts in 2005–2019 ranged from 13,009 (2009) to 19,596 (2011) with an average of 15,841 birds (Table 2). This amounts to about 14% fewer birds than in 1983–1994 and thus reduces the population estimate from 28,000 in 1983–1994 to 24,000 in 2019.

The highest winter numbers were consistently found in the Manukau Harbour, Kaipara Harbour, and the Firth of Thames, which combined accounted for 49–70% of each winter total count (Table 4). The Manukau Harbour held the highest number in 11 of the 15 years, the Kaipara Harbour in three years, and the Firth of Thames once. Lake Ellesmere and Tasman Bay were the South Island strongholds for the species in winter and Lake Ellesmere consistently held the highest number in summer with 778–2,901 counted during the survey period (Table 4).

The summer 2017 counts were anomalous with the South Island total much higher than normal and the North Island much lower. This is mostly accounted for by the Lake Ellesmere count being

considerably higher and the Firth of Thames count lower than expected.

The wide variation in numbers, particularly at Parengarenga Harbour is, in part, due to the difficulties of counting that site because access to parts of the harbour is not always possible due to lack of boats, high winds, or rough waters, (Detlef Davies *pers. comm.*).

4. Black stilt (*Himantopus novaeseelandiae*)

Whilst this species was covered during the 1983–1994 survey, during this latest survey they were not counted at inland sites. Their numbers are monitored closely on the breeding grounds by the Department of Conservation and so we will not cover them here except to say that during the 1990s several colour-banded Black Stilts were seen annually during the winter at one or two locations on the Kaipara Harbour (Adrian Riegen *pers. obs.*); however, no banded birds have been seen there for at least 10 years. Several unbanded hybrids were seen at North Island sites on most censuses.

5. New Zealand dotterel (*Charadrius obscurus*)

Two subspecies of this endemic wader have been described (Dowding 1994). The larger southern New Zealand dotterel (*C. o. obscurus*) (nationally critical) breeds on Stewart Island hill tops and, in winter, regularly disperses to Paterson Inlet and Mason Bay on Stewart Island, and to



Figure 9. Distribution and mean numbers of New Zealand dotterel during winter and summer 2005–2019.

Awarua Bay, Southland (Dowding 2017). Southern New Zealand dotterels reached a low of 62 birds in 1992, but responded well to management, and the post-breeding population fluctuated between 240 and 290 birds from 2005 to 2013 (Dowding 2017). However, since then there has been another decline in the population to about 126 birds in 2016, with perhaps only 30–40 breeding pairs (J. Dowding *in litt.* 2016; BirdLife International 2018a). The reason for this decline is still not entirely clear; however, work is underway to increase the area of predator control on the breeding grounds and to intensify monitoring, which includes increasing the number of birds banded, disease screening, nest monitoring, and health checks. The most recent population estimate is 170 birds, based on the 2019 winter flock counts at Stewart Island and Southland, (Kevin Carter, Department of Conservation, *pers. comm.*).

Only a portion of the southern population is counted during the national wader censuses each winter, mostly in Awarua Bay and other Southland sites. A few individuals occasionally occurred as far north as Farewell Spit (Fig. 9). Counts at Awarua Bay ranged from nine (2015) to 96 (2007) with an average of 64. Southern New Zealand dotterels are very closely associated with Awarua Bay, and only

57 were counted at all other sites combined during the whole survey period.

Northern New Zealand dotterel (*C. o. aquilonius*) occur mainly from Bay of Plenty and Waikato northwards with major concentrations on the east coasts of Coromandel, Auckland and Northland (Heather & Robertson 2015). They are, however, gradually moving south on both coasts (J. Dowding *pers. comm.*). North Island counts were 221–761 during the 1983–1994 survey, and 309 (2005) to 1,116 (2019) during the 2005–2019 surveys. Winter counts at Mangawhai Estuary during this study ranged from 66 (2008) to 203 (2017) with an average of 137 compared to 23–55, average 38, in the 1983–1994 survey. Kaipara Harbour winter counts ranged from 58 (2017) to 260 (2019) with an average of 122 compared to 3–64, average 32, in the 1983–1994 survey. Whangateau Harbour (Omaha) was counted only seven times and ranged from 63 (2012) to 136 (2015) with an average of 92, compared with 28–42 and an average of 38 in 1983–1994. These three sites accounted for 46% of all birds counted (Table 2 & Table 5). Although the Kaipara Harbour covers >900 km² most dotterels were found at just two sites, Wainui Inlet (South Head) and Big Sand Island, Tapora.

Table 5. Sites where a mean of >20 New Zealand dotterel were counted during winter 2005–2019.

Site	No. Counts	Mean	SD	Range
Winter Northern NZ				
Mangawhai Estuary	15	137	47	66–203
Kaipara Harbour	15	122	59	58–260
Whangateau Harbour - Omaha	7	92	25	63–136
Ohiwa Harbour	11	63	24	25–94
Manukau Harbour	15	47	24	10–116
Whangapoua Harbour	7	46	35	4–88
Firth of Thames	15	41	18	18–77
Tauranga Harbour	12	39	15	10–58
Maketu Estuary	11	36	20	4–64
Ruakaka & Waipu Estuaries	15	27	19	0–63
Whangarei Harbour	15	21	18	0–64
Winter Southern NZ				
Awarua Bay	15	59	26	0–96

Periodic post-breeding counts of northern New Zealand dotterel are undertaken in April at major post-breeding flocking sites (Dowding 2020). Some counts were also completed during the breeding season and a total of 2,075 northern New Zealand dotterels were counted in the 2011 breeding season census (Dowding 2017).

There is considerable variation between counts at some sites – Whangarei Harbour, Ruakaka and Waipu Estuaries, Whangapoua Harbour, Maketu Estuary, and Ohiwa Harbour in particular – which may be due to the timing of counts because by June and early July (when counts are done) many

dotterels will have already moved to breeding sites or flocks may have been missed in some years.

The northern population increased in recent years thanks mainly to Department of Conservation, Regional Councils, and community groups doing intensive predator control and fencing off nesting areas at many beaches. Pest eradication from some islands (e.g. Motutapu) has also helped (Dowding & Davis 2007).

6. Banded dotterel (*Charadrius bicinctus*)

Banded dotterel is a New Zealand breeding

Table 6. Sites where a mean of >100 banded dotterel were counted during winter 2005–2019.

Site	No. Counts	Mean	SD	Range
Winter				
Farewell Spit	15	911	349	595–1,921
Lake Ellesmere	15	839	444	30–1,721
Kaipara Harbour	15	682	231	279–1,087
Manukau Harbour	15	562	276	147–1,076
Kawhia Harbour	15	445	112	185–653
Golden Bay	15	229	163	41–495
Firth of Thames	15	212	75	102–354
Whangateau Harbour - Omaha	7	210	44	138–279
Tauranga Harbour	12	186	188	0–628
Whangarei Harbour	15	185	188	2–564
Tasman Bay	15	175	83	43–317
Lake Wairarapa	8	171	124	42–412
Ohiwa Harbour	11	146	142	0–321
Aotea Harbour	15	127	119	0–358

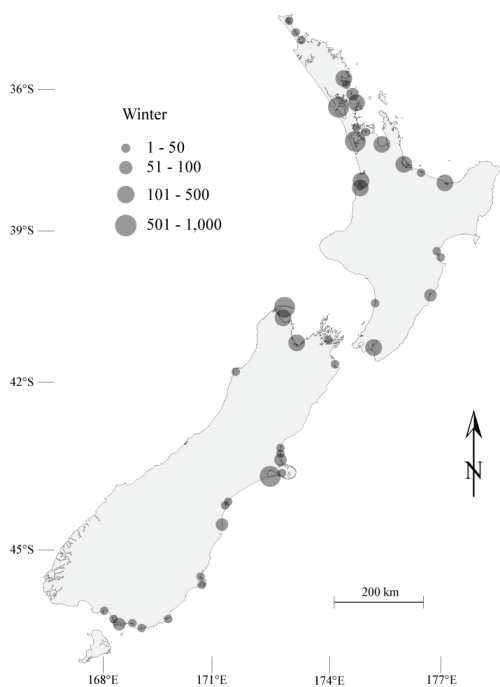


Figure 10. Distribution and mean numbers of banded dotterel during winter 2005–2019.

endemic, breeding predominantly on braided riverbeds on the east side of the North and South Islands, and in a range of other habitats, including sandy beaches (Heather & Robertson 2015). From about January, after breeding, many move northwards to coastal areas mainly in the North Island (Fig. 10), but a significant portion of the population that breeds in the inland South Island migrates to southern Australia for the winter where they are found from Cairns in Queensland to Perth in Western Australia, and in Tasmania, with most occurring from southeast Queensland to Tasmania (Pierce 1999; Hansen *et al.* 2016). In the 1990s, the population was estimated at around 50,000 birds,

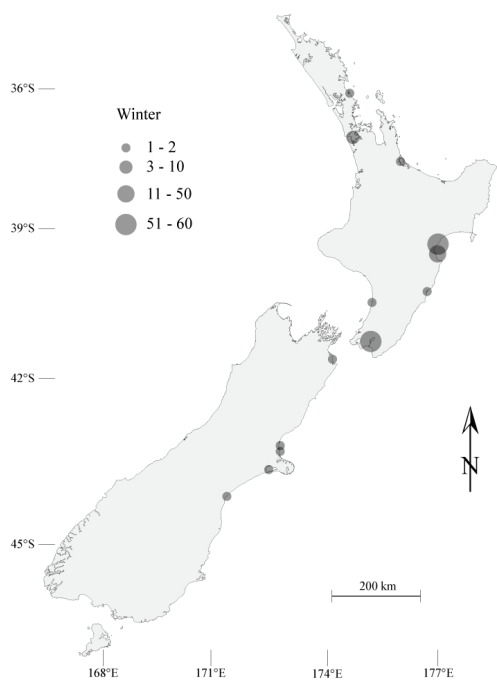


Figure 11. Distribution and mean numbers of black-fronted dotterels during winter 2005–2019.

with about 30,000 migrating to Australia and 20,000 remaining in New Zealand each winter (Heather & Robertson 1996; Pierce 1999) even though only about 11,000 of the New Zealand birds were found at count sites during the 1983–1994 survey because many overwintered at inland sites that were not counted (Sagar *et al* 1999).

Winter counts during the 2005–2019 survey ranged from 4,443 (2013) to 7,365 (2011) with an average of 5,752 (Table 2), whereas the winter counts for 1983–1994 ranged from 5,254 (1991) to 9,242 (1989) with an average of 7,882, a decline of 27% between the two survey periods. With much of the population migrating to Australia each winter,

Table 7. Sites where a mean of ≥ 2.5 black-fronted dotterel were counted during winter 2005–2019.

Site	No. Counts	Mean	SD	Range
Winter				
Ahuriri Estuary	15	42	46	0–166
Lake Wairarapa	8	25	31	0–85
Waitangi Estuary	15	3.9	9	0–32
Manukau Harbour	15	3.5	4.8	0–13
Wairau Lagoon	5	2.7	2.9	0–7

estimating the current population is problematic. Hansen *et al.* (2016) estimated a population of 19,000 with 12,300 visiting Australia each year and 6,400 remaining in New Zealand. If the estimated 20,000 remaining in New Zealand 1983–1994 (Heather & Robertson 1996) is compared with the average counted during that period (7,882), then only about 40% were counted during the winter surveys. Therefore, if the average of 5,752 for 2005–2019 was only 40% of the true population, this would suggest a New Zealand wintering population of about 14,300 birds. The 1983–1994 counts included many small estuaries not counted in 2005–2019 and many of those small sites hold small flocks of banded dotterels. The Chatham Islands were poorly covered each time, especially in 2005–2019 so including these sites would perhaps push the national wintering estimate over 15,000.

The highest average counts in 2005–2019 were at Farewell Spit (911), Lake Ellesmere (839), Kaipara Harbour (682), and Manukau Harbour (562). The top seven wintering sites were all counted 15 times except for Kawhia Harbour (14), and they held 72% of the total count (Table 6). These sites all have large areas of intertidal mud/sand flats or have large muddy lake margins and include the three Auckland harbours, Farewell Spit and Golden Bay. Winter counts of banded dotterels at Lake Ellesmere appear to be affected by the timing of counts, with higher totals in late June and early July than in early-mid June. This may indicate that birds have returned from the North Island and Australia, and so may not all be true over-wintering birds.

Large fluctuations in the counts at most sites (Table 6), indicate that in some years flocks are missed during the counts, when they may be in paddocks away from the coastline; differences in water levels at Lake Wairarapa affect the counts (Robertson & Heather 1999), and counts at Lake Ellesmere are probably affected in the same way.

7. Black-fronted dotterel (*Elseyornis melanops*)

Black-fronted dotterels breed throughout Australia (Marchant & Higgins 1993) and since arriving in New Zealand in the late 1950s they have spread through mainly lowland eastern regions from Auckland to Southland with their stronghold being Hawke's Bay and Wairarapa in the North Island, and Canterbury and Otago in the South Island (Heather & Robertson 2015). The population has increased only slowly to perhaps around 3,000 birds (Armitage 2017); however, the vast majority remain on, or close to, the rivers where they nest. Lake Wairarapa and the Ahuriri and Waitangi Estuaries in Hawke's Bay held by far the majority of birds counted in winter (Fig. 11), with an average of 42 at Ahuriri Estuary, 25 at Lake Wairarapa, 3.9

Table 8. Distribution and mean numbers of wrybill during winter counts 2005–2019.

Winter Totals	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
North Island	6,073	4,808	4,042	6,135	4,597	4,612	4,941	5,768	4,766	4,055	3,848	4,587	4,686	5,237	3,629
South Island	4	158	54	104	15	2	81	67	61	53	53	88	32	88	94
National total	6,077	4,966	4,096	6,239	4,612	4,614	5,022	5,835	4,827	4,102	4,018	4,675	4,718	5,325	3,723
Auckland region total	5,859	4,497	3,908	5,765	4,435	4,348	4,824	5,246	4,389	3,717	3,807	4,396	4,550	5,007	3,336
Auckland region percentage of total	96.5	91.3	95.4	92.4	96.1	94.2	97.0	89.9	90.9	90.6	91.8	95.8	96.4	94.1	89.6
Manukau Harbour percentage of total	52.3	64.5	48.9	57.3	50.2	44.6	49.1	46.4	29.4	24.7	42.2	45.7	47.0	23.3	27.0
Firth of Thames percentage of total	39.8	20.5	41.5	30.5	42.0	43.5	44.2	38.6	56.8	61.4	47.2	45.5	44.6	68.5	60.2
Manukau & Firth combined percentage of total	92.2	85.0	90.4	87.8	92.2	88.1	93.3	85.0	86.2	86.1	89.4	91.2	91.6	91.8	87.2

Table 9. Sites where a mean of >10 wrybill were counted during winter 2005–2019. (*see correction in text).

Site	No. Counts	Mean	SD	Range
Winter				
Firth of Thames	15	2,164	581	1,010–3,650
Manukau Harbour	15	2,142	793	1,008–3,573*
Kaipara Harbour	15	176	71	53–308
Tauranga Harbour	12	137	103	9–338
Porangahau Estuary	15	55	29	0–91
Tasman Bay	15	44	33	0–109
Whangarei Harbour	15	41	43	0–146
Waitemata Harbour	15	35	33	0–112
Manawatu Estuary	12	19	11	0–34

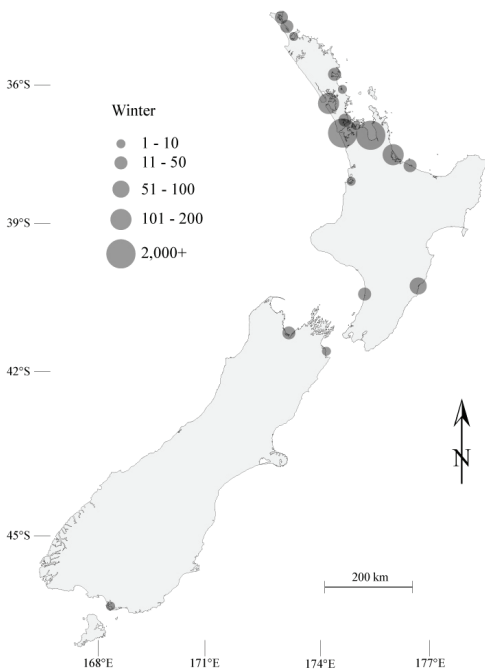
at Waitangi Estuary, and 3.5 Manukau Harbour. No other sites averaged more than three birds (Table 7). Annual winter totals ranged from 2 (2010) to 203 (2006) with a mean of 84, and summer counts ranged from 4 (2010) to 27 (2018) with a mean of 13.3 (Table 2).

8. Wrybill (*Anarhynchus frontalis*)

Wrybill breed on the braided rivers of Canterbury

and Otago between August and January (Heather & Robertson 2015). They start arriving in the non-breeding sites around the Auckland region from the last week of December, with numbers increasing rapidly during January (Davies 1997). Very few wrybill spend the non-breeding season in the South Island, with the average count of just 59 birds in 2005–2019, compared to the North Island average of 4,800 (Table 2). The majority of wrybill were found in the greater Auckland region during winter with 87.4% of the national average of 4,859 counted there in 2005–2019 (Fig. 12; Table 8). Within the Auckland region, the Manukau Harbour (43.5%) and the Firth of Thames (45.6%) held on average 89.1% of the national total (Table 8), up slightly from the 1983–1994 average of 84.9%.

National winter counts ranged from 3,655 (2019) to 6,239 (2008). Two counts over 6,000 were of concern because they were considerably higher than counts in all other years. A high 2005 count of 6,071 could be the result of movement between sites and count dates, with Firth of Thames counted on 12 June and Manukau Harbour counted 14 days later on 26 June. Counts either side of the very high 2008 count of 6,239 birds were 4,096 (2007) and 4,612 (2009), which are more in line with usual numbers. It is possible a Manukau Harbour flock was double-counted because 1,400 were recorded in the Upper Onehunga Harbour area and 1,350 at Mangere Sewage Ponds. The field sheets from those two sites are not available to check on count times, but it seems quite likely the flock moved the 2 km between the two sites. If the lower count is discarded, the total 2008 count is reduced to 4,889, which is reasonable given the national counts in years before and after. Making this assumption, the average for the 2005–2019 period would reduce from 4,859 (Table 2) to 4,769 birds. This compares with the average of 3,657 during the 1983–1994 period, an increase of around 33%. Improved

**Figure 12.** Distribution and mean numbers of wrybill during winter 2005–2019.

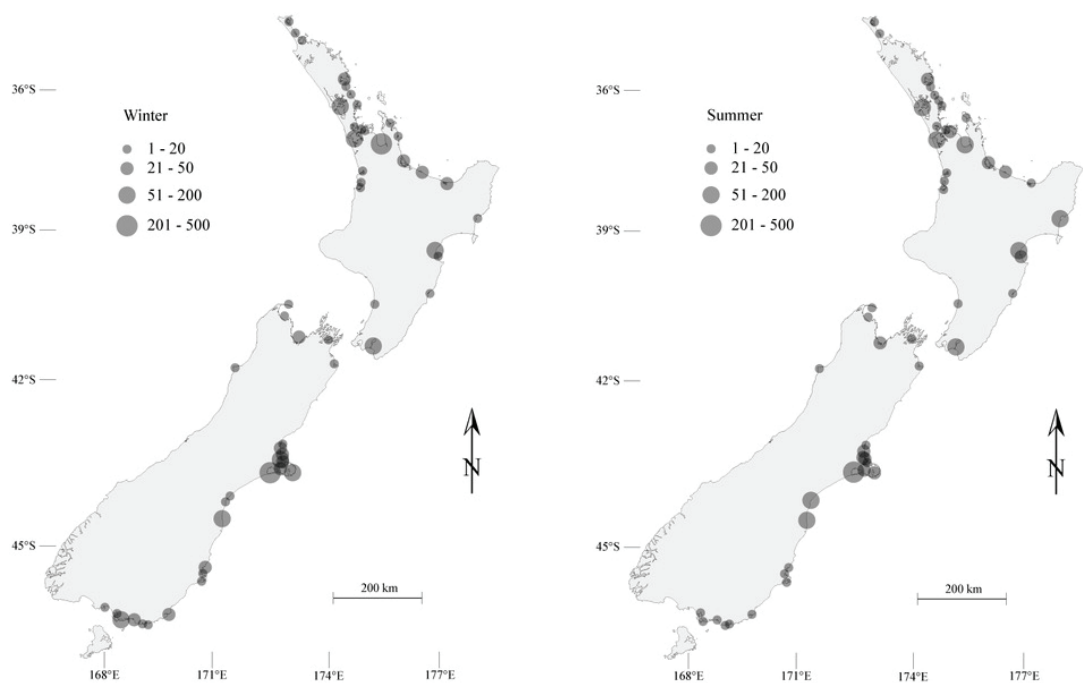


Figure 13. Distribution and mean numbers of spur-winged plover during winter and summer 2005–2019.

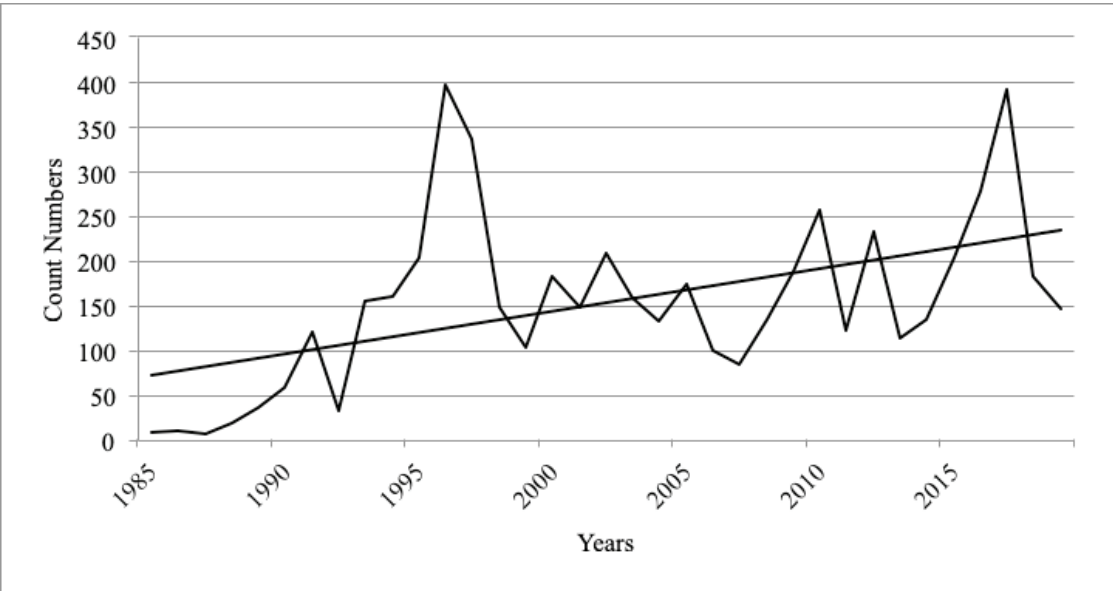


Figure 14. Total winter counts of spur-winged plover on Manukau Harbour from 1985, when they were first recorded, to 2019, with a linear trendline.

Table 10. Sites where a mean of >50 spur-winged plover were counted during winter and summer 2005–2019.

Site	No. Counts	Mean	SD	Range
Winter				
Lake Ellesmere	15	435	289	56–1,143
Firth of Thames	15	273	160	109–742
Manukau Harbour	15	188	68	100–342
Kaipara Harbour	15	149	64	74–257
Lake Wairarapa	8	134	196	14–508
Lake Ki-Wainono	12	71	61	0–194
Ahuriri Estuary	15	58	92	10–359
Avon-Heathcote Estuary	15	52	20	0–92
Summer				
Lake Ellesmere	15	208	170	67–785
Firth of Thames	15	156	104	59–501
Manukau Harbour	15	132	66	48–275
Kaipara Harbour	15	117	53	56–247
Lake Wairarapa	10	116	110	14–376
Lake Ki-Wainono	8	81	46	20–137
Ahuriri Estuary	15	76	75	0–306
Washdyke Lagoon	10	66	121	5–406
Wherowhero Lagoon	3	52	34	19–87

predator control and restoration of braided rivers in the South Island are probably important factors in this increase. Based on the winter count figures, and correcting for regular count sites that were missed, we estimate the population in 2019 to be 4,892 birds.

The top nine sites were counted 12 or more times during winter, and with approximately 50 birds representing 1% of the world population, all except the Manawatu Estuary are internationally important for this species (Table 9). There is a considerable range in count totals at some sites, indicating perhaps that the flocks were not found, particularly in the case of Whangarei Harbour, Tauranga Harbour, and Tasman Bay.

Summer counts of wrybill were usually much lower as most birds were on the breeding grounds during the census periods, but their totals are shown in Table 2 for completeness. The highest summer counts were at Lake Ellesmere, which ranged from 1 (2007, 2010, 2015) to 547 (2019). This may reflect weather or river levels on the breeding grounds, forcing breeding birds to abandon the braided rivers either temporarily or for the season (Crossland & Crutchley 2020).

9. Spur-winged plover (*Vanellus miles*)

Spur-winged plover breed in grassland and riverbed habitats and are often gregarious when not breeding, with flocks of hundreds gathering

on farmland or estuarine wetlands with short vegetation (Heather & Robertson 2015). Because many of these flocks occur well away from regular wader count sites it is not possible to estimate the national population size based on these counts. The counts do, however, show expansion northward (Fig. 13) and population increases as seen from counts in the Manukau Harbour since 1985 when they were first encountered during the surveys (Fig. 14). North Island winter counts ranged from 525 (2007) to 1,732 (2015) with an average of 964. South Island winter counts ranged from 518 (2006) to 1,798 (2011) with an average of 1,064. Sites where 50 or more were counted are shown in Table 10.

Regular northern hemisphere migrants

1. Bar-tailed godwit (*Limosa lapponica*)

The bar-tailed godwit is by far the most numerous northern hemisphere breeding wader to visit New Zealand annually, with those migrating to New Zealand and south-eastern Australia being almost entirely of the subspecies *baueri*, which breeds in Alaska. A few *menzbieri*, breeding in northern Siberia and spending the non-breeding season mainly in northern and Northwest Australia, may also occur in New Zealand. The *menzbieri* subspecies is identifiable in the field by its whiter rump and lower back, which is most

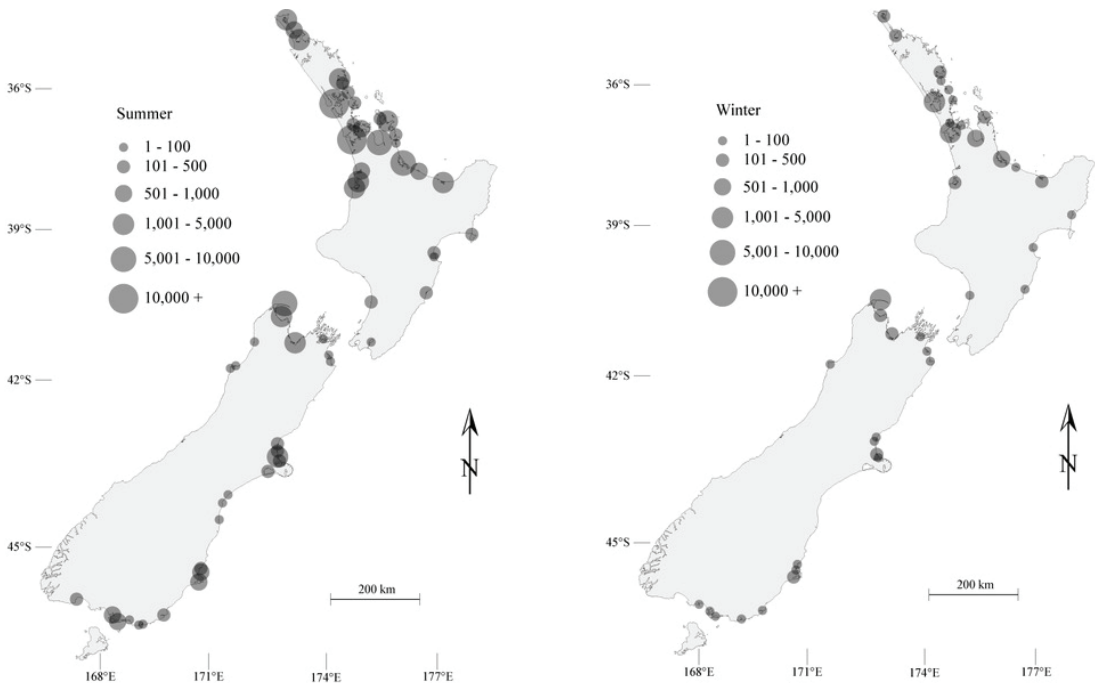


Figure 15. Distribution and mean numbers of bar-tailed godwit during summer and winter 2005–2019.

obvious when in breeding plumage and flying. Little is known about the sub-species *anadyrensis* breeding in Lowland Anadyr in eastern Siberia, but it is likely they also occur in New Zealand in small numbers (Tomkovich 2009). Bar-tailed godwit are widely distributed around the whole of coastal New Zealand with almost every estuary having at least a few birds each summer (Fig. 15).

In 1993, the EAAF population of bar-tailed godwit was estimated at 330,000 birds (Watkins 1993). However, Watkins (1993) suggested that *menzbieri* was found in NW Australia, and the Northern Territory and Queensland with around 145,000 birds and *baueri* in south and eastern Australia and New Zealand with 115,000 birds. Approximately 28% of the global population of bar-tailed godwit uses the EAAF. There is considerable concern that loss of intertidal stopover habitat in the Yellow Sea region of East Asia is driving population declines in shorebirds (Amano *et al.* 2010; Yang *et al.* 2011; Murray *et al.* 2015). Both the *menzbieri* and *baueri* populations have apparently experienced serious declines (around 80% *menzbieri* and 30% *baueri* over three generations) according to monitoring data from Australia and New Zealand (Studds *et al.* 2017). Recent data suggest that the *baueri* population may decline by

a further 44% within 10 years (Conklin *et al.* 2016). Although we only cover the period 2005–2019, the bar-tailed godwit count in November 2018 was the lowest national count recorded at 65,420, since a full nationwide summer census was undertaken in 1983. The winter 2018 and 2019 counts were also the lowest on record since full surveys were undertaken in 1984, with 5,216 and 5,116 birds respectively. In October–November 2019, observers around New Zealand reported an unusually high number of juveniles and this is reflected in the higher count of 74,456 bar-tailed godwits in November 2019. The 2020 winter count reflected this increase with 12,813 counted, more than double the numbers counted in the two previous winters.

Latest estimates put the EAAF population at 325,000 individuals in 2016 (Hansen *et al.* 2016), which is similar to the 1993 estimate, but it is now considered that the early estimate was very conservative because new overwintering sites have now been identified.

Attempts to better estimate the *baueri* population were made in the 2019/2020 summer in New Zealand and Australia, after an aerial survey of bar-tailed godwits was undertaken in Alaska just before southward migration in 2019. The Alaskan figures and the special bar-tailed godwit counts

undertaken during February 2020 in New Zealand and November 2019 and January–February 2020 in eastern Australia will provide a more accurate population estimate. The February 2020 count in New Zealand was 81,549 birds (Birds New Zealand 2020). This is 8.7% higher than the November–December 2019 count of 74,456. The increase may be partly due to late arrivals into New Zealand and a more thorough count of flocks in the Far North through aerial photography.

Annual summer counts in New Zealand fluctuated widely during 2007–2019 when all major New Zealand godwit sites were counted (the

key site of Tauranga was not counted in 2006 and Ohiwa Harbour was not counted in 2005 or 2006), with totals ranging from 65,420 (2018) to 101,459 (2010) (Table 12). Twelve sites had a mean of >2,000 birds 2005–2019 (Table 11). The count of 101,459 in 2010 is a little puzzling and may have resulted from overcounting because counts either side were considerably lower at 84,499 (2009) and 90,599 (2011) (Table 12), but no individual site in 2010 had an unusually high count.

The average bar-tailed godwit count in 1983–1994 was 83,133 compared with 77,796 in 2005–2019, a 6.4% decline. Over 60% of the birds (average

Table 11. Sites where a mean of >2,000 bar-tailed godwits were counted during summer and >150 during winter 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Manukau Harbour	15	13,452	3,088	8,951–21,110
Kaipara Harbour	15	12,922	2,411	8,121–16,930
Farewell Spit	15	9,591	2,311	6,190–14,543
Firth of Thames	15	6,425	1,217	3,812–8,667
Tauranga Harbour	14	6,360	2,232	2,638–10,200
Tasman Bay	15	4,007	736	2,434–5,141
Rangaunu Harbour	9	2,996	694	1,570–3,850
Whangarei Harbour	14	2,738	1,108	1,100–5,301
Kawhia Harbour	15	2,535	1,042	1,107–4,353
Ohiwa Harbour	13	2,385	626	1,500–3,809
Golden Bay	15	2,227	541	1,134–2,995
Parengarenga Harbour	11	2,123	15	15–4,359
Winter				
Manukau Harbour	15	2,049	649	788–3,441
Kaipara Harbour	15	1,713	916	369–3,622
Farewell Spit	15	1,692	451	776–2,477
Tauranga Harbour	12	888	483	260–1,908
Firth of Thames	15	559	241	264–1,035
Tasman Bay	15	478	218	130–819
Parengarenga Harbour	7	327	314	0–796
Rangaunu Harbour	7	291	204	28–593
Kawhia Harbour	15	286	175	120–806
Ohiwa Harbour	11	273	143	0–515
Whangarei Harbour	15	254	130	0–472
Avon-Heathcote Estuary	15	216	95	0–410
Golden Bay	15	177	96	35–441

Table 12. Total numbers of regular migrant waders in New Zealand during winter and summer 2005–2019.

Season	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean±SD	Estimated NZ Pop
bar-tailed godwit																	
Winter	8,557	10,853	8586	8,562	9,641	12,562	9,151	14,095	13,030	8,903	7,757	9,997	7,033	5,216	5,116	9,271±2,592	82,611
Summer	65,535	68,808	80,169	87,573	84,499	101,459	90,599	77,343	81,252	70,459	74,877	72,543	72,193	65,420	74,456	77,812±9,996	
red knot																	
Winter	3,653	3,691	2,468	1,751	1,730	1,287	1,537	3,183	2,243	987	1,218	1,763	1,150	2,341	1,084	2,006±889	29,449
Summer	38,984	25,009	39,241	40,220	24,994	29,728	32,208	28,194	31,285	28,540	34,212	27,235	31,087	33,563	26,775	31,418±5,520	
ruddy turnstone																	
Winter	266	339	58	416	141	281	275	154	131	354	180	206	322	137	288	237±101	1,767
Summer	1,315	1,498	1,628	2,382	1,024	1,601	1,393	921	1,986	1,416	1,047	1,713	1,925	1,497	2,468	1,588±456	
Pacific golden plover																	
Winter	1	12	11	2	0	0	0	5	4	5	0	0	0	0	2	2.8±4.0	213
Summer	188	203	301	271	161	201	136	72	159	64	272	112	266	219	224	190±73	
red-necked stint																	
Winter	22	5	73	12	15	15	9	10	6	24	7	4	2	10	18	15±17	95
Summer	121	176	202	91	87	54	65	54	111	53	92	124	24	53	87	93±48	
whimbrel																	
Winter	27	24	10	6	1	4	6	3	5	3	4	10	2	3	3	7.4±7.8	37
Summer	62	41	69	31	14	24	35	14	18	24	11	38	28	18	65	33±19	
curlew sandpiper																	
Winter	0	1	0	3	2	7	2	1	0	3	0	6	2	0	0	1.8±2.2	8
Summer	15	9	17	9	8	6	9	4	12	15	6	6	2	1	1	8.0±5.1	
sharp-tailed sandpiper																	
Winter	2	13	0	1	0	1	1	0	0	0	0	0	0	0	0	1.2±3.3	15
Summer	60	27	36	14	13	8	13	24	17	3	3	16	15	15	9	18.2±14.5	
eastern curlew																	
Winter	3	2	0	1	0	2	1	0	2	2	3	0	1	1	4	1.6±1.3	8
Summer	15	18	15	11	2	9	8	5	8	3	5	7	7	2	5	8.0±4.9	

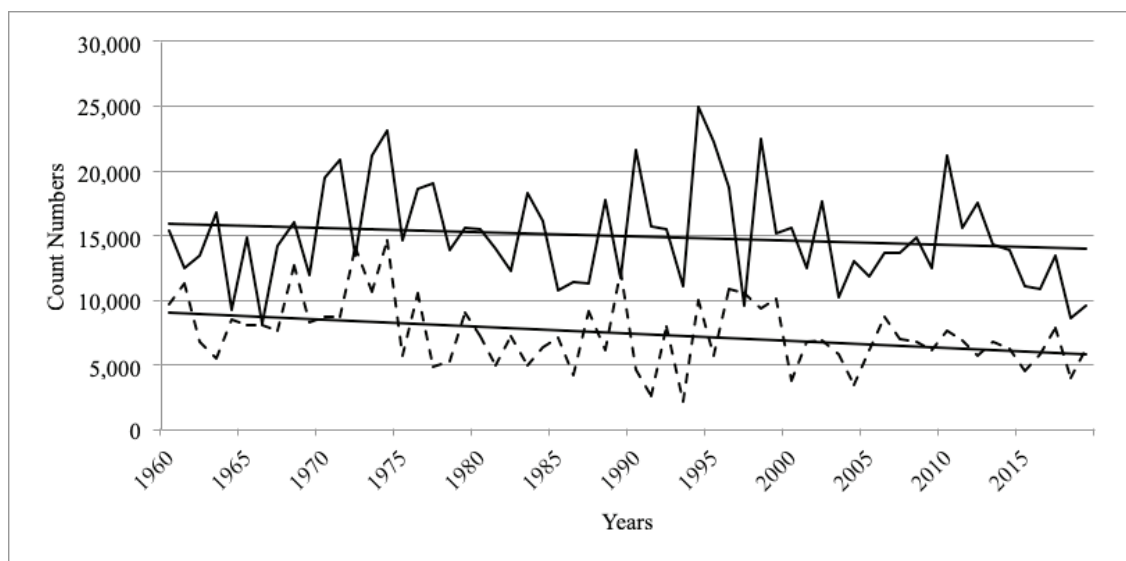


Figure 16. Summer counts of bar-tailed godwit from 1960 to 2019 for Manukau Harbour (solid line) and Firth of Thames (dashed line) with linear trendlines.

48,750) were recorded at just five sites, each averaging >6,000 birds (Table 11). The Manukau Harbour and Kaipara Harbour alternated in being the top two sites in all years except for 2012, when Farewell Spit edged out Kaipara Harbour.

The variation in counts at individual sites from year to year is puzzling, because sightings of birds with colour bands and engraved flags show bar-tailed godwit to be extremely site faithful (A. Riegen & P. Battley *unpubl. data*), and so this warrants further investigation. Parengarenga Harbour is often a challenging site to count because the birds are particularly wary of humans and they can be difficult to find or are missed completely, but there does appear to have been a significant decline in numbers there in recent years. Counts in 2007–2013 ranged from 2,200 to 4,062, but 2016–2019 ranged from 255 to 1,650. Concern has been raised by the Birds New Zealand regional representative in the Far North about illegal hunting of bar-tailed godwit in Parengarenga Harbour, Kowhai Beach, and Rangaunu Harbour, and this may explain the declining numbers (Leslie Feasey *pers. comm.*).

Whilst godwit numbers do show a downward trend in New Zealand, it is less steep than other migratory species. This may be due, in part, to the *baueri* godwits only relying on the Yellow Sea once a year during northward migration because they make a non-stop flight south to New Zealand and southeast Australia from Alaska (Gill *et al.* 2005) whilst the *menzbieri* subspecies, which is declining

more rapidly, uses the Yellow Sea on both northward and southward migration (Studds *et al.* 2017). Many other wader species stopover around the Yellow Sea on both the northward and southward migrations. It is becoming clear from many studies, that the Yellow Sea is critical for waders on migration and the loss of about 65% of the mudflats between the mid-1950s and early 2000s has had a serious effect on their populations (Murray *et al.* 2015). It is likely that this is currently the pinch point for many wader species and the main reason for population declines.

Winter numbers ranged from 5,116 (2019) to 14,095 (2012) (Table 12). Three sites had a winter mean of >1,000 birds: Manukau Harbour, Kaipara Harbour, and Farewell Spit. Tauranga Harbour, Firth of Thames, and Tasman Bay averaged 500–800 birds each (Table 11).

The Firth of Thames and Manukau Harbour have been counted each summer since 1960 and constitute the longest continuous data set of any wader species on the EAAF. They show numbers varying considerably over the years; the Manukau Harbour has shown no significant trend over the 60 years, but numbers declined by 34% at the Firth of Thames over this period (Fig. 16).

2. Red knot (*Calidris canutus*)

The red knot is the second most numerous northern hemisphere breeding wader species to visit New Zealand annually. Those migrating



Figure 17. Distribution and mean numbers of red knot during summer and winter 2005–2019.

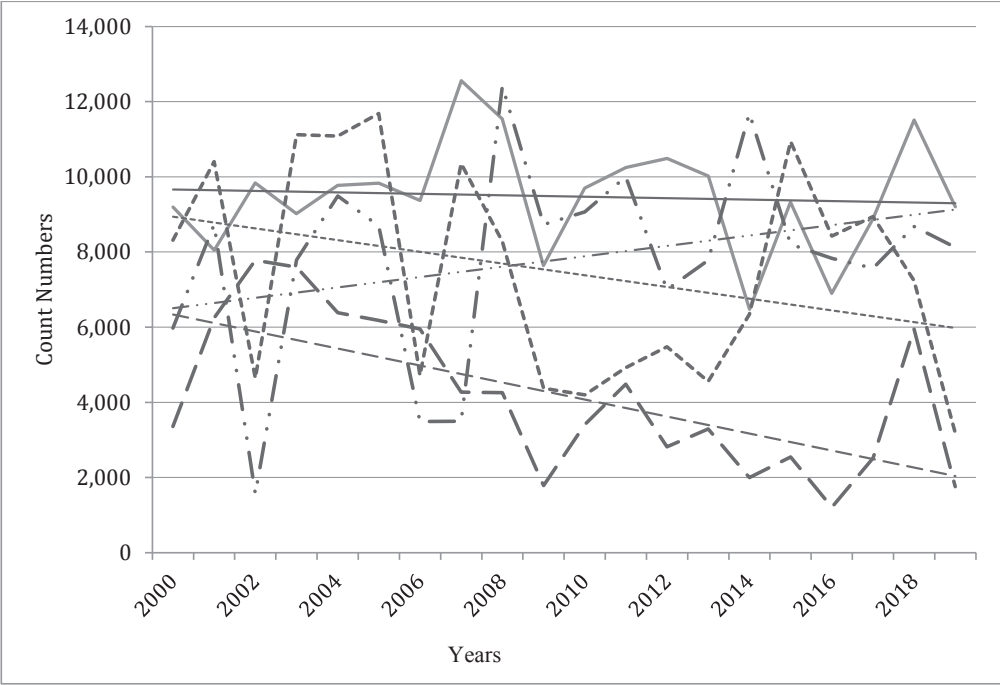


Figure 18. Summer counts of red knots in 2000–2019 for Manukau Harbour (solid line), Kaipara Harbour (dotted line), Firth of Thames (dashed line) and Farewell Spit (dashed and dotted line) with linear trendlines.

to New Zealand and southeastern Australia are predominantly the subspecies *rogersi*, which breeds in the Russian Far East, particularly Chukotka (Tomkovich *et al.* 2013). It was considered that a few of the subspecies *canutus* were also present in New Zealand each year; however, a new subspecies, *piersmai*, was described (Tomkovich 2001), which breeds on the New Siberian Islands and is the most numerous subspecies in NW Australia. In full breeding plumage they can be separated from *rogersi* in the field and it is now known that some *piersmai* reach New Zealand each year and these would have been those birds considered as *canutus* in the 1980s and 1990s. The proportion of *piersmai* in New Zealand has not been determined.

In 1993 the EAAF population of red knot was estimated to be 255,000 birds (Watkins 1993) with *rogersi* being the only subspecies recognised at the time. That figure has been revised down to around 110,000 (Rogers *et al.* 2010) and is probably continuing to decline with habitat loss at stopover sites in the Bohai Sea arm of the Yellow Sea being a major contributing factor (Amano *et al.* 2010; Yang *et al.* 2011). To date only one major staging site has been found in East Asia, on the Luannan coast of the Bohai Sea, where several tens of thousands are counted annually (Rogers *et al.* 2010; Chris Hassell *pers. comm.*). As we have seen, estimating wader populations is very difficult, particularly when the breeding ranges are remote, vast and rarely visited by wader researchers, and in countries such as Australia finding and counting all individuals of a species is rarely possible with available resources. A further problem is that often data used for estimating populations are several, or even many, years old.

During the 1983–1994 survey, red knot numbers in New Zealand ranged from 33,054 (1993) to 67,367

(1991) with a mean of 51,227 and, correcting for sites not counted each year, the national population was estimated to be a little over 58,500 birds.

Counts during the 2005–2019 period ranged from 24,994 (2009) to 40,220 (2008) (Table 12) with a mean of 32,080, a decline of 37.4% since 1983–1994. Winter counts ranged from 987 (2014) to 3,691 (2006) birds (Table 12).

Although the red knot is the second most numerous wader species in New Zealand, they occur in high numbers at only a few sites, chief among these being Kaipara Harbour, Manukau Harbour, Firth of Thames, and Farewell Spit (Fig. 17), which together accounted for 85% of the average count each year. The decline in numbers on the Kaipara Harbour, Manukau Harbour and Firth of Thames over the extended period 2000–2019, but an increase at Farewell Spit can be seen in Figure 18. In the 1983–1994 period there were eight sites that had averages of >1,000 red knots during summer counts, compared to just four sites in this period (Table 13) and only one site, Manukau Harbour, averaged >1,000 in winter 2005–2019.

It is not clear from the data how well the Manukau Harbour was counted in the 1960s because red knots were recorded at only 1–2 roost sites around the harbour, so although data exist from 1960, Figure 19 only covers the 50-year period 1970–2019.

3. Ruddy turnstone (*Arenaria interpres*)

The ruddy turnstone breeding range is circumpolar at high latitudes along coastal regions of Scandinavia, Siberia, Alaska, Canada, and Greenland. Their non-breeding range extends to the coasts of all southern hemisphere landmasses (Heather & Robertson 2015). The estimated EAAF

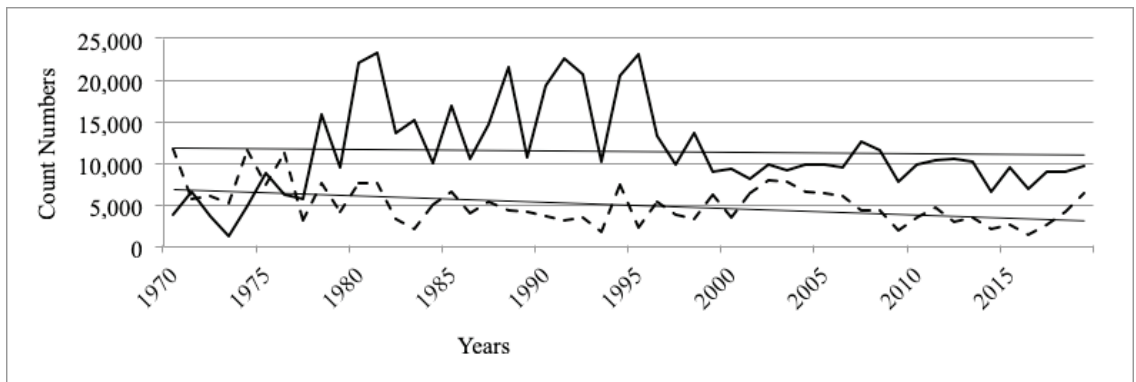


Figure 19. Summer counts of red knots in 1970–2019 at Manukau Harbour (solid line) and Firth of Thames (dashed line) with linear trendlines.

Table 13. Sites where a mean of >500 red knot were counted during summer and >100 during winter 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Manukau Harbour	15	9,580	1,676	6,477–12,560
Farewell Spit	15	8,184	2,408	3,490–12,416
Kaipara Harbour	15	6,908	2,719	3,189–11,683
Firth of Thames	15	3,257	1,501	1,210–6,180
Whangarei Harbour	14	828	604	19–2,100
Parengarenga Harbour	11	823	1,112	0–3,500
Tasman Bay	15	721	154	430–1,015
Rangaunu Harbour	9	533	510	0–1,650
Clifton Rd - Whitford	13	391	355	0–860
Winter				
Manukau Harbour	15	1,181	614	210–2,278
Kaipara Harbour	15	282	294	10–1,109
Rangaunu Harbour	7	200	432	0–1,175
Firth of Thames	15	198	216	0–800
Farewell Spit	15	194	189	13–733

Table 14. Sites where a mean of >50 ruddy turnstones were counted during summer and >25 during winter 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Farewell Spit	15	333	227	104–1,028
Manukau Harbour	15	265	81	120–412
Kaipara Harbour	15	255	113	86–466
Rangaunu Harbour	9	218	162	0–561
Parengarenga Harbour	11	194	176	0–627
Tasman Bay	15	119	48	33–182
Portland Island	1	113	0	113–113
Awarua Bay	15	81	47	12–200
Tauranga Harbour	14	62	72	0–182
Invercargill Estuary	15	58	42	0–150
Riverton	8	46	41	0–107
Winter				
Farewell Spit	15	69	48	1–155
Manukau Harbour	15	63	39	14–140
Kaipara Harbour	15	48	27	7–91
Tasman Bay	15	21	24	0–68



Figure 20. Distribution and mean numbers of ruddy turnstones during summer and winter 2005–2019.

population in 1993 was 28,000 (Watkins 1993). Hansen *et al.* (2016) estimated the EAAF population to be 30,000, not because there was real increase, but because roosting sites were better known. The New Zealand annual counts in 1983–1994 ranged from 2,394 to 5,915 birds, with an average 4,227 and an estimated New Zealand population of 5,069 taking into account sites missed in some years. Since then, the ruddy turnstone population has declined dramatically. The highest count in 2005–2019 was 2,468 in 2019 and the lowest was 921 in 2012, when Parengarenga and Rangaunu Harbours were not surveyed – each site usually averaged over 100 birds on summer censuses. The 2019 summer figure is considerably higher than the previous three years when counts ranged from 1,497 to 1,925 and averaged 1,654 birds (Table 12). Even with the high count in 2019, there has still been a 61% decline between the two survey periods (Table 12). They were rarely found on the west coast of New Zealand, except for Farewell Spit, preferring eastern harbours and estuaries from Parengarenga to Invercargill, with the largest concentrations being in the Far North, Auckland, Nelson, and Southland regions (Fig. 20); but, many use rocky wave platforms, including on the Chatham and the Subantarctic Islands, and these sites were not covered in these surveys. Because

ruddy turnstone are less reliant on mudflats and are found in a wide range of coastal habitats it could be expected that they would be less affected by loss of habitat in the Yellow Sea, and so it is difficult to determine what the problems are for this declining species. Although the overall numbers in New Zealand each summer have declined significantly, numbers in the Manukau Harbour have remained stable since counts began in 1960, but over the same period numbers on the Firth of Thames have declined dramatically (Fig. 21). During the 1983–1994 period, 14 sites each held an average of 50 or more ruddy turnstone, but this declined to 11 sites in the summers of 2005–2019 (Table 14). Maximum counts at most of those sites were much reduced during this latest survey period.

4. Pacific golden plover (*Pluvialis fulva*)

The Pacific golden plover is the fourth most numerous northern hemisphere-breeding wader to visit New Zealand each summer from breeding grounds in the Arctic and sub-Arctic of Siberia and Alaska (Heather & Robertson 2015). They migrate to South East Asia and Australasia on the EAAF and had a flyway population estimated at 90,000 in 1993 (Watkins 1993). A more recent estimate of

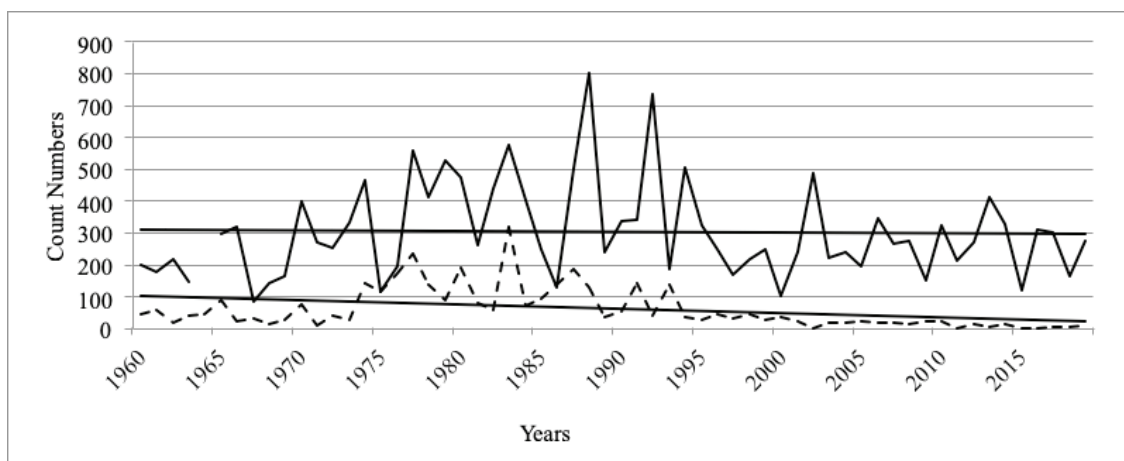


Figure 21. Summer counts of ruddy turnstone in 1960–2019 for Manukau Harbour (solid line) and Firth of Thames (dashed line) with linear trendlines.

120,000 birds (Hansen *et al.* 2016) was as a result of finding more sites with Pacific golden plovers rather than an increase in the population. The total global population was estimated at 190,000–250,000 in 2006 (BirdLife International 2018b). Due to its widespread non-breeding distribution it is difficult to determine whether the population is declining, but the counts in New Zealand presented here indicate a considerable decline at the extreme end of their migration route.

Before 2019, there were no data on whether the Pacific golden plovers that occur in New Zealand were from breeding populations in Alaska, Siberia, or both, or what their migration routes were. However, in February 2019 three Pacific golden plovers were each fitted with a GPS pinpoint satellite tag at Pūkoro Mirānda in an attempt to answer these questions and by early June 2019 two had reached Alaska via stopovers in Japan. One appeared to be heading for Siberia before turning east to cross the Bering Sea to Alaska (Pūkoro Mirānda Naturalists' Trust [PMNT] *unpubl. data*). Although the three transmitters are no longer working, one (JoJo) worked long enough to be tracked from Alaska to Kiribati where it stayed from 22 September to 25 October 2019, before moving south to Tongatapu, transmitting from there between 30 October and 19 November 2019. It was seen back at Pūkoro Mirānda on 15 March 2020.

This is another species in marked decline, which does not use the Yellow Sea both ways on migration, and the small sample from Firth of Thames did not use the Yellow Sea at all.

They are widespread on Pacific islands with

many of the birds overwintering there breeding in Alaska (Marchant & Higgins 1993), and there is at least one record of an Alaskan banded bird being seen in New South Wales, Australia (Marchant & Higgins 1993). The only information on their site fidelity in New Zealand comes from three birds fitted with white flags at Jordan's Farm, Kaipara Harbour, in February 2005 and observed there for two subsequent summers (ACR *unpubl. data*), and one with an engraved flag banded at Karaka on the Manukau Harbour in February 2016 was seen there in January 2017 (Tony Habraken *pers. obs.*).

Numbers in New Zealand during the summer 1983–1994 surveys ranged from 151 (1993) to 1,120 (1987), with an average of 466 birds. Considerably fewer were counted during the 2005–2019 summer survey period with counts ranging from 64 (2014) to 301 (2007), average of 181 (Table 12). This represents a decline of around 60%, but not all favoured sites were counted in the most recent survey period, and counts at the most favoured sites varied considerably from year to year. This may be due to flocks being missed in some years if they were roosting away from traditional roost sites on count days. This was certainly the case on the Firth of Thames November 2019 census, when only six were counted but 30+ were seen in weeks either side of the census day. Pacific golden plover are rare during winter counts and were recorded only 18 times during the survey period with mostly just one or two birds seen. The highest winter count was eight on the Kaipara Harbour in June 2007.

Pacific golden plover are widespread in New Zealand, occurring regularly from Parengarenga Harbour in the north to Awarua Bay in the south

Table 15. Sites where a mean of >10 Pacific golden plover were counted during summer 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Lake Ellesmere	15	28.7	22.5	0–80
Kaipara Harbour	15	28.5	21.1	0–82
Firth of Thames	15	23.3	20.7	0–52
Maketu Estuary	12	18.8	27.9	0–91
Lake Wairarapa	10	15.0	8.8	0–27
Manukau Harbour	15	13.9	13.1	0–44
Invercargill Estuary	15	12.1	19.9	0–69
Ahuriri Estuary	10	10.9	5.0	1–16
Farewell Spit	15	10.7	9.6	2–37

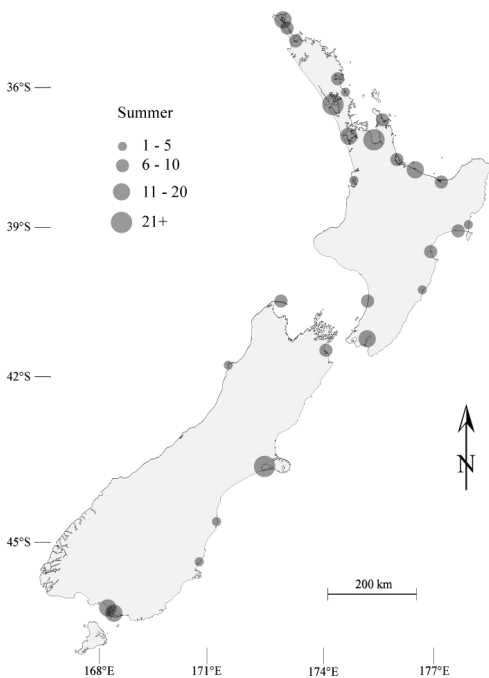


Figure 22. Distribution and mean numbers of Pacific golden plover during summer 2005–2019.

(Fig. 22) with Kaipara Harbour, Firth of Thames, and Lake Ellesmere being the only sites recording a mean of >20 birds (Table 15). They inhabit grasslands as much as tidal flats and are often seen in the upper tidal flats and saltmarsh (Heather & Robertson 2015), preferring to roost separately from other waders, and so may have been overlooked in some areas.

5. Red-necked stint (*Calidris ruficollis*)

Red-necked stint are restricted to the EAAF, breeding at high latitudes in Siberia and migrating south to South East Asia, the Philippines, and Australasia (Heather & Robertson 2015). During the 1983–1994 survey they were the most numerous wader on the EAAF with an estimated population of 471,000 of which 353,000 reached Australia in the non-breeding season (Watkins 1993). Those figures have since declined to 315,000 and 270,000 respectively (BirdLife International 2016). The IUCN status has subsequently risen from Least Concern to Near Threatened. The justification for this status change is due to monitoring data from Australia and New Zealand showing a population decline of 29% over three generations (Studds *et al.* 2017). Further research is needed to ascertain whether this is entirely due to a genuine global decline or whether it can partly be accounted for by a shift in the wintering range.

Hansen *et al.* (2016) estimated the red-necked stint population based on three factors: direct counts in Australasian non-breeding grounds (282,882), extrapolated to 285,343 based on spatial distribution, and 475,000 based on extrapolation of breeding range and density.

During the 1983–1994 survey the top two sites were Lake Ellesmere with a summer average of 68 and Awarua Bay with 27 birds. These two sites were still the most important in 2005–2019 but with summer averages of 29 and 20 respectively (Table 16). During summer 2005–2019 national totals ranged from 24 (2017) to 202 (2007), with an average of 93 birds (Table 12). Winter counts nationally ranged from 2 (2017) to 73 (2007), with an average of 15 birds. These compare to averages of 158 (summer) and 23 (winter) in the 1983–1994 survey, indicating a decline of about 40% between survey periods. Red-necked stint were found regularly at only a few sites in New Zealand each summer (Fig. 23).

Table 17. Sites where a mean of >1 whimbrel were counted during summer 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Manukau Harbour	15	6.8	5.2	0–16
Firth of Thames	15	6.0	8.1	0–22
Rangaunu Harbour	9	3.9	4.8	0–14
Kaipara Harbour	15	3.8	3.8	0–12
Parengarenga Harbour	11	3.7	8.5	0–25
Kawhia Harbour	15	1.8	4.8	0–18
Whangarei Harbour	14	1.7	3.6	0–13
Farewell Spit	15	1.5	20.	0–7
Ashley Estuary	14	1.4	1.7	0–6
Ohiwa Harbour	13	1.3	2.7	0–8

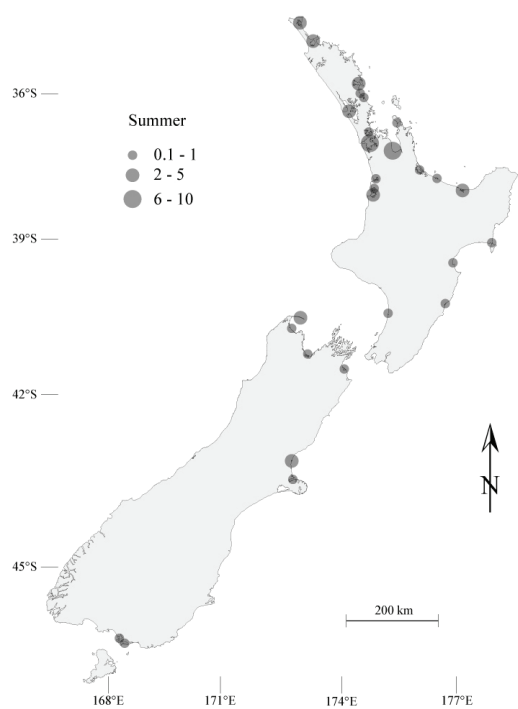


Figure 24. Distribution and mean numbers of whimbrel during summer 2005–2019.

6. Whimbrel (*Numenius phaeopus*)

It is possible that at least two subspecies of whimbrel visit New Zealand annually (Heather & Robertson 2015), the majority being Asiatic

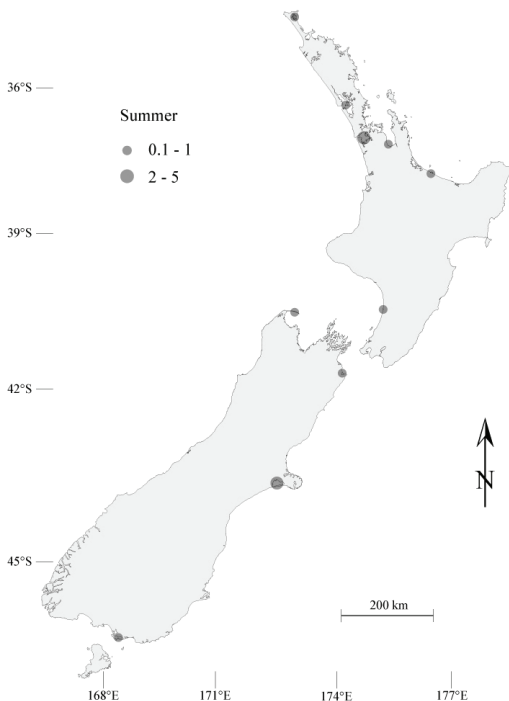
whimbrel (*N. p. variegatus*) with a smaller number of American whimbrel (*N. p. hudsonicus*) reported. Identification can be problematic because American whimbrel are usually identified in flight by their darker rumps; however, the rumps of *variegatus* are usually much lighter but can vary considerably across their breeding range of eastern Siberia (Pavel Tomkovich *pers. comm.*), and so identification based simply on rump colour may not be sufficient to conclusively identify *hudsonicus*. Consequently, counts of both Asiatic and American whimbrels are combined for this analysis.

Population estimates for whimbrel on the EAAF were 40,000 (Watkins 1993) and 65,000, based on a combination of direct counts, spatial extrapolation and estimated breeding range and density (Hansen *et al.* 2016).

Whimbrel can be elusive, are generally not easy to approach because they will often fly at the first sign of humans approaching and, like Pacific golden plover, will generally roost separately from other waders. Summer numbers during the 1983–1994 survey ranged from 33 (1990) to 178 (1992), with an average of 89 birds, and the largest single flock being 53 at Parengarenga Harbour in 1992. During the 2005–2019 survey, numbers ranged from 11 (2015) to 69 (2007), with an average of 31 birds (Table 12), representing a >60% decline between the two periods. The largest single flock counted was 25 at Parengarenga Harbour in 2011, and only five sites had a mean of >3 birds during summer 2005–2019 (Table 17). During the survey, four whimbrel at Invercargill Estuary and Awarua Bay in November 2019 were the only birds recorded south of Christchurch (Table 17; Fig. 24). Winter counts of whimbrel ranged from 1 (2009) to 27 (2005).

Table 18. Sites where a mean of ≥ 1 curlew sandpiper were counted during summers 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Lake Ellesmere	15	3.3	2.5	0–8
Manukau Harbour	15	2.3	2.7	0–7
Firth of Thames	15	1.2	2.1	0–6

**Figure 25.** Distribution and mean numbers of curlew sandpiper during summer 2005–2019.

7. Curlew sandpiper (*Calidris ferruginea*)

Curlew sandpiper breed in high Arctic Siberia (Heather & Robertson 2015) and the EAAF population estimate was 250,000 birds in 1993 (Watkins 1993) of which 188,000 were in Australia. By 2016 the estimated number was down to 90,000 birds (Hansen *et al.* 2016), a 64% decline, and the species is now classified as Near Threatened by IUCN (BirdLife International 2018c).

Summer counts ranged from 2 (2017) to 17 (2007) with an average of 7.9 birds (Table 12). This compares to the 1983–1994 survey when numbers ranged from 29 (1989, 1990) to 136 (1992) with an average of 75 birds and whilst never numerous in New Zealand, this shows an 89% decline between count periods.

Curlew sandpiper were recorded from Parengarenga Harbour to Awarua Bay, but at just ten sites during the survey period (Table 18; Fig. 25). A few are known to overwinter in New Zealand with up to seven (2010) counted (Table 12).

8. Sharp-tailed sandpiper (*Calidris acuminata*)

Sharp-tailed sandpiper breed in high Arctic of eastern Siberia (Heather & Robertson 2015) and are generally confined to the EAAF, where the population estimate was 166,000 birds in 1993 (Watkins 1993). A revised population estimate of

Table 19. Sites where an average of ≥ 1 sharp-tailed sandpiper were counted during summer 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Lake Ellesmere	15	5.4	4.5	0–13
Firth of Thames	15	4.6	3.7	0–14
Ahuriri Estuary	15	1.8	3.9	0–15
Porangahau Estuary	15	1.6	2.6	0–8
Manukau Harbour	15	1.5	2.3	0–8
Lake Grassmere	11	1.5	2.5	0–7

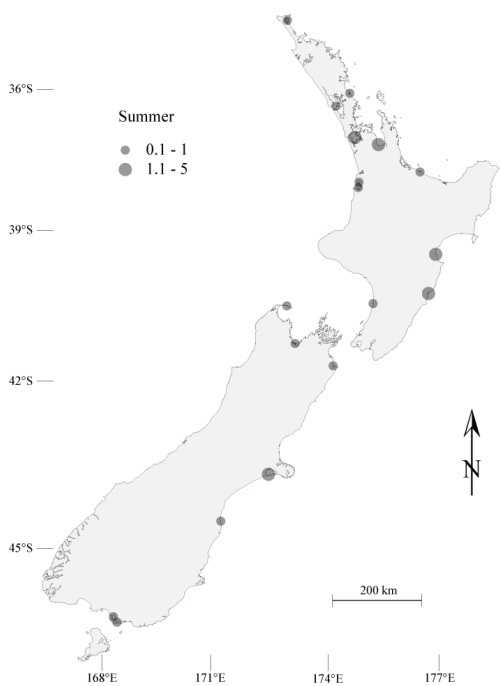


Figure 26. Distribution and mean numbers of sharp-tailed sandpiper during summer 2005–2019.

85,000 in 2016 (Hansen *et al.* 2016) represented a 50% decline. The majority spend the non-breeding season in Australia and New Guinea with small and decreasing numbers reaching New Zealand annually. As sharp-tailed sandpiper are not confined to mudflat habitats on migration, they should be more secure from the loss of intertidal habitat so other factors must be affecting them.

Summer counts ranged from 3 (2014, 2015) to 60 (2005) and averaged 19 birds (Table 12), compared to the 1983–1994 survey when numbers ranged from 34 (1984) to 175 (1987) with an average of 68 birds, a decline of >70%.

Sharp-tailed sandpiper were recorded at 17 sites

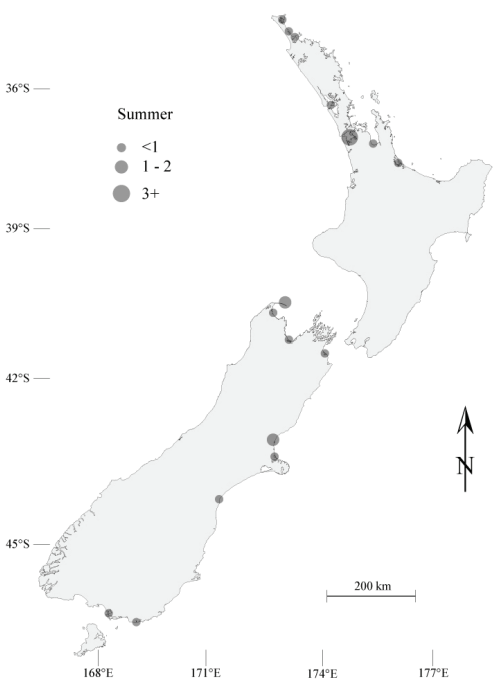


Figure 27. Distribution and mean numbers of eastern curlew during summer 2005–2019.

from Parengarenga Harbour to Awarua Bay during the summer survey periods (Table 19; Fig. 26). Winter numbers have always been low, with none recorded since 2011.

9. Eastern curlew (*Numenius madagascariensis*)

Eastern curlew are confined to the EAAF and breed in Northeast Asia. The estimated population was 21,000 birds in 1993 (Watkins 1993) with 19,000 in Australia during the non-breeding season. This was reassessed in 2006 at 38,000 birds, (Wetlands International 2006) and then 35,000 birds in 2016 (Hansen *et al.* 2016). These increases in the estimates

Table 20. Sites where ≥1 eastern curlew were counted during summer 2005–2019.

Site	No. Counts	Mean	SD	Range
Summer				
Manukau Harbour	15	3.2	2.6	0–8
Ashley Estuary	14	1.4	1.2	0–4
Farewell Spit	15	1.2	2.1	0–8

are likely due to much better counting coverage of birds in the non-breeding season rather than any actual increase in the population. An analysis of monitoring data collected from around Australia and New Zealand (Studds *et al.* 2017), suggested that the species has declined much more rapidly than was previously thought; with an annual rate of decline of approximately 5.2%, equating to a loss of 81.7% over three generations.

During the 1983–1994 survey period, summer count numbers ranged from 19 (1991) to 46 (1984), with an average of 29 birds. During the 2005–2019 survey, summer numbers ranged from 3 (2014) to 18 (2006) and averaged 8.6 birds (Table 12) indicating a 70% decline. Eastern curlew were recorded at only 15 sites during the summer surveys (Fig. 27) and at only seven of them on more than one occasion. Only three sites had a mean of ≥ 1 bird (Table 20). Once again the numbers are very low compared to Australia, but with small populations it is much easier to see population changes.

Winter counts during 1983–1994 ranged from 1 (1991) to 22 (1985) with an average of 7 birds, compared to winter counts of from 0 to 3 birds 2005–2019 with an average of 1.3, an 80% decline over the 1983–1994 period.

10. Terek sandpiper (*Tringa cinerea*)

The Terek sandpiper is included here as another example of an Arctic breeding species that appears to be in decline even though the EAAF population in 1993 was estimated at 36,000 birds, based on counts (Watkins 1993), but in 2016 it was revised to 30,761 estimated from direct counts and other data sources and then estimated at 50,000 based on extrapolated counts (Hansen *et al.* 2016). This has always been one of the least common wader species to regularly visit New Zealand, but was seen annually in small numbers. During the 1983–1994 survey a total of 39 were counted with from 1–9 each year of the survey. During the 2005–2019 survey only nine were counted in total with the highest count being three in 2005. Since 2007 only five have been counted with the last ones being in summer 2014 and 2019. This species is now rarely encountered in New Zealand at any time of year.

CONCLUSION

This study shows that New Zealand estuaries continue to support a large and varied population of waders that changes seasonally, although populations of all of the Arctic migrant species occurring in New Zealand are in decline, some seriously. Bar-tailed godwit may be an exception because annual counts have fluctuated considerably since the national wader counts began in 1983 and

the mean from the 2005–2019 counts was only c. 6% lower than in the 1983–1994 period; it is therefore difficult to draw a conclusion about the status of this species in New Zealand.

Although the loss of habitat at staging sites in East Asia is a major contributing factor to the decline of migratory wader populations, there are probably other factors affecting these birds both internationally and nationally. An example of this was seen on the Firth of Thames in the summer of 2019/2020 when 80 red knot, three banded dotterel, two bar-tailed godwit, one New Zealand dotterel, and one wrybill were found sick and dying. The red knots that were alive were taken into care for rehabilitation and of the total, 18 died and 62 recovered (Mailee Stanbury, DOC Thames, *pers. comm.*). It is likely many more were affected but efforts to find them were hampered when travel restrictions were introduced in New Zealand due to the Covid-19 outbreak. The cause has not been determined as yet but an algal bloom is a likely contender, perhaps brought on by the hot summer and runoff of nutrients from surrounding farmland.

Of the New Zealand breeding species, South Island pied oystercatcher is still the most abundant, even though its population has decreased since the 1983–1994 survey. Winter counts of pied stilt and banded dotterel are likely to underestimate their total numbers, primarily because not all these birds flock at estuaries and many banded dotterel migrate to Australia after breeding. Although variable oystercatcher and New Zealand dotterel are not fully counted, both show significantly increasing numbers at post-breeding sites that are monitored regularly. Some of this is likely to be a direct result of active protection afforded to them at many beach-nesting sites, generally by local community groups of volunteers, regional councils and the Department of Conservation.

Significant proportions of the EAAF populations of bar-tailed godwit, red knot, and ruddy turnstone migrate to New Zealand estuaries after breeding, and many pre-breeders remain for at least their first northern summer following their arrival here. New Zealand is at the extreme limit of the migration routes for many Arctic species and apart from bar-tailed godwit and red knot, only a small proportion of the flyway populations of these species occur here each year. As was the case during the 1983–1994 surveys, most waders still favour relatively few sites, particularly the large harbours of the northern North Island, Farewell Spit, Tasman Bay, Avon-Heathcote Estuary, and Southland estuaries. Large coastal lakes such as Wairarapa, Grassmere, and Ellesmere, plus smaller estuaries such as Ahuriri, Porangahau, and Manawatu supported as great a variety of species but in smaller numbers. This study, like the previous one, provides information about

the extent to which waders use particular estuaries. As such it provides important information required to put in place effective conservation actions. With continuing pressure on wader habitats along the whole EAAF it is important that we continue to monitor the native and migrant waders on an annual basis into the future.

ACKNOWLEDGEMENTS

None of these data would be available without the tremendous effort of more than 300 Birds New Zealand members and supporters who have headed out to estuaries, harbours and rivermouths, close to home, and in remote areas, in all weathers to count the waders and almost always at their own expense. We are extremely grateful to them all. We are especially grateful to all the regional organisers who spend long hours coordinating teams and collating their results.

We are also most grateful to reviewers Dick Veitch and Rob Clemens, and especially Hugh Robertson who made a huge contribution to improving this paper.

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Appendix 1. *continued*

SITES COUNTED BY YEAR		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WINTER																	
Sites counted out of 71																	
Waikato																	
25	Raglan Harbour	15	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26	Aotea Harbour	15	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27	Kawhia Harbour	15	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gisborne - Wairoa																	
28	Waipaoa Rivermouth	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
29	Wherowhero Lagoon	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
30	Mahia - Maungawhio	2	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Hawkes Bay																	
31	Ahuriri Estuary	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32	Waitangi Estuary	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
33	Porangahau Estuary	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manawatu																	
34	Manawatu Estuary	12	-	1	1	1	-	1	-	1	1	1	-	1	1	1	1
Wairarapa																	
35	Lake Wairarapa	8	-	-	-	-	-	-	1	-	1	1	1	1	1	1	1
Nelson																	
36	Farewell Spit	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
37	Westhaven Inlet	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
38	Golden Bay	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	Tasman Bay	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Marlborough																	
40	Pelorus Sound	12	-	1	1	1	1	-	1	1	-	1	1	1	1	1	1
41	Queen Charlotte Sound	12	-	1	1	1	1	-	1	1	-	1	1	1	1	1	1
42	Wairau Lagoon	5	-	1	1	1	1	-	1	-	-	-	-	-	-	-	-
43	Lake Grassmere	12	-	1	1	1	1	-	1	1	-	1	1	1	1	1	1
44	Kaikoura Peninsula	3	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-
West Coast																	
45	Orowaiti Estuary	10	-	-	-	-	1	1	1	1	1	-	1	1	-	1	1
46	Okari Estuary	10	-	-	-	-	1	1	1	1	1	-	1	1	-	1	1

Appendix 1. continued

SITES COUNTED BY YEAR																			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WINTER																			2004															
Sites counted out of 71																			Number of Counts															
Chatham Islands																			1			1	-	-	-	-	-	-	-	-	-	-	-	-
74	Chatham Island																																	
Canterbury																																		
47	Waipara Estuary													10		1	1	1	-	1	1	-	-	1	1	1	1	1	1					
48	Ashley Est. & Saltwater Creek													15		1	1	1	1	1	1	1	1	1	1	1	1	1	1					
49	Waimakariri & Brooklands Lag.													14		1	1	1	1	1	1	-	1	1	1	1	1	1	1					
50	Travis Wetland													14		1	1	1	1	1	1	-	1	1	1	1	1	1	1					
51	Avon-Heathcote Estuary													15		1	1	1	1	1	1	1	1	1	1	1	1	1	1					
52	Lyttelton Harbour													15		1	1	1	1	1	1	1	1	1	1	1	1	1	1					
53	Banks Peninsula													15		1	1	1	1	1	1	1	1	1	1	1	1	1	1					
54	Lake Forsyth													12		-	1	1	1	1	1	1	1	1	1	1	1	1	-					
55	Lake Ellesmere													15		1	1	1	1	1	1	1	1	1	1	1	1	1	1					
56	Coopers Lagoon													9		1	1	-	1	-	1	1	1	1	1	-	1	-	-					
58	Ashburton Rivermouth													6		1	-	-	1	1	-	1	-	-	-	-	1	1	1					
59	Rangitata Rivermouth													4		-	1	-	1	-	-	-	-	-	-	1	-	-	-					
60	Spider Lagoon													2													1	1	1					
61	Opihi Rivermouth													11		1	-	-	1	1	1	1	1	1	1	1	1	1	1					
62	Washdyke Lagoon													13		1	1	1	-	1	-	1	1	1	1	1	1	1	1					
63	Lake Ki-Wainono													12		1	1	1	-	1	1	-	1	1	1	1	1	1	1					
Otago																																		
64	Karitane													9		-	-	-	-	1	1	1	1	1	1	1	1	1	1					
65	Blueskin Bay - Warrington													9		-	-	-	-	1	1	1	1	1	1	1	1	1	1					
66	Otago Peninsula & Harbour													14		-	1	1	1	1	1	1	1	1	1	1	1	1	1					
67	Catlin Lake Estuary													12		-	1	-	1	1	1	1	1	1	1	1	1	1	1					
Southland																																		
68	Waikawa Harbour													8		-	-	1	1	-	-	-	1	1	1	1	1	1	1					
69	Haldane Estuary													7		-	-	1	1	-	-	-	1	-	1	1	1	1	1					
70	Fortrose - Toetoes Estuary													11		-	-	1	1	1	-	1	1	1	1	1	1	1	1					
71	Awarua Bay													15		-	1	1	1	1	1	1	1	1	1	1	1	1	1					
72	New River Estuary - Invercargill													13		-	1	-	1	1	1	1	1	1	1	1	1	1	1					
73	Riverton													8		-	-	1	-	-	1	-	1	1	1	1	1	1	1					
No. Sites Counted																			13	43	45	42	51	45	49	54	50	41	58	55	52	58	61	56

Appendix 2. OSNZ regions and sites counted on two or more occasions in summer (November /December) 2004–2019. (1 = counted, ‘-’ = no count). See Figure 1 & 2 for locations of sites.

SITES COUNTED BY YEAR		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SUMMER	Number of Counts																
Sites counted out of 72																	
Far North																	
1	Parengarenga Harbour	11	-	-	1	1	1	1	1	1	-	1	-	1	1	1	1
2	Houhora Harbour	11	-	-	-	1	1	1	1	1	-	1	-	1	1	1	1
3	Rangaunu Harbour	9	-	-	1	1	1	1	-	-	-	-	-	1	1	1	1
Northland																	
4	Whangarei Harbour	14	-	1	1	1	1	-	1	1	1	1	1	1	1	1	1
5	Ruakaka Estuary	14	-	1	1	1	1	-	1	1	1	1	1	1	1	1	1
6	Waipu Estuary	14	-	1	1	1	1	-	1	1	1	1	1	1	1	1	1
10	Kaipara Harbour - North	15	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Auckland																	
10	Kaipara Harbour - South	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Mangawhai Estuary	15	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Te Arai Canal	14	-	1	-	1	1	1	1	1	1	1	1	1	1	1	1
9	Whangateau Harbour - Omaha	15	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	Waitemata Harbour	12	1	1	1	-	1	1	1	1	-	-	-	1	1	1	1
Auckland - South Auckland																	
16	Manukau Harbour	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
South Auckland																	
11	Colville Harbour	3	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-
12	Coromandel Harbour	3	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-
13	Whangapoua Harbour	9	-	-	1	1	1	1	1	1	1	-	-	-	-	-	1
15	Tamaki Estuary	8	-	-	-	-	-	1	-	1	1	1	1	1	-	1	1
17	Clifton Road - Whitford	13	-	1	1	-	-	1	1	1	1	1	1	1	1	1	1
18	Tairua Harbour	6	-	-	-	1	1	1	1	1	1	-	-	-	-	-	1
20	Firth of Thames	16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	Port Waikato	5	-	-	-	-	-	-	-	-	-	1	1	1	-	1	-

Appendix 2. continued

[illegible]

Appendix 2. *continued*

SITES COUNTED BY YEAR		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WINTER																	
Sites counted out of 71		Number of Counts															
West Coast																	
45	Orowaiti Estuary	-	1	-	1	1	-	1	-	1	1	1	-	1	-	1	1
46	Okari Estuary	-	1	-	-	-	-	1	-	-	1	1	-	1	-	1	1
Canterbury																	
47	Waipara Estuary	-	1	-	1	1	-	1	1	1	1	-	1	1	1	1	1
48	Ashley Est. & Saltwater Creek	-	1	1	1	1	-	1	1	1	1	1	1	1	1	1	1
49	Waimakariri & Brooklands Lag	-	1	1	1	1	1	1	-	1	1	1	1	1	1	1	1
50	Travis Wetland	-	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1
51	Avon-Heathcote Estuary	-	1	1		1	1	1	1	1	1	1	1	1	1	1	1
52	Lyttelton Harbour	-	1	1	-	1	1	1	1	1	1	1	1	1	1	1	1
53	Banks Peninsula	-	1	1	1	1	-	1	1	-	1	1	1	1	1	1	1
54	Lake Forsyth	-	1	-	1	1	1	1	1	-	-	1	-	1	1	1	1
55	Lake Ellesmere	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
56	Coopers Lagoon	-	-	1	1	1	-	-	-	-	1	-	1	-	1	-	-
57	Rakaia Rivermouth	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	-
58	Ashburton Rivermouth	-	-	-	-	-	-	-	-	-	1	-	1	-	1	1	1
60	Spider Lagoon	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1
61	Ophi Rivermouth	-	1	-	-	1	-	-	-	-	1	-	-	1	1	1	1
62	Washdyke Lagoon	-	1	1	-	1	-	-	-	1	1	-	1	1	1	1	1
63	Lake Ki-Wainono	-	1	-	1	-	-	-	-	-	1	-	1	1	1	1	1
Otago																	
64	Karitane	-	1	-	-	1	1	-	1	1	1	1	1	1	1	1	1
65	Blueskin Bay - Warrington	-	1	-	-	-	1	-	1	1	1	1	1	1	1	1	1
66	Otago Peninsula & Harbour	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
67	Catlin Lake Estuary	-	1	1	1	1	1	-	1	1	1	1	1	1	1	1	1
Southland																	
68	Waikawa Harbour	-	-	1	1	1	1	-	-	-	-	-	1	1	1	1	1
69	Haldane Estuary	-	-	1	1	1	1	-	-	-	-	-	1	1	-	1	1
70	Fortrose - Toetoes Estuary	-	-	1	1	1	1	1	-	-	-	-	1	1	1	1	1
71	Awarua Bay	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
72	New River Estuary - Invercargill	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
73	Riverton	-	-	-	1	1	1	-	-	1	-	-	1	1	1	1	-
No. Sites Counted		9	54	42	55	56	43	50	49	45	58	49	55	59	59	63	65

Appendix 3. National winter counts June–July 2004.‘-’ = zero counted.

Species	Species Totals	North Kaipara Harbour	South Kaipara Harbour	Mangawhai Estuary	Waitemata/Tamaki	Manukau Harbour	Firth of Thames	Hawkes Bay	Southern Hawkes Bay	Tasman Bay	Golden Bay	Farewell Spit
red knot	1,378	-	11	-	-	1,021	166	-	-	-	26	154
curlew sandpiper	1	-	-	-	-	1	-	-	-	-	-	-
sharp-tailed sandpiper	2	-	-	-	-	2	-	-	-	-	-	-
red-necked stint	12	-	3	-	-	9	-	-	-	-	-	-
eastern curlew	3	-	-	-	-	3	-	-	-	-	-	-
whimbrel	7	-	7	-	-	-	-	-	-	-	-	-
bar-tailed godwit	4,623	147	1,303	40	5	1,443	509	31	27	302	75	741
black-tailed godwit	1	-	-	-	-	-	1	-	-	-	-	-
marsh sandpiper	1	-	-	-	-	1	-	-	-	-	-	-
Terek sandpiper	1	-	-	-	-	1	-	-	-	-	-	-
ruddy turnstone	66	-	24	-	-	23	-	-	-	1	-	18
variable oystercatcher	972	3	59	110	2	73	102	5	14	454	51	99
South Island pied oystercatcher	66,155	8,059	12,831	42	266	25,909	10,011	36	14	2,928	1,620	4,439
pied stilt	11,667	1,061	2,180	6	128	4,202	2,901	263	40	768	65	53
black stilt/hybrids	18	-	7	-	-	6	2	-	-	3	-	-
New Zealand dotterel	217	8	56	75	7	40	31	-	-	-	-	-
banded dotterel	2,152	42	558	84	-	505	146	-	95	289	48	385
lesser sand plover	3	-	-	-	-	3	-	-	-	-	-	-
wrybill	5,017	27	144	8	28	3,102	1,610	-	55	43	-	-
black-fronted dotterel	28	-	-	-	-	3	-	25	-	-	-	-
spur-winged plover	799	26	247	11	7	132	225	73	34	44	-	-
Totals	93,123	9,373	17,430	376	443	36,479	15,704	433	279	4,832	1,885	5,889

Appendix 4. National summer counts November–December 2004.

Species	Species Totals	South Kaipara Harbour	Mangawhai Estuary	Waitemata Harbour	Manukau Harbour	Firth of Thames	Tasman Bay	Golden Bay	Farewell Spit
red knot	41,944	11,081	191	4,000	9,771	6,382	430	147	9,942
sanderling	3	1	-	-	-	-	-	-	2
curlew sandpiper	6	-	-	-	3	-	-	-	3
sharp-tailed sandpiper	11	2	-	-	3	5	-	-	1
pectoral sandpiper	1	-	-	-	1	-	-	-	-
red-necked stint	26	-	-	-	19	-	-	-	7
eastern curlew	17	2	-	-	7	-	-	-	8
whimbrel	50	17	-	-	6	13	1	-	13
bar-tailed godwit	47,249	13,953	214	3,000	12,972	3,434	1,731	1,485	10,460
black-tailed godwit	2	-	-	-	2	-	-	-	-
grey-tailed tattler	1	-	-	-	1	-	-	-	-
Terek sandpiper	1	-	-	-	1	-	-	-	-
ruddy turnstone	1,064	317	25	-	245	19	71	-	387
variable oystercatcher	823	41	60	-	86	98	411	75	52
South Island pied oystercatcher	13,505	2,058	10	100	5,701	1,799	1,392	1,009	1,436
pied stilt	914	131	18	-	408	280	67	2	8
black stilt/hybrids	1	-	-	-	-	1	-	-	-
Pacific golden plover	36	7	-	-	13	8	-	-	8
grey plover	1	1	-	-	-	-	-	-	-
New Zealand dotterel	131	52	40	-	24	14	-	-	1
banded dotterel	111	12	3	-	1	-	67	9	19
lesser sand plover	1	-	-	-	1	-	-	-	-
greater sand plover	6	-	-	-	6	-	-	-	-
wrybill	53	8	-	-	4	41	-	-	-
black-fronted dotterel	1	-	-	-	1	-	-	-	-
spur-winged plover	428	155	8	-	58	176	31	-	-
Totals	106,386	27,838	569	7,100	29,334	12,270	4,201	2,727	22,347

Appendix 5. List of all wader species recorded during the 2005–2019 survey period. Nomenclature follows Gill *et al.* (2010).

Common Name	Scientific Name
red knot	<i>Calidris canutus</i>
great knot	<i>Calidris tenuirostris</i>
sanderling	<i>Calidris alba</i>
dunlin	<i>Calidris alpina</i>
curlew sandpiper	<i>Calidris ferruginea</i>
sharp-tailed sandpiper	<i>Calidris acuminata</i>
pectoral sandpiper	<i>Calidris melanotos</i>
red-necked stint	<i>Calidris ruficollis</i>
ruff	<i>Philomachus pugnax</i>
eastern curlew	<i>Numenius madagascariensis</i>
whimbrel	<i>Numenius phaeopus</i>
bar-tailed godwit	<i>Limosa lapponica</i>
black-tailed godwit	<i>Limosa limosa</i>
Hudsonian godwit	<i>Limosa haemastica</i>
wandering tattler	<i>Tringa incana</i>
grey-tailed tattler	<i>Tringa brevipes</i>
common sandpiper	<i>Tringa hypoleucos</i>
common greenshank	<i>Tringa nebularia</i>
marsh sandpiper	<i>Tringa stagnatilis</i>
Terek sandpiper	<i>Tringa cinerea</i>
ruddy turnstone	<i>Arenaria interpres</i>
red-necked phalarope	<i>Phalaropus lobatus</i>
variable oystercatcher	<i>Haematopus unicolor</i>
South Island pied oystercatcher	<i>Haematopus finschi</i>
Chatham Island pied oystercatcher	<i>Haematopus chathamensis</i>
pied stilt	<i>Himantopus himantopus</i>
black stilt	<i>Himantopus novaezelandiae</i>
Pacific golden plover	<i>Pluvialis fulva</i>
grey plover	<i>Pluvialis squatarola</i>
New Zealand dotterel	<i>Charadrius obscurus</i>
semipalmated plover	<i>Charadrius semipalmatus</i>
banded dotterel	<i>Charadrius bicinctus</i>
lesser sand plover	<i>Charadrius mongolus</i>
greater sand plover	<i>Charadrius leschenaultii</i>
oriental dotterel	<i>Charadrius veredus</i>
wrybill	<i>Anarhynchus frontalis</i>
black-fronted dotterel	<i>Euseyornis melanops</i>
shore plover	<i>Thinornis novaeseelandiae</i>
spur-winged plover	<i>Vanellus miles</i>