SHOREBIRDS OF FAREWELL SPIT, GOLDEN BAY AND TASMAN BAY

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Prepared for Nelson City Council and Tasman District Council

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Front cover photo David Melville: Bar-tailed Godwit and South Island Pied Oystercatcher roosting at Motueka Sandspit

SHOREBIRDS OF FAREWELL SPIT, GOLDEN BAY AND TASMAN BAY

Executive Summary

The coastal area of the Top of the South Island has extensive estuaries and large tidal flats that are visited by thousands of shorebirds annually. Shorebird surveys at the Top of the South Island started at Farewell Spit in 1961, and since 1983 biannual shorebird counts have been undertaken by members of the Ornithological Society of New Zealand (OSNZ). This report analyses the latest counts between November (spring) 2001 and June (winter) 2012.

The average number of all Arctic-breeding migratory shorebirds in the Top of the South Island in spring (November) showed a decline of 26% between the periods 1983-2000 and 2001-2012. In terms of total numbers, Red Knot declined by about 4,700 birds, Bar-tailed Godwit by about 5,100 and Ruddy Turnstone by about 500.

Populations of endemic shorebirds appear to be stable or showing a slight increase; Variable Oystercatcher had the largest increase of about 400 birds.

Eight *areas* are of international importance for at least one species of shorebird:

- Westhaven Inlet
- Farewell Spit
- Pakawau
- Collingwood
- Rototai
- Motueka Sandspit
- West Waimea Inlet (including Grossi Point and No-Mans Island)
- East Waimea Inlet (including Rabbit Island East, Bell Island Shellbank and Sand Island, Nelson Airport Area)

Motueka Sandspit and East Waimea Inlet are also of national importance for at least one shorebird species.

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1. INTRODUCTION

1.1 Scope of this report

Counts of shorebirds in the Top of the South Island started at Farewell Spit in 1961 and have continued as a national project of the Ornithological Society of New Zealand (OSNZ) since 1983, when geographical coverage was expanded to include sites in Golden and Tasman Bays.

This report analyses the latest counts between November 2001 and June 2012. For the purposes of this report shorebirds (also known as waders) are defined as oystercatchers (Haematopodidae), stilts (Recurvirostridae), plovers (Charadriidae) and sandpipers (Scolopacidae). A total of 68 species of shorebirds are known from New Zealand (Checklist Committee OSNZ 2010), of which 38 species have been recorded from the Top of the South Island (Appendix 1). A distinction is made between endemic and migratory shorebirds. Endemic shorebirds breed in New Zealand and, if migratory, stay within New Zealand or, as in the case of Banded Dotterel *Charadrius bicinctus* stay within Australasia. Migratory shorebirds breed in the northern hemisphere and migrate to spend the non-breeding season in New Zealand; the broad migration route used by these birds, together with the breeding and non-breeding areas, is known as the East Asian-Australasian Flyway (Boere & Stroud 2006).

Population trends are discussed and compared with an earlier shorebird assessment in the Top of the South Island (Schuckard 2002). Sites of national and international importance for shorebirds are identified.

1.2 International agreements

New Zealand is a party to two international conventions that relate to the conservation of migratory birds and their habitats.

The Convention on Wetlands of International Importance Especially as Waterfowl Habitat[1] (also known as the Ramsar Convention) promotes wetland conservation. The convention entered into force in New Zealand in 1976, at which time Farewell Spit was designated as a Wetland of International Importance. The Convention has established a set of criteria for the identification of wetlands of international importance and these are used in this report (see Section 1.5). The Convention requires (Art. 3.1) that 'The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List [of Wetlands of International Importance], and as far as possible the wise use of wetlands in their territory'.

The Convention on the Conservation of Migratory Species of Wild Animals[2] (also known as the Bonn Convention), provides a multinational framework for the conservation of migratory species. The Convention entered into force in New Zealand in 2000. Far Eastern Curlew *Numenius madagascariensis* is the only species that occurs in the Top of the South Island that is listed as an 'endangered migratory species' in Appendix I of the Convention, thereby requiring New Zealand to endeavour 'to conserve and, where feasible and appropriate, restore those habitats of the species which are of importance to removing the species from danger of extinction' (Art. III.4.a).

Additionally, in 2011, New Zealand joined the *East Asian–Australasian Flyway Partnership*[3] (EAAFP), which promotes the conservation of sites used by migratory shorebirds.The Partnership has criteria for identification of sites for nomination to the Flyway Site Network which are similar to those of the Ramsar Convention, but with additional criteria for staging sites used by migratory birds (see Section 1.5). Farewell Spit was designated an East Asian-Australasian Flyway Shorebird Network Site in 2000.

1.3 Global trends in shorebird populations

Globally many shorebird populations are in decline (Stroud *et al*. 2006), including those using the East Asian-Australasian Flyway, where rates of decline (5-9%, up to 26% for the critically endangered Spoon-billed Sandpiper *Eurynorhynchus pygaemus*) 'are among the highest of any ecological system on the planet' (MacKinnon *et al*. 2012).

In eastern Australia populations of small, mostly migratory shorebirds have fallen significantly (Olsen 2008); Wilson *et al*. (2011) recorded population declines of 43-79% over 15 years for many migrant waders at Moreton Bay, Queensland. Some of the declines can be attributed to destruction of important staging sites in Asia, such as in the Yellow Sea (Amano *et al*. 2010, Wilson *et al.* 2011). However, population declines are also known for endemic and migratory species that only occur in the southern hemisphere (Harding *et al.* 2007).

1.4 Seasonal variations of shorebirds in New Zealand

A number of New Zealand coastal wetlands are important habitats for long distance migrants and endemic shorebirds (Sagar *et al.* 1999, Schuckard 2002, Southey 2009).

[1] www.ramsar.org; [2] www.cme.int; [3] www.eaaflyway.net

Shorebirds utilise New Zealand tidal flats throughout the year, but the species composition changes. During the winter (June census) most shorebirds in the coastal area are endemic species like South Island Pied Oystercatcher[4] *Haematopus finschi*, Variable Oystercatcher *Haematopus unicolor*, Pied Stilt *Himantopus himantopus*, Banded Dotterel and Wrybill *Anarhynchus frontalis*. In spring (November census) most endemic species have moved inland to breed; those remaining on the coast are mostly long distance migrants like Red Knot *Calidris canutus*, Bar-tailed Godwit *Limosa lapponica*, Ruddy Turnstone *Arenaria interpres*, and Pacific Golden Plover *Pluvialis fulva*. During the late summer (February census), the coastal wetlands host long distance migrants as well as endemic species that have returned to the coast after breeding. Food demands on the tidal flats are highest during this summer period, when invertebrate biomass has to meet the needs of both endemic and migratory birds.

The most numerous shorebird species in New Zealand estuaries are Red Knot, Bar-tailed Godwit and South Island Pied Oystercatcher.

1.5 Identification of sites of significance for shorebirds

OSNZ count data allow for an objective assessment of sites against the criteria set down under the Ramsar Convention, to which New Zealand is a party. The Ramsar criteria for identifying sites of *international importance* based on waterbird numbers are:

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6. A wetland should be considered internationally important if it regularly supports 1% of the individuals of a population of one species or subspecies of a waterbird.

For those species where coastal habitats regularly support 1% or more of the flyway population, the site is identified as being of international importance, where 'regularly' is defined as:

> i) the requisite number of birds is known to have occurred in two thirds of the seasons for which adequate data are available, the total number of seasons being not less than three; or
>
> ii) the mean of the maxima of those seasons in which the site is internationally important, taken over at least five years, amounts to the required level (means based on three or four years may be quoted in provisional assessments only) (Ramsar Convention Secretariat 2010).

[4] Nomenclature follows Checklist Committee (OSNZ) 2010

The East Asian-Australasian Flyway Partnership also includes criteria for recognition of staging sites used by migrant shorebirds:

> iii) a staging site should be considered internationally important if it regularly supports 0.25% of individuals in a population of one species or subspecies of waterbirds on migration.
>
> iv) a staging site should be considered internationally important if it regularly supports 5,000 or more waterbirds at one time during migration.

Another set of crtiteria for identifying areas of *national importance* was proposed by Watkins (1993). The major difference is the use of 1% or more of the minimum population estimate for a country, rather than the minimum flyway population estimate. The second modification for a national assesment for shorebirds was to lower the 'total number of shorebirds' criterion from 20,000 to 10,000. These criteria were applied to New Zealand populations to identify sites of national importance by Schuckard (2002) and are used in this report.

The protocol for application of these criteria, as used in this report, is summarised in Figure 1.

The Ramsar Convention Secretariat (2010) notes that 'To ensure international comparability, wherever possible Contracting Parties should use the international population estimates and 1% thresholds published and updated every three years by Wetlands International[5] as the basis for evaluating sites for the List' [of Wetlands of International Importance]. The most recent assessments (2013) are used in this report (see section 4.3).

The significance of coastal habitats for shorebirds in the Top of the South Island was established over a decade ago using data up until June (winter) 2001 (Schuckard 2002). The current report analyses and assesses data gathered over the succeeding 11 years between November (spring) 2001 and June (winter) 2012. In the Top of the South Island, OSNZ has carried out a combination of winter (June), spring (November) and summer (February) counts since 1999. The addition of the summer census to the historic spring and winter counts has contributed to a better understanding of shorebirds populations and their use of coastal habitats.

[5] http://wpe.wetlands.org/

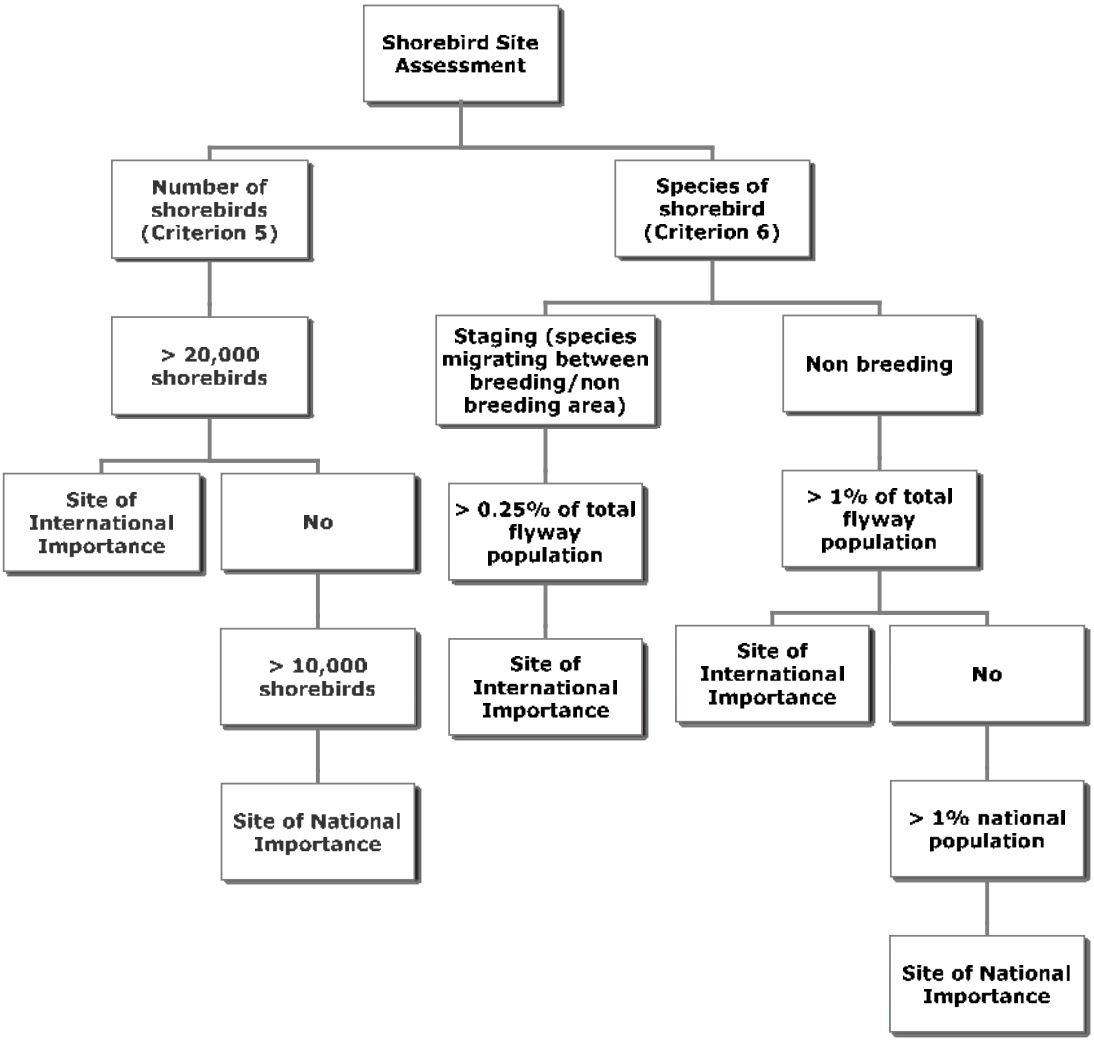

Figure 1 Protocol for assessing sites of importance for shorebirds.

National shorebird populations were first determined for the period 1983-1994 (Sagar *et al*. 1999). During two consecutive years, a national summer census (February 2008 and February 2009) was undertaken in addition to the standard national winter and spring censuses (OSNZ *in prep*.). Preliminary results of this national effort have been used to establish the national shorebird numbers in New Zealand at that time (see Section 4.1). The most recent published and unpublished population estimates have been included in this report.

2. METHODS AND STUDY AREA

2.1 Counts

Counts are undertaken over the spring high tide period when birds are concentrated at roost sites.

Most shorebirds forage on intertidal flats, and as the rising tide covers the flats birds gather at communal roosting sites where they remain for several hours over high tide. Once the ebbing tide uncovers the flats birds resume foraging. Generally birds will select a roost site close to their foraging grounds, thereby minimising time and energy spent commuting between the two.

It is not possible to undertake synchronous counts at all sites, but counts are coordinated such that most sites in one area are counted at the same time and all counts are completed within a one week period.

Most roost sites are used regularly; however birds may move sites in response to short-term factors such as human disturbance and extreme weather conditions.

The dynamic nature of the coastal environment means that physical changes occur as a result of erosion and deposition. Examples are the erosion of the eastern end of Rabbit Island, and the growth of Sand Island in East Waimea Inlet, and the appearance of new sand bars off Totara Avenue and Collingwood in Golden Bay.

2.2 Farewell Spit

Farewell Spit is a 30km long sandspit extending east and south-eastwards from the northern tip of the South Island of New Zealand, across the northern part of Golden Bay (Figure 2). The predicted average tidal range in Golden Bay varies between 1.4m and 3.8m and the predicted spring tidal range varies between 0.5m and 4.7m (Collingwood). The water circulation within Golden Bay is usually in a clockwise direction that splits from the eastward moving d'Urville current of Cook Strait (Ballance *et al.* 2006). This gyre is driven by the predominant west to northwest winds. The area of Farewell Spit is about 11,388 ha, with about 1,961 ha above mean high water mark and an intertidal zone of about 9,427 ha (Cromarty & Scott 1996). Farewell Spit was designated as a Wetland of International Importance (Ramsar Site) in 1976.

During a census, Farewell Spit is counted in five different sections. The census takes one or two days, dependent on the experience of the counters and the number of people available.

Figure 2a Map of shorebird roosting sites in the Top of the South Island where surveys were undertaken.

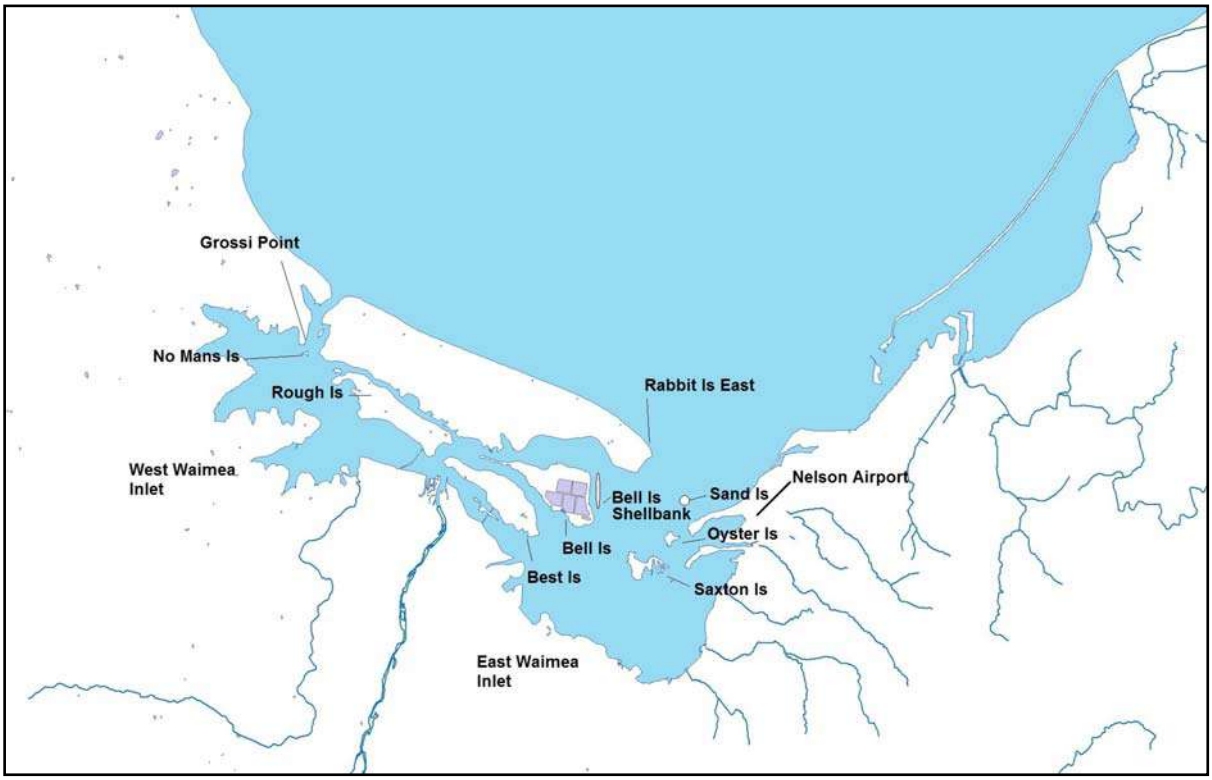

Figure 2b Map of shorebird roosting sites in the Waimea Inlet.

2.3 Golden Bay and Westhaven Inlet

Golden Bay at the northwest end of New Zealand's South Island is a shallow bay with an easterly open exposure to the Cook Strait (Figure 2). The total coastal length is about 171 km with major shoreline habitats including estuaries, beaches, dunes and rocky shores (Robertson & Stevens 2012). In the north, a significant part of Golden Bay is sheltered from the open ocean by Farewell Spit (see 2.2). Two big south-to-north flowing rivers (Aorere and Takaka Rivers) have created large coastal estuaries with important shorebird sites. Estuaries range in size from the very small estuaries like Taupata Estuary (0.4ha) to the larger estuaries like Ruataniwha Inlet at Collingwood (864ha). In Golden Bay/Westhaven 11 sites have been visited during shorebird counts, nine of which have been counted regularly: Westhaven Inlet, Taupata Creek, Pakawau, Totara Avenue, Collingwood, Parapara, Paton's Rock, Rototai, and Wainui Inlet. Onekaka and Pohara have only been counted occasionally and are not included in this analysis.

In Golden Bay, sandbanks have built up in front of Totara Avenue (starting about 2005) and are now often used as a high tide roost. Only with extreme high tides

(≥4.8m), are birds pushed elsewhere. There is also a sandy island in front of Collingwood, often hosting roosting shorebirds. Due to difficulties of access this island has been omitted from the census. Where possible, numbers have been estimated from Collingwood through a telescope.

2.4 Tasman Bay

Tasman Bay is a large V-shaped bay at the north end of New Zealand's South Island (Figure 2). It stretches along 120 kilometres of coastline including estuaries, beaches, dunes and rocky shores (Robertson & Stevens 2012). Separation Point, located in Abel Tasman National Park, is the western-most point of the bay, separating it from Golden Bay. The land includes the coastal plains around the mouth of the Waimea River, at the bay's southernmost point, and the Motueka River. Both river mouths have coastal estuaries hosting significant numbers of shorebirds. Other rivers entering the sea include the Moutere, Riwaka, Otuwhero/Holyoake and Marahau Rivers. The long low form of Rabbit Island, a sand barrier island, is located close to the bay's south coast. The 13km long Boulder Bank encloses Nelson Haven and Wakapuaka flats, which includes the North Nelson sewage treatment ponds and associated wetland areas. Delaware Bay is the most northern site included in the Tasman Bay survey.

A very good example of how changing coastal dynamics can affect shorebird distribution was the disappearance of the sand beach at the eastern end of Rabbit Island in the winter of 2009. Subsequently an island developed between Nelson Airport and Rabbit Island, referred to as 'Sand Island' in this report. This island now not only hosts the most significant number of roosting shorebirds in the whole of eastern Waimea Inlet on high tides, but is also an important breeding site for birds such as Variable Oystercatcher, White-fronted Tern *Sterna striata* and Black-billed Gull *Larus bulleri*. From the winter of 2009, this newly developed island has been incorporated in the shorebird counts.

In Tasman Bay, there are eight areas where regular shorebird counts have been carried out: Awaroa, Marahau, Motueka Sandspit, Moutere Inlet, West Waimea Inlet (Grossi Point/No-Mans Island), East Waimea Inlet (Rabbit Island, Bell Island Shellbank, Sand Island, Nelson Airport area), Nelson Haven and Delaware Bay. Due to incomplete data sets, the Riwaka coastal area has not been included in this assessment, but only small numbers of birds are present there.

3. LIMITATIONS AND VALIDITY OF DATA

3.1 Timing of sampling

Shorebirds in the Top of the South Island have been counted during the winter (June), spring (November) and summer (February) over the study period between 2001 and 2012. OSNZ's national shorebird counts take place in winter (June) and spring (November) – resource constraints have meant that only two national February counts have been made (2008 and 2009). Australia also conducts a June census but instead of spring their choice for assessment of migratory shorebirds is a summer census (December to February) since populations are thought to be most stable at that time with relatively little movement between sites (including trans-Tasman) (Watkins 1993, Bamford & Watkins 2005).

Counting shorebirds at roosts is the most efficient way to obtain information on numbers of birds present, however it must be recognised that the resulting information can only be used in conservation assessments of the roost sites. Whilst shorebirds usually roost close to their foraging sites additional surveys are required to delimit these areas.

3.2 Movements

Movements of birds may affect count results if birds move between roost sites during a count period. Furthermore the assessment of the conservation importance of an individual site may be affected by movements of birds.

Movements of Bar-tailed Godwits and Red Knots in New Zealand have been studied through an individual colour-banding programme (Battley *et al.* 2011). On average, young birds of both species were more mobile compared to adults and Red Knots were generally more mobile than Bar-tailed Godwits. Overall, adult Bar-tailed Godwits are highly site faithful during the non-breeding period in New Zealand.

Observations of marked birds have revealed that Bar-tailed Godwits occurring at the base of Farewell Spit (Gobi Desert) are part of the population that forages along the Golden Bay coast as far south as Totara Avenue; the location of where birds roost on any particular day being related largely to disturbance. For example, the sandspit at Pakawau is frequently used early in the summer but is largely abandoned after Christmas as holiday homes are occupied and people and dogs frequent the beach. However observations of marked birds show that birds then move to other sites, such as Farewell Spit. In Tasman Bay, during low

spring tides Bar-tailed Godwits roost at a number of sites such as the head of Nelson Haven, the Bell Island Shellbank and Sand Island, as well as Motueka Sandspit, but on 'King' tides the majority of the Waimea Inlet godwits (>4,000 birds; Figure 3a) are forced to Motueka Sandspit (Figure 3b), as this is the last remaining site as the others become inundated.

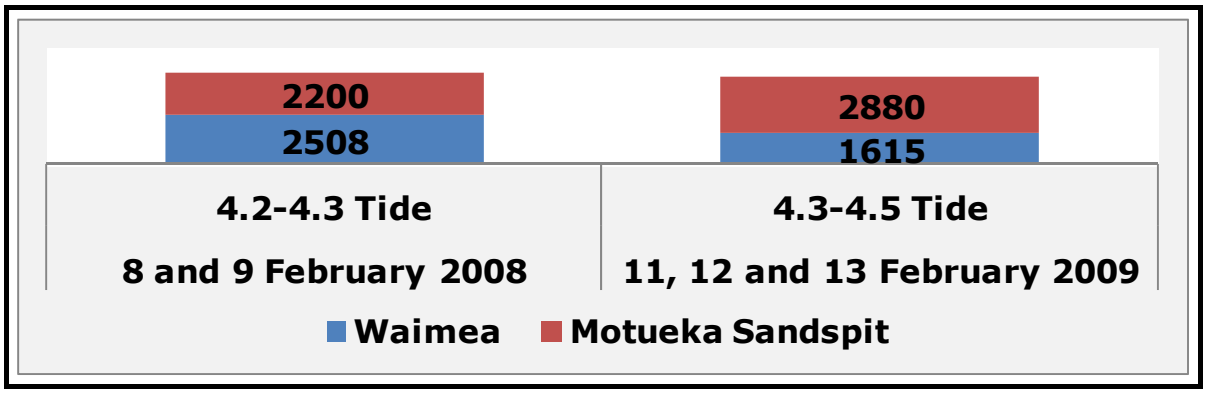

Figure 3a Bar-tailed Godwit numbers roosting in Waimea Inlet and Motueka Sandspit, during normal spring tides and 'King' tides.

Motueka Sandspit on 11 February 2009. Photo: Ingrid Hutzler

Figure 3b Birds are forced to Motueka Sandspit during 'king' tides as other sites become inundated.

Information obtained from the colour-banding programme have confirmed that the count programme, where a group of sites is counted simultaneously, is appropriate for assessing numbers of birds along the coast.

3.3 Missing data

For the overall assessment of the total number of shorebirds and the population trends for species, missing site data have been compensated for by using the average over the 10 year survey period.

Onekaka and Pohara in Golden Bay and Riwaka in Tasman Bay have been visited infrequently and are not included in this report. All sites only support small numbers of shorebirds that are not of national importance and do not contribute significantly to overall population numbers.

4. RESULTS

4.1 Total shorebird populations

The species composition and number of shorebirds changes throughout the annual cycle. In June 2006, 2007 and 2008 there were on average about 132,000 shorebirds in New Zealand (about 10% migratory and 90% endemic) and in November 2007 and 2008 there were on average about 150,000 shorebirds (81% migratory and 19% endemic). In February 2008 and 2009, New Zealand hosted up to 281,000 shorebirds (about 52% endemic and 48% migratory) - based on national census data (OSNZ *in prep*.).

Table 1 Total number of shorebirds counted on the New Zealand coast compared with total numbers in the Top of the South Island.

New Zealand Shorebird Populations	Endemic shorebirds (percentage of national population)	Migratory shorebirds (percentage of national population)	Total
National June Average	118,907 (90%)	13,111 (10%)	132,018
Top of South Island June Average	16,381 (14%)	2,441 (19%)	18,882 (14%)
National November Average	28,380 (19%)	122,064 (81%)	150,444
Top of South Island November Average	4,934 (17%)	25,247 (21%)	30,182 (20%)
National February Average	147,021 (52%)	133,591 (48%)	280,612
Top of South Island February Average	21,758 (15%)	29,048 (22%)	50,805 (18%)

During June, on average about 19,000 shorebirds (SD ±3,912) occurred in the Top of the South Island estuaries, 14% of the national winter population of shorebirds (Table 1, Figure 4).

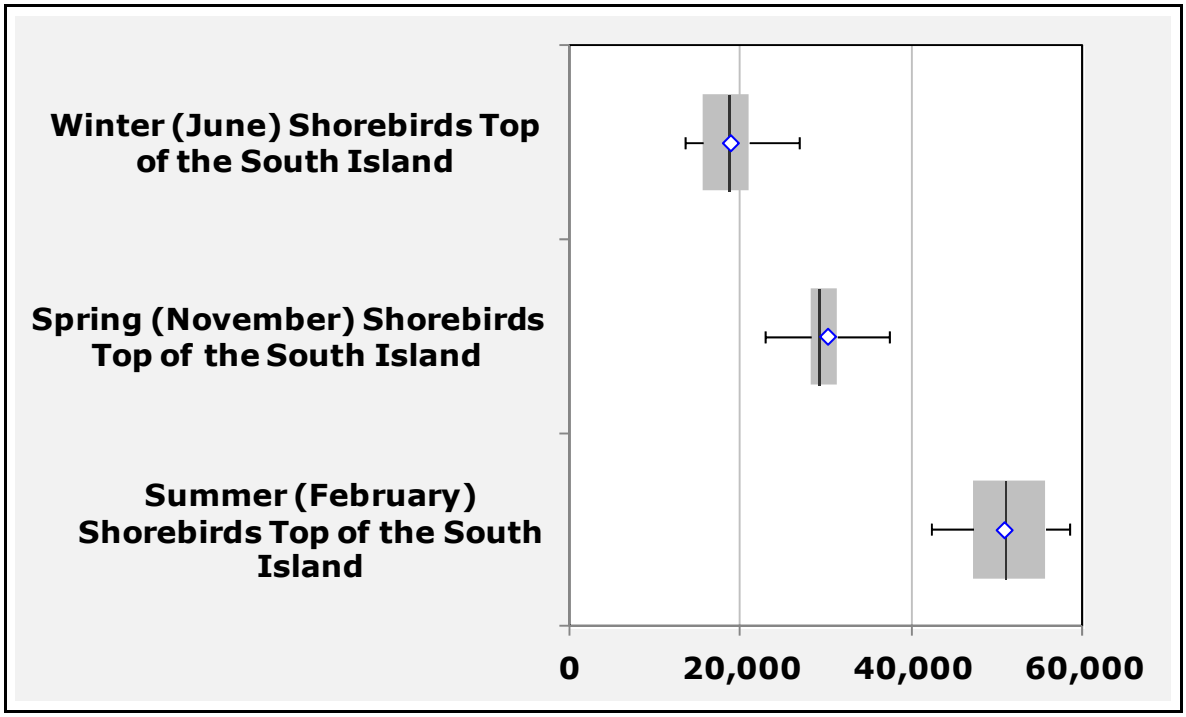

Figure 4 Numbers of shorebirds in the Top of the South Island in different seasons (2001-2012). The box-and-whisker plot shows the average (diamond shape) and median (black central line) values. The grey area represents 25% of data (quartile) greater and 25% of data lesser than the median. The remaining 25% lesser or greater than the grey box are represented by the left and right side 'whiskers'.

On average, about 30,200 shorebirds (SD±4,199) were present during November in the Top of the South Island, about 20% of the national population of shorebirds in New Zealand at that time of the year (Figure 4). During February, on average about 51,000 shorebirds (SD±5,565) were present in the Top of the South Island, 18% of all the shorebirds in New Zealand (Table 1, Figure 4). Overall, the estuaries in the Top of the South Island hosted between 14 - 22% of all the coastal shorebirds that occurred in New Zealand between 2006 and 2009 (Table 1).

During the course of a year, between 45% and 66% of all shorebirds in the Top of the South Island, were found at Farewell Spit. Some 14 - 25% were recorded from Golden Bay/Westhaven and 20 - 30% from Tasman Bay (Table 2).

Table 2 Proportions of shorebirds during different seasons at the three main areas of the Top of the South Island.

	November (%)	February (%)	June (%)
Farewell Spit	66%	56%	45%
Golden Bay/Westhaven	14%	20%	25%
Tasman Bay	20%	24%	30%

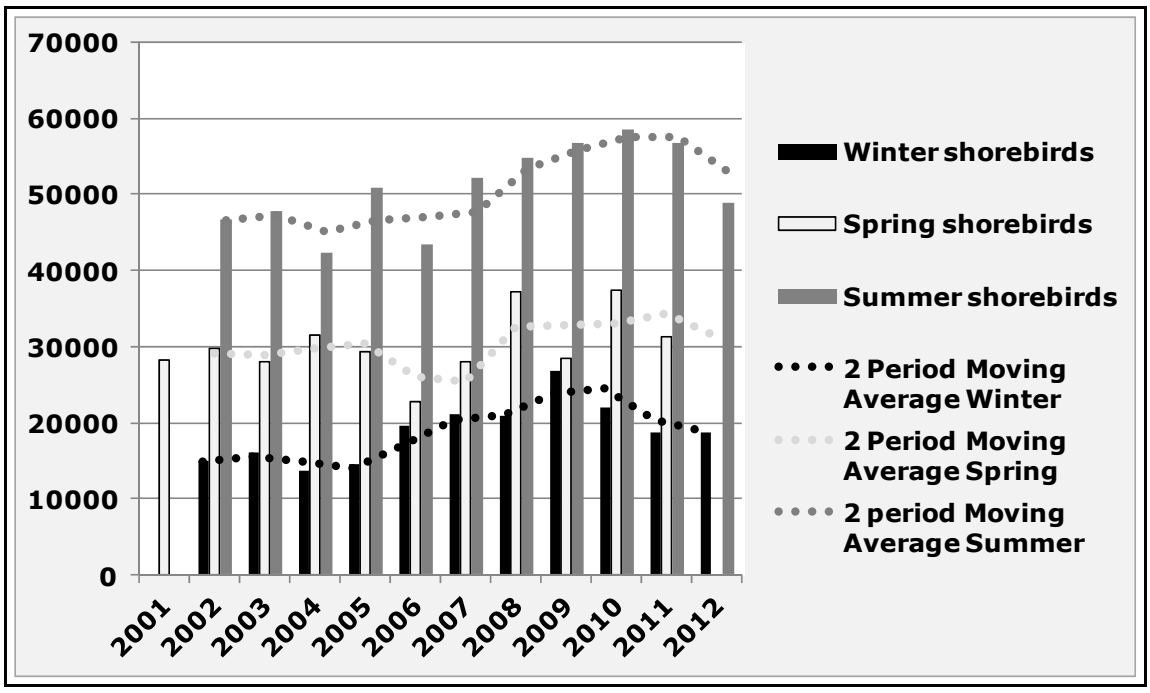

Figure 5 Trends of all shorebirds during spring (November), summer (February) and winter (June) periods.

Summer (February) is the period with the highest number of shorebirds on the coast in New Zealand. The number of shorebirds in summer in the Top of the South Island was about 2.5 times greater than the winter (June) total (Figure 4 and Figure 5).

Comparing summer (February) counts between 2001 and 2012, the total number of shorebirds in the Top of the South Island has increased by 19% over this period. About 46,000 birds were recorded in the period 2002-2006, and 55,000 in the second part of the study period (Figure 7a). Endemic shorebirds account for about 47% and migratory shorebirds about 53% of the total. (Figure 7b). This proportion has not changed significantly over the summer study period between 2002 and 2012, although there is some annual variation, thus the increase of total shorebirds is attributable to both endemic and migratory birds.

This increase, however, follows a steep and prolonged decrease in migrant shorebirds between the mid 1980s through the early/mid 2000s, so that overall there has been a reduction in the total populations of Red Knot, Bar-tailed Godwits and Ruddy Turnstone across the Top of the South Island (section 4.5.1).

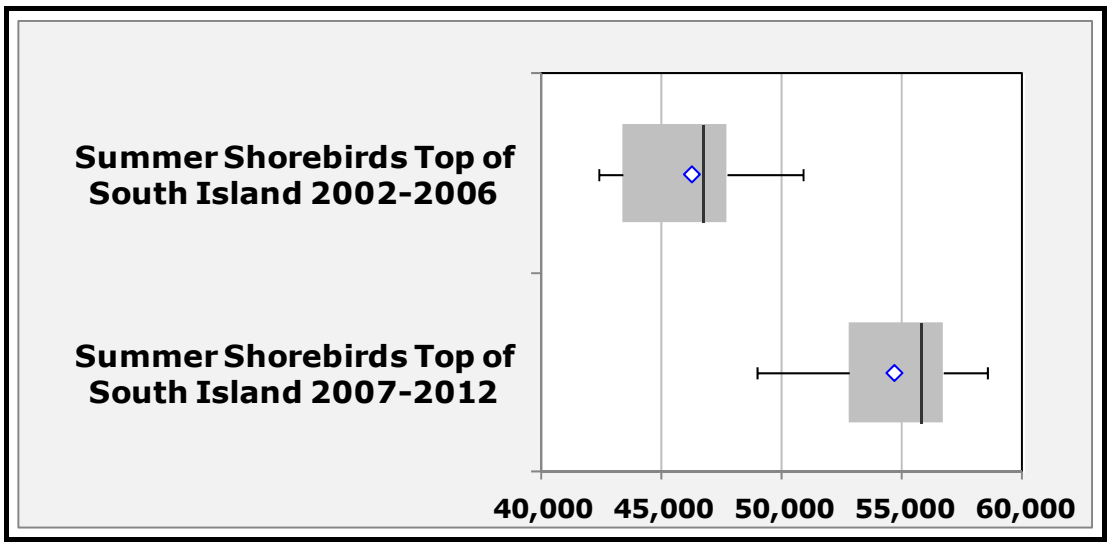

Figure 6 Comparison of summer (February) shorebird numbers during the study period, 2002-2006 and 2007-2012.

The numbers of migratory birds from the northern hemisphere that are present in New Zealand during the winter (June) are thought to largely reflect the breeding success in the arctic over the previous year or two since most Bar-tailed Godwits appear to migrate north for the first time in their third year of life (McCaffery & Gill 2001). Between 2001 and 2012, the number of long distance migrants that remained in the Top of the South Island over the winter period almost doubled from about 1,500 to more than 3,000 birds (Figure 8) and can, in part, explain some of the increase of migatory birds since 2007. The numbers of endemic shorebirds in the November count are likely to also reflect the numbers of juveniles and subadults of the previous breeding seasons. The spring numbers of endemic shorebirds increased from 4,500 to about 6,000 between 2005 and 2007, but were back to 4,500 in 2012 (Figure 8).

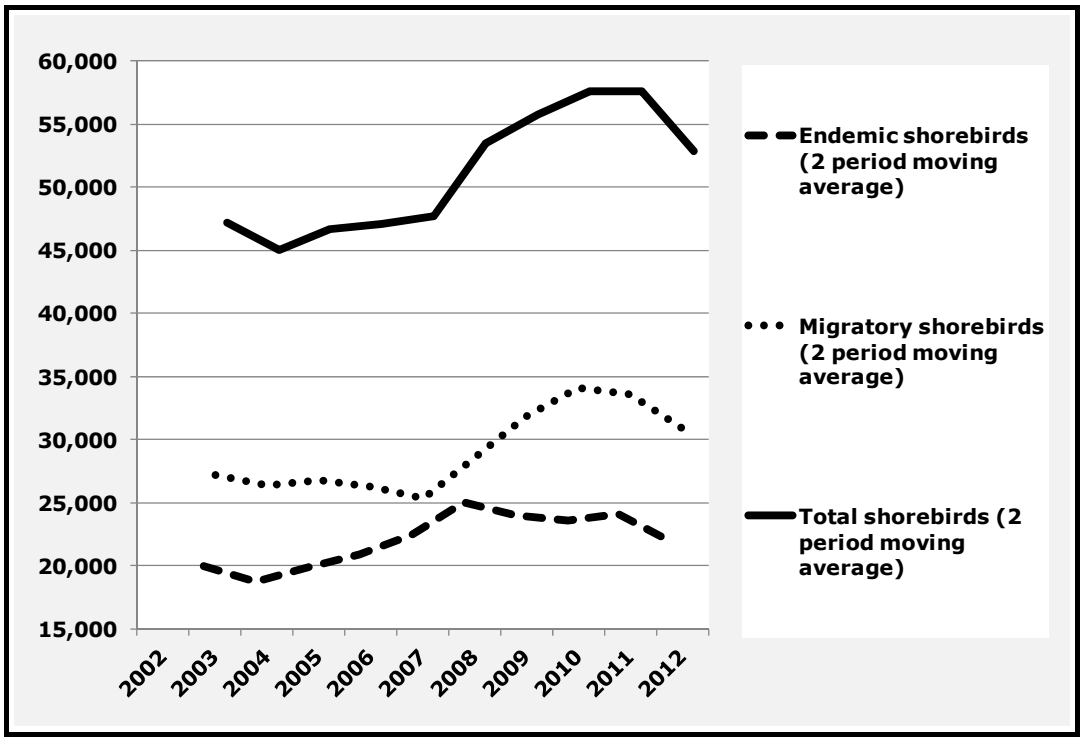

Figure 7a Changes in the numbers of migratory and endemic shorebirds during the summer (February) period between 2002 and 2012

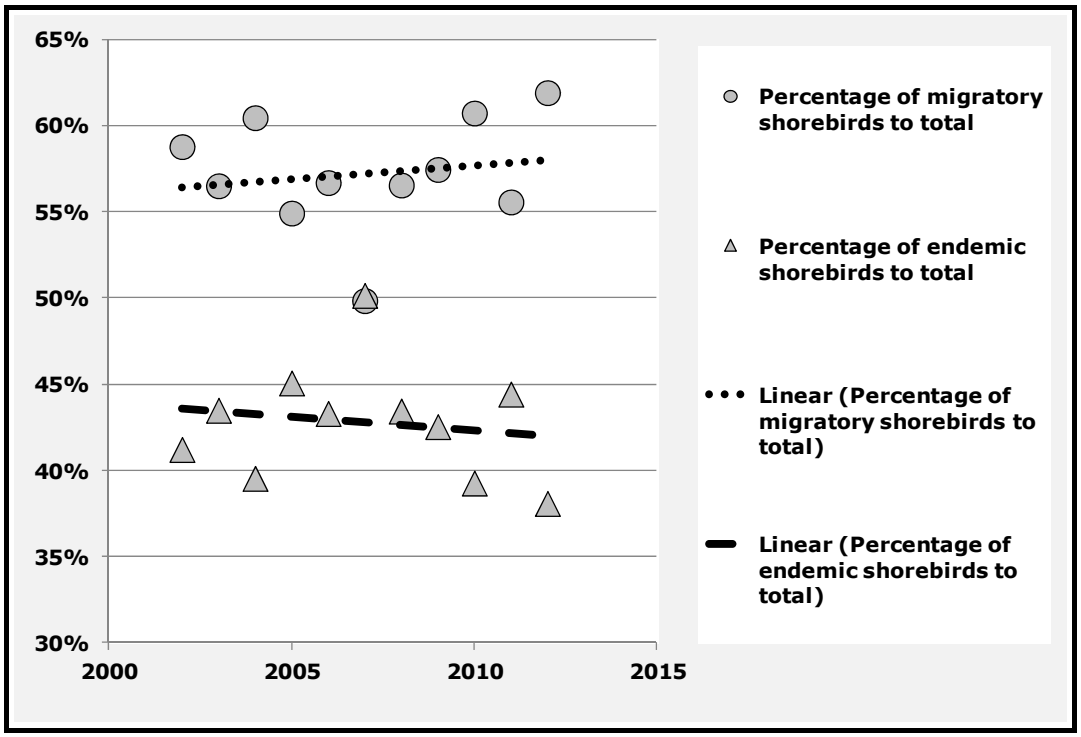

Figure 7b The relative contribution of migratory and endemic shorebirds to the total number

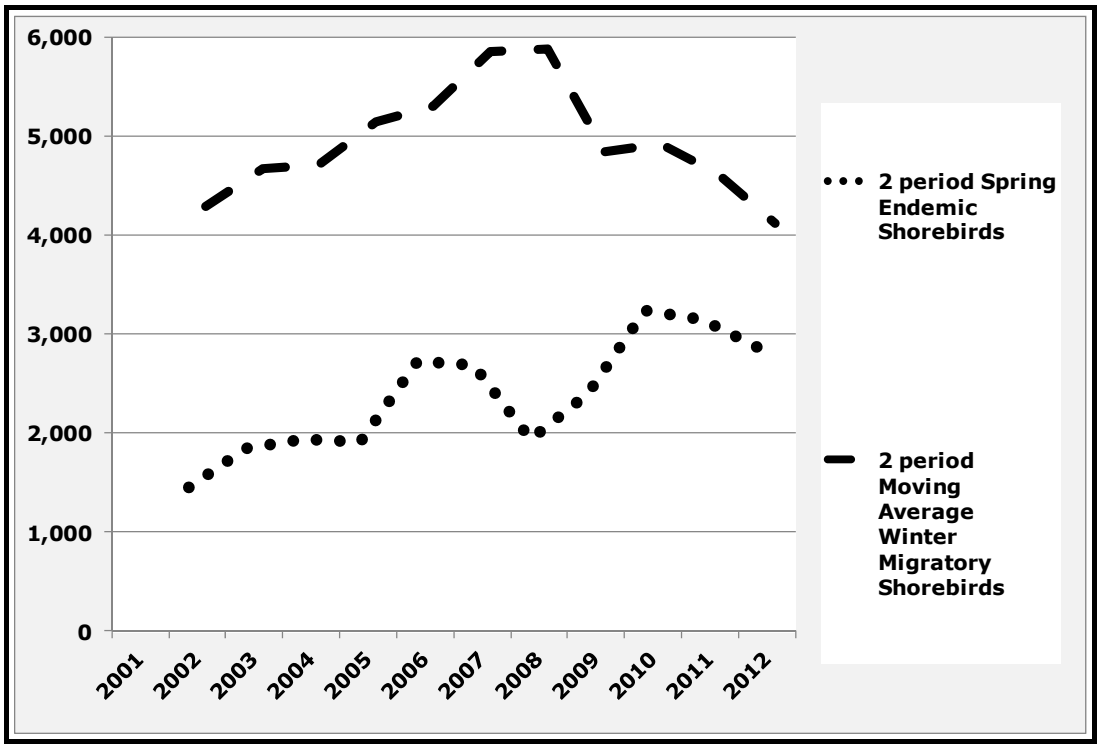

Figure 8 Numbers of probable juvenile and subadult shorebirds for migratory birds in Winter and endemic birds in Spring

4.2 Site assessments – based on total numbers present

For a site to be of *international importance* is should support 20,000 or more waterbirds, while a site requires 10,000 or more to be considered to be of *national importance* (see section 1.5).

4.2.1 Farewell Spit

Farewell Spit hosted an average of about 29,000 shorebirds during the summer (maximum of 34,000), equivalent to 10.2% of the national population. In winter (June) there were on average 8,500 birds (maximum 11,000), 6.5% of the national population, and in spring (November) an average of 20,000 (13.2% of the national population), with a maximum of up to 29,000. During summer and spring, Farewell Spit hosted ≥20,000 shorebirds, thereby meeting the threshold for recognition as a site of international importance in accordance with Ramsar Convention Criterion 5.

4.2.2 Golden Bay/Westhaven

Golden Bay/Westhaven hosted an average of about 10,000 birds (maximum 13,000) in summer (February). Most shorebirds in Golden Bay/Westhaven were recorded during the summer at Collingwood and Westhaven Inlet (about 1,500

and 2,500 respectively. Over the winter period, Collingwood had the highest number of shorebirds (about 3,700). No site hosted more than 10,000 shorebirds.

4.2.3 Tasman Bay

Tasman Bay hosted an average of about 12,000 birds (maximum 15,000) in summer (February). The highest numbers in Tasman Bay in summer were recorded from Motueka Sandspit (about 5,000 on average; maximum of 7,500) and East Waimea Inlet (about 4,100 birds on average; maximum of 6,000). No site hosted more than 10,000 shorebirds.

4.2.4 Species composition

In the Top of the South Island, and New Zealand as a whole, the most numerous shorebird species on the coast are South Island Pied Oystercatcher, Bar-tailed Godwit and Red Knot. South Island Pied Oystercatcher is the most widespread species, occurring at most estuaries, whereas the two most common migratory species (Bar-tailed Godwit and Red Knot) are more restricted in their distribution (Robertson *et al*. 2007). South Island Pied Oystercatcher was the most abundant shorebird species in Golden Bay/Westhaven, comprising 69% and 84% of the total population over the summer and winter periods respectively (Table 3).

In Tasman Bay, South Island Pied Oystercatchers comprised 48% of all shorebirds during the summer (February) and 69% in winter (June), whereas in spring (November) Bar-tailed Godwits comprised about 63% of all shorebirds present. Tasman Bay also had the highest relative percentage of Variable Oystercatchers and Pied Stilts in the Top of the South Island. Both represented about 9% of all the shorebirds during the winter (June) period (Table 3).

Proportionately, migratory waders comprised a greater amount of the total population during the spring and summer period at Farewell Spit (respectively 93% and 73% of all the shorebirds) than elsewhere in the Top of the South Island (Table 3).

Table 3 Relative abundance of shorebird species in Farewell Spit, Golden Bay, and Tasman Bay during the winter, spring, and summer periods (highest values ≥40% are highlighted in red).

	Winter (June)			Spring (November)			Summer (February)		
	Farewell Spit	**Golden Bay**	**Tasman Bay**	**Farewell Spit**	**Golden Bay**	**Tasman Bay**	**Farewell Spit**	**Golden Bay**	**Tasman Bay**
Red Knot	3%	0%	0%	41%	2%	10%	29%	2%	7%
Bar-tailed Godwit	16%	4%	9%	49%	53%	63%	41%	25%	35%
Ruddy Turnstone	1%	0%	0%	2%	0%	2%	2%	0%	2%
Variable Oystercatcher	1%	3%	9%	0%	3%	6%	0%	1%	3%
South Island Pied Oystercatcher	69%	84%	69%	7%	42%	18%	24%	69%	48%
Pied Stilt	0%	2%	9%	0%	0%	1%	0%	1%	3%
Banded Dotterel	10%	7%	4%	0%	0%	1%	3%	2%	1%
Migratory Shorebirds	20%	4%	9%	93%	55%	75%	73%	27%	44%
Endemic Shorebirds	80%	96%	91%	7%	45%	25%	27%	73%	56%
Total shorebirds (n)	8,523	4,564	5,570	19,869	4,354	5,856	28,617	9,751	12,119

4.3 Population estimates

This report only considers the four populations of arctic-breeding migratory shorebirds that occur in New Zealand in significant numbers: Bar-tailed Godwit, two populations of Red Knot, and Ruddy Turnstone. All other migratory species occur in New Zealand in very small numbers compared to East Asian-Australasian Flyway population estimates:

Pacific Golden Plover and Whimbrel *Numenius phaeopus* < 1%

All other species < 0.1%.

The crtiterion for identifying areas of *national importance* for shorebirds (see section 1.5) requires an assessment of total populations for each species. National population estimates were determined by Sagar *et al.* (1999) for the period between 1983 and 1994. At that time there were about 163,000 endemic and 22,000 migratory shorebirds during the June (winter) census, and 37,000 endemic and 167,000 migratory shorebirds during the November (spring) census; no information was available for February (summer).

For this report, the national total shorebird numbers have been reviewed and updated as neccessary. The current assessment is that New Zealand hosts 119,000 endemic and 13,000 migratory shorebirds in the winter period, 28,000 endemic and 122,000 migratory shorebirds in the November (spring) period, and 147,000 endemic and 134,000 migratory shorebirds in February (summer) period (Table 1). These updated numbers have been used in this report for the assessment of sites of national importance based on the total numbers of shorebirds present in New Zealand.

Species accounts are only provided for those that occur in numbers exceeding the 1% national population.

Table 4 Flyway and national population estimates and 1% thresholds for those shorebirds occurring in internationally and nationally significant numbers in the Top of the South Island.

	Flyway Population Estimate	1% of Flyway Population	0.25% of Flyway Population	National Population Estimate	1% of National Population
Red Knot	105,000	1,100	-	42,000	420
Bar-tailed Godwit	133,000	1,300	-	80,000	800
Ruddy Turnstone	28,500	290	-	2,504	25
Variable Oystercatcher	4,500	45	-	-	-
South Island Pied Oystercatcher	100,000	1,000	-	-	-
Pied Stilt	30,000	300	-	-	-
Banded Dotterel	50,000	500	125	20,000	200
Wrybill	4,500	45	11	-	-

4.3.1 Red Knot

Two subspecies of Red Knot occur in the East Asian-Australasian Flyway: *C. c. rogersi*, which nests in Chukotka, far-eastern Siberia, and *C. c. piersmai*, which nests on the New Siberian Islands. The two subspecies can seldom be reliably separated by plumage characters in the non-breeding season (Hasssell *et al*. 2011). It is thought that *C. c. rogersi* migrates predominantly to eastern Australia and New Zealand, whereas *C. c. piersmai* migrates predominantly to north-western Australia; however there is considerable geographical overlap between them on the non-breeding grounds (Rogers *et al.* 2010).

Red Knot (both subspecies present) with Bar-tailed Godwit (Photo: Phil Battley)

Between 1983 and 1994, the estimated national population was about 58,637 birds (Sagar *et al.*1999). Numbers were apparently reduced in the period 1995-2003 to 49,224 (Southey 2009), an overall decline of 14%. Up until 2008, the total flyway population was estimated to be 220,000 birds (Bamford *et al.* 2008), however a recent reassessment of the numbers has reduced that estimate to less than half, the total flyway population now being estimated to be no more than 105,000 of which 63,000 occur in Australia and 42,000 in New Zealand (Rogers *et al.* 2010).

Rogers *et al*. (2010) also provided the first population estimates for the two subspecies; the world population of *C. c. piersmai* is thought to be between 48,736 and 60,068 birds, and that of *C. c. rogersi* between 50,669 and 62,000 birds. The same authors estimated that 83.1% of the north-western Australian population was *C. c. piersmai* compared with 24.6% of the New Zealand population. Most of the New Zealand population is *C. c. rogersi* (~75%).

Since the two subspecies are difficult to tell apart in the field (Hassell *et al.* 2011) they are combined when determining the flyway 1% level of 1,100 birds (Wetlands International 2013). The national 1% level is 420.

4.3.2 Bar-tailed Godwit

The Bar-tailed Godwits that spend the non-breeding season in New Zealand and eastern Australia (*Limosa lapponica baueri*) breed in western Alaska (Battley *et al*. 2012). The flyway population is estimated to be 133,000 and the 1% level is established at 1,300 (Wetlands International 2013).

Bar-tailed Godwit (Photo: Rebecca Bowater)

Between 1983 and 1994, the New Zealand population was estimated at about 101,698 birds (Sagar *et al.*1999). Between 1995 and 2003 the population was estimated at about 95,308 (Southey 2009) suggesting a tendency to decline. The population then increased in the period 2004 to 2010, but subsequently declined again to the current (2012) level of about 80,000 (Robertson 2013) which is used for this report.

4.3.3 Ruddy Turnstone

The breeding range of Turnstones occurring in New Zealand remains unknown. A very small number of records from near the breeding grounds of birds banded in Australia indicate a possible origin in the coastal areas of Yakutia in northern Siberia (Minton *et al.* 2006). It remains unclear whether any birds from the Alaskan breeding population reach New Zealand, although this has been suggested (Nettleship 2000).

Ruddy Turnstone (Photo: Willie Cook)

In 2008, the East Asian-Australasian Flyway population was estimated to be about 35,000 birds, of which some 73% were thought to occur in Australia and New Zealand during the non-breeding season (Bamford *et al*. 2008). Summer censuses undertaken in both Australia (Kearney *et al.* 2008, Oliveira *et al.* 2009) and New Zealand during 2008 and 2009 provided combined totals of 6,400 and 9,300 respectively (OSNZ *in prep*). Thus less than one third of the estimated

flyway population was accounted for during the censuses. Between 1983 and 1994, the New Zealand population was estimated at 5,069 birds (Sagar *et al.*1999), while Southey (2009) estimated the population as 2,504 in the period 1995-2003, suggesting an overall decline.

Wetlands International (2013) currently estimate the East Asian-Australasian Flyway population to be 29,000, therefore for this report, the 1% population level of 290 has been used. The national 1% level used is 25. Due to the apparent steep decline care needs to be taken when applying the 1% criterion due to the potential for the overestimation of the total flyway population.

4.3.4 Variable Oystercatcher

The Variable Oystercatcher is endemic to New Zealand. Its conservation status is 'at risk', but it is described as 'recovering' with numbers increasing (Miskelly *et al.* 2008).

Variable Oystercatcher (Photo: Rebecca Bowater)

The species has an almost entirely coastal distribution and is found around the North, South and Stewart Islands and their offshore islands (Dowding & Moore 2006, Robertson *et al.* 2007). Between 1983 and 1994, the total world population was estimated at about 3,413 birds (Sagar *et al.*1999). Between

1995 and 2003 this had increased to about 4,500 (Dowding & Moore 2006) and numbers are continuing to rise. The 1% population level is 45 birds (Wetlands International 2013).

4.3.5 South Island Pied Oystercatcher

The South Island Pied Oystercatcher is endemic to New Zealand. The species breeds inland in the South Island and on a few riverbeds in the southern North Island (Dowding & Moore 2006). Migration from the South Island breeding grounds northwards starts in late December. Up to 1994, twice as many birds were wintering in the North Island as in the South Island (Sagar *et al.* 1999).

South Island Pied Oystercatcher (Photo: Rebecca Bowater)

Between 1983 and 1994, the total world population was estimated at about 112,675 birds (Sagar *et al.*1999). The increase of about 128% compared to the early 1970s was thought to be related to the protection of the species from hunting in the 1940s. If the same rate of increase had continued to 2006, the population would have grown to about 130,000 birds (Dowding & Moore 2006). However, between 1995 and 2003 the population was estimated at 90,161 ± 3,811 (Southey 2009) and no increase of the winter population could be detected over the country as a whole. Although it is the most numerous and widespread species along the New Zealand coastline, it is now assessed as being 'at risk, declining' (Miskelly *et al.* 2008).The total population is currently estimated to be 100,000 and the 1% level is 1,000 birds (Wetlands International 2013).

4.3.6 Pied Stilt

The Pied Stilt is a widespread species, being almost cosmopolitan. The form *leucocephalus* occurs throughout most of New Zealand but is rare on Stewart Island and the Chatham Islands and absent from Fiordland and the subantarctic islands (Dowding & Moore 2006, Robertson *et al*. 2007). This form also occurs in Southeast Asia and Australia, and is sometimes considered to be a full species (Wetlands International 2013). It is classed as 'at risk, declining' (Miskelly *et al*. 2008).

Pied Stilt (Photo: Rebecca Bowater)

Between 1983 and 1994, the New Zealand population was estimated at about 27,906 birds (Sagar *et al.*1999). Numbers at most significant sites in New Zealand increased by 22% between 1995 and 2003, when the national population was assessed to be about 30,000 birds (Dowding & Moore 2006). The population 1% level for New Zealand is established at 300 - the New Zealand population being considered separate from the Southeast Asian-Australian population (Wetlands International 2013).

4.3.7 Banded Dotterel

The Banded Dotterel is usually regarded as endemic since its breeding range is wholly within New Zealand. The nominate subspecies *Charadrius bicinctus bicintus* breeds in the North, South and Stewart Islands (Robertson *et al.* 2007), however more than half of the population spends the non-breeding season in

eastern Australia (Pierce 1999, Dowding & Moore 2006).The conservation status of Banded Dotterel is 'Nationally Vulnerable' (Miskelly *et al.* 2008).

Banded Dotterel (Photo: Rebecca Bowater)

The annual cycle of the Banded Dotterel makes assessing population sizes difficult based on OSNZ counts. During the spring (November) count most birds are breeding, many of those in the South Island being inland (Robertson *et al.* 2007). During the summer (February) count Banded Dotterels are moving within New Zealand and this is when inland breeding birds move to the coast. During the winter (June) count the population is split between New Zealand and Australia.

Pierce (1999) estimated the total number of Banded Dotterels as 50,000 birds, of which about 30,000 migrated to Australia for the winter and 20,000 remained in New Zealand. The winter population estimate during the period 1983-1994 was 10,843 (Sagar *et al*. 1999), and in the period 1995-2003 was 5,900 ± 253 (Southey 2009). Population increases were recorded at some sites, and reductions at others (Southey 2009), however Figure 9 shows a very marked downward trend in the total numbers counted. Owen *et al*. (2006) recorded a ~50% decline in numbers on Ohiwa Harbour, Bay of Plenty between 1984 and 2001, which appears to be similar to the overall trend in Figure 9.

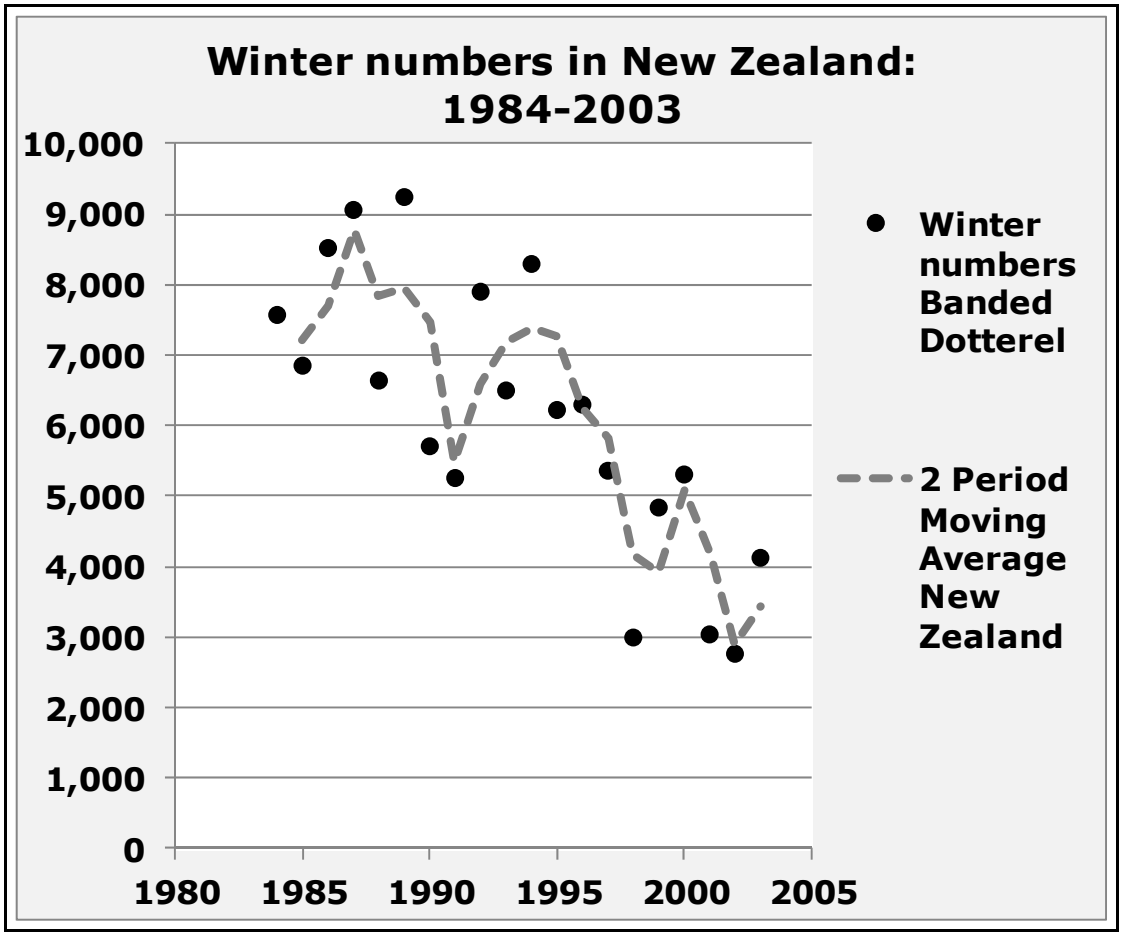

Figure 9 National decline of wintering Banded Dotterels between 1984 and 2003 (data from Sagar *et al.* 1999 and Southey 2009).

Numbers in Australia are difficult to assess, but there are indications that numbers may be declining. For example in New South Wales, there was a 24% reduction in reporting rate for this species between bird distribution atlas surveys 20 years apart – 1977-1981 and 1998-2001 (Barrett *et al.* 2007).

Despite growing evidence suggesting that the total population estimate requires a significant downward adjustment, the current population 1% level is assessed at 500 (Wetlands International 2013), this figure being unchanged from the 2002 assessment (Delany & Scott 2002). In view of the very marked apparent population reduction (Figure 9) we suggest that a revised total population estimate might be closer to 30,000, rather than 50,000 – a reduction of 40%.

For this report we use the Wetlands International 1% threshold (500), but caution that this almost certainly too high.

4.3.8 Wrybill

The Wrybill is an endemic species that is classified as 'nationally vulnerable (Miskelly *et al*. 2008). It only breeds in braided riverbeds east of the main divide in Canterbury and Otago, South Island (Dowding &Moore 2006, Robertson *et al*. 2007). From December, birds migrate north and most individuals winter in the large harbours around Auckland. The global population has been estimated to be between 4,500-5,000 birds (Riegen & Dowding 2003); the 1% population level is established at 45 (Wetlands International 2013).

Wrybill (Photo: Rebecca Bowater)

Most birds are recorded in the Top of the South Island during southward migration, around August, which falls outside the regular shorebird census programme. As a result, the highest numbers of this species are missing from the data sets.

4.4 Site assessments – based on species populations

Details of the 1% thresholds for international and national importance are given in Appendices 2 and 3 respectively.

4.4.1 Red Knot

Red Knots occur in high numbers in the Top of the South Island, at a very limited number of sites (Figure 10). On average, the February numbers were 9,361, about 8.9% of the estimated flyway population (maximum 12,863).

On average 8,260 Red Knots (7.9% of the flyway population) were recorded from Farewell Spit during the summer; the maximum was 12,416 birds. The site is of international importance for Red Knot.

In Golden Bay/Westhaven, no sites met the 1% threshold for either the flyway or the national populations. Westhaven Inlet hosted most of the Red Knots in Golden Bay with an average of 210 birds during the summer period.

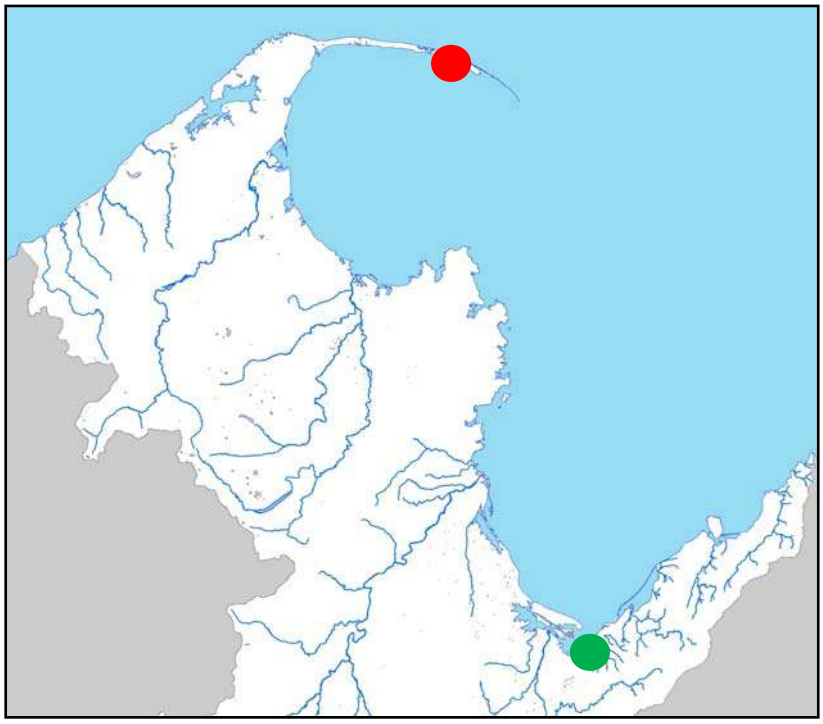

Figure 10 Sites of international (red circle) and national (green circle) importance for Red Knots in the Top of the South Island.

In Tasman Bay 891 Red Knots were recorded on average, about 2.1% of the national population; the maximum was 1,430 recorded in the summer. The East Waimea Inlet is of national importance for this species (Figure 10, Appendix 3).

4.4.2 Bar-tailed Godwit

Bar-tailed Godwits occur in high numbers in the Top of the South Island. On average, in February there were 18,527, about 13.9% of the estimated flyway population (maximum 23,798).

Farewell Spit hosts internationally important numbers of godwits during the spring, summer, and winter periods. On average 11,872 godwits occur in the summer period, 9.1% of the total estimated flyway population (maximum 15,723) (Figure 11, Appendix 2).

In Golden Bay/Westhaven, Westhaven Inlet hosted on average 1,453 birds during the summer and this site is of international importance for this species (Figure 11, Appendix 2).

Tasman Bay had an average of 4, 245, equivalent to 3.3% of the flyway population; (maximum 5,412). Motueka Sandspit is of international importance for Bar-tailed Godwit, and East Waimea Inlet is of national importance (Figure 11).

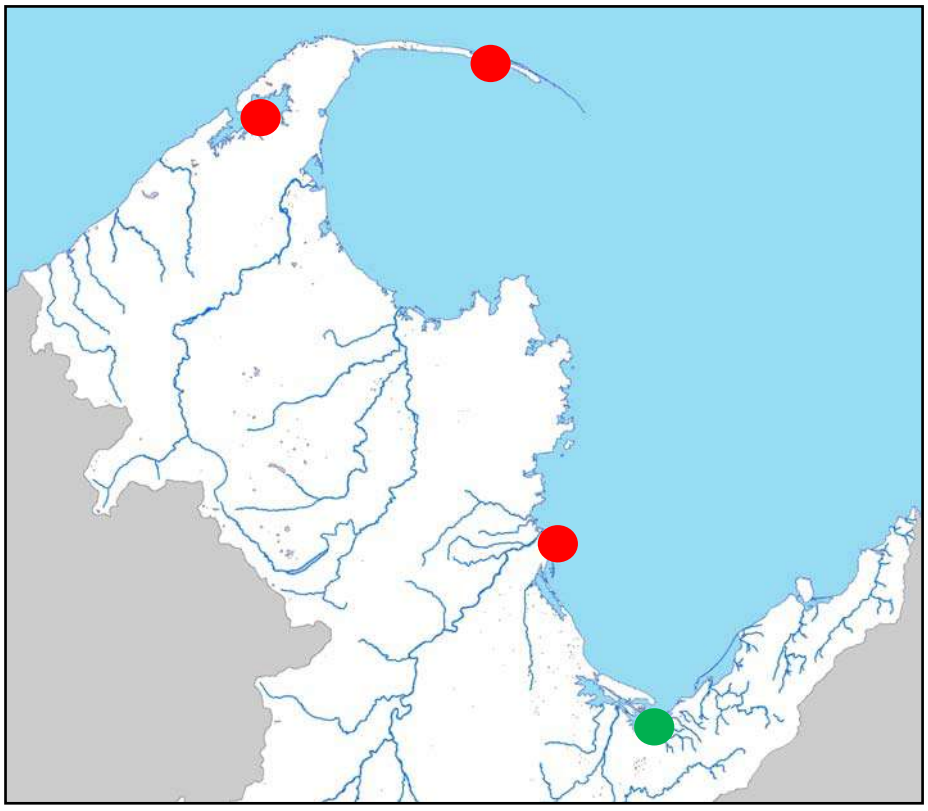

Figure 11 Sites of international (red circle) and national (green circle) importance for Bar-tailed Godwits in the Top of the South Island.

4.4.3 Ruddy Turnstone

Ruddy Turnstones occur in relatively high numbers in the Top of the South Island, but at very few sites (Figure 12). On average there were 912 Ruddy Turnstones during the summer in the Top of the South Island (maximum 1,246), about 3.1% of the estimated flyway population.

Farewell Spit hosted on average of 679 Ruddy Turnstones in the summer (maximum 1,028), or 2.3% of the flyway population. This site is of international importance for this species.

There are no sites in Golden Bay/Westhaven with significant numbers of Ruddy Turnstone.

In Tasman Bay, Motueka Sandspit is the most important site for Ruddy Turnstones with an average of 239 (maximum 346) birds during the summer, about 9.6% of the national population. Motueka is of national importance for Ruddy Turnstone (Appendix 3).

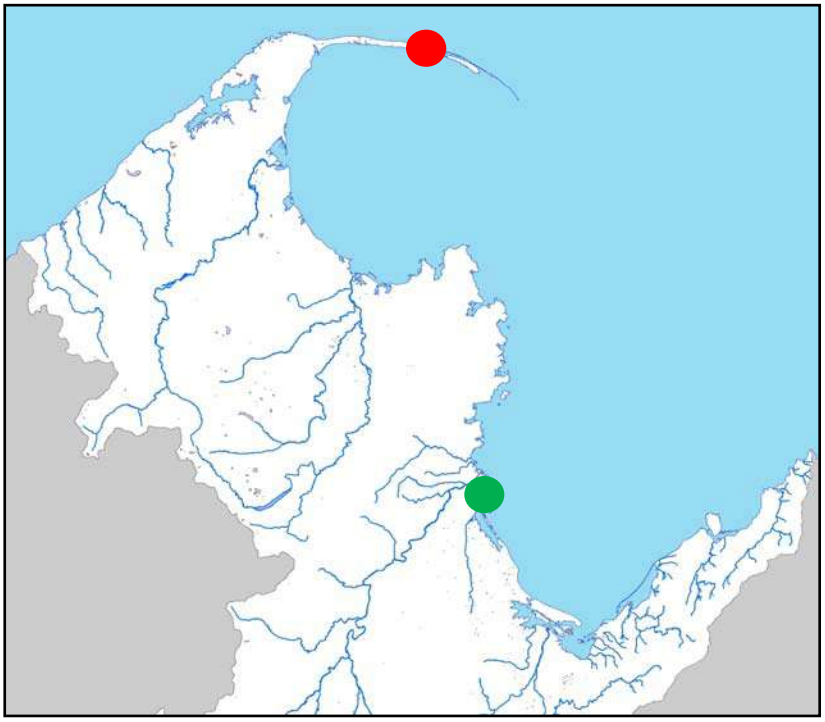

Figure 12 Sites of international (red circle) and national (green circle) importance for Ruddy Turnstones in the Top of the South Island.

4.4.4 Variable Oystercatcher

Variable Oystercatchers occur in high numbers in the Top of the South Island. On average there were 731 Variable Oystercatchers in the Top of the South

Island during the winter period (about 16.2% of the estimated total population). The maximum recorded was 981.

Farewell Spit hosted up to 153 Variable Oystercatchers, with on average, 99 birds during the winter period (2.2 % of the total population). The site is of international importance for this species.

On average there were 145 birds in Golden Bay/Westhaven (maximum 291) during the winter, about 3.2% of the total population. No site meets the 1% threshold.

Tasman Bay is the most important site in the world for this species (Dowding & Moore 2006). On average, there were 487 Variable Oystercatchers in Tasman Bay (10.8% of the total population); maximum 720. Motueka Sandspit, West Waimea Inlet, East Waimea Inlet are of international importance for this species (Figure 13, Appendix 2).

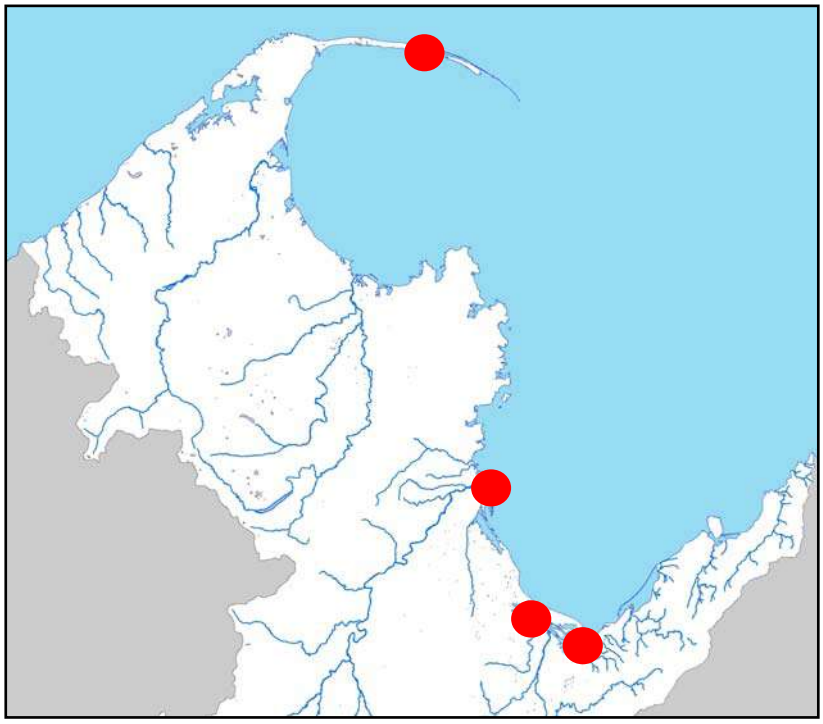

Figure 13 Sites of international importance for Variable Oystercatchers in the Top of the South Island (red circle).

4.4.5 South Island Pied Oystercatcher

The maximum of about 25,000 South Island Pied Oystercatchers in the Top of the South Island was recorded in February 2007, representing about a quarter of the global population. The highest numbers of South Island Pied Oystercatchers

are always recorded in the summer during the northward migration after breeding. At this time there are about twice as many birds present than during the winter (June). This pattern of occurrence has been very consistent over at least the past 10 years (Figure.14).

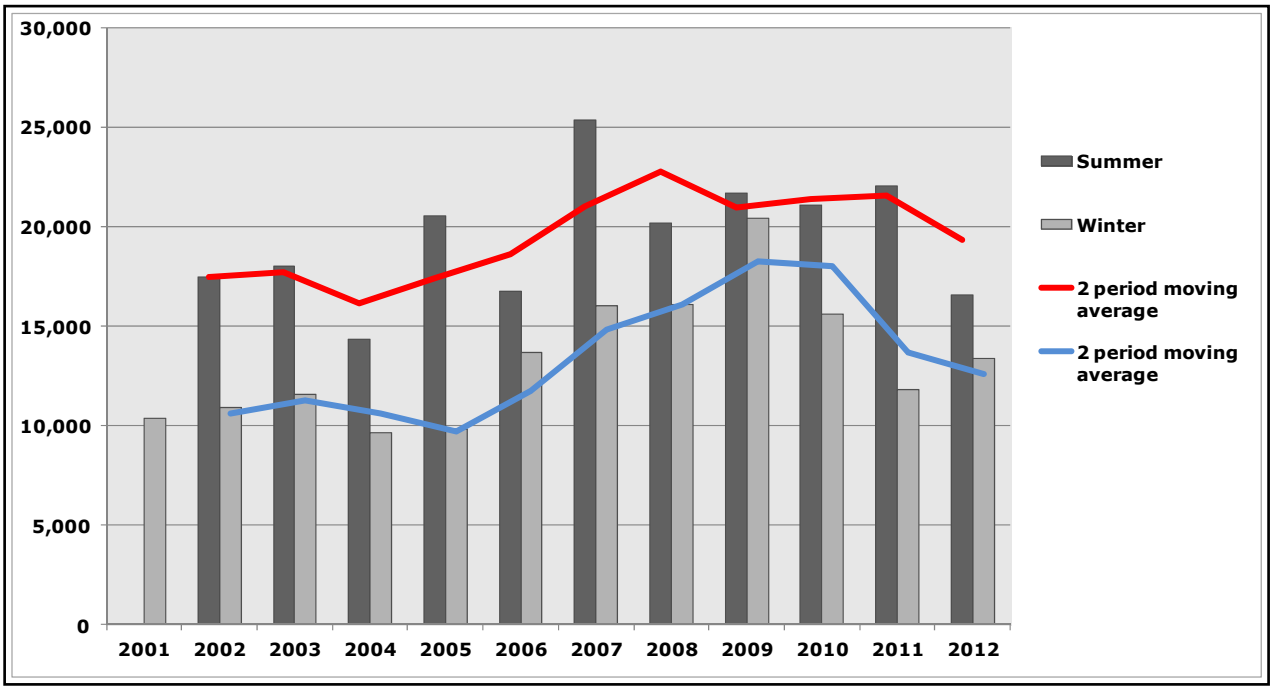

Figure 14 Comparison of summer (red) and winter (blue) numbers of South Island Pied Oystercatchers in the Top of South Island.

The pattern of high numbers in February is recorded from all of the estuaries in the Top of the South Island, including Farewell Spit (Figure 15).

A significant part of the national population of South Island Pied Oystercatchers stages in the Top of the South Island during northward migration. Establishing turnover rates is complex, but it seems likely that the Top of the South Island is used as a staging site by birds before heading to wintering areas in the North Island – a significant number of those present in late summer are in active wing moult which suggest that they are likely to remain in the area for some time as generally birds do not overlap migration and moult, as both are energy demanding activities. It does not appear that the Top of the South Island is used as a staging area during southward migration to any extent.

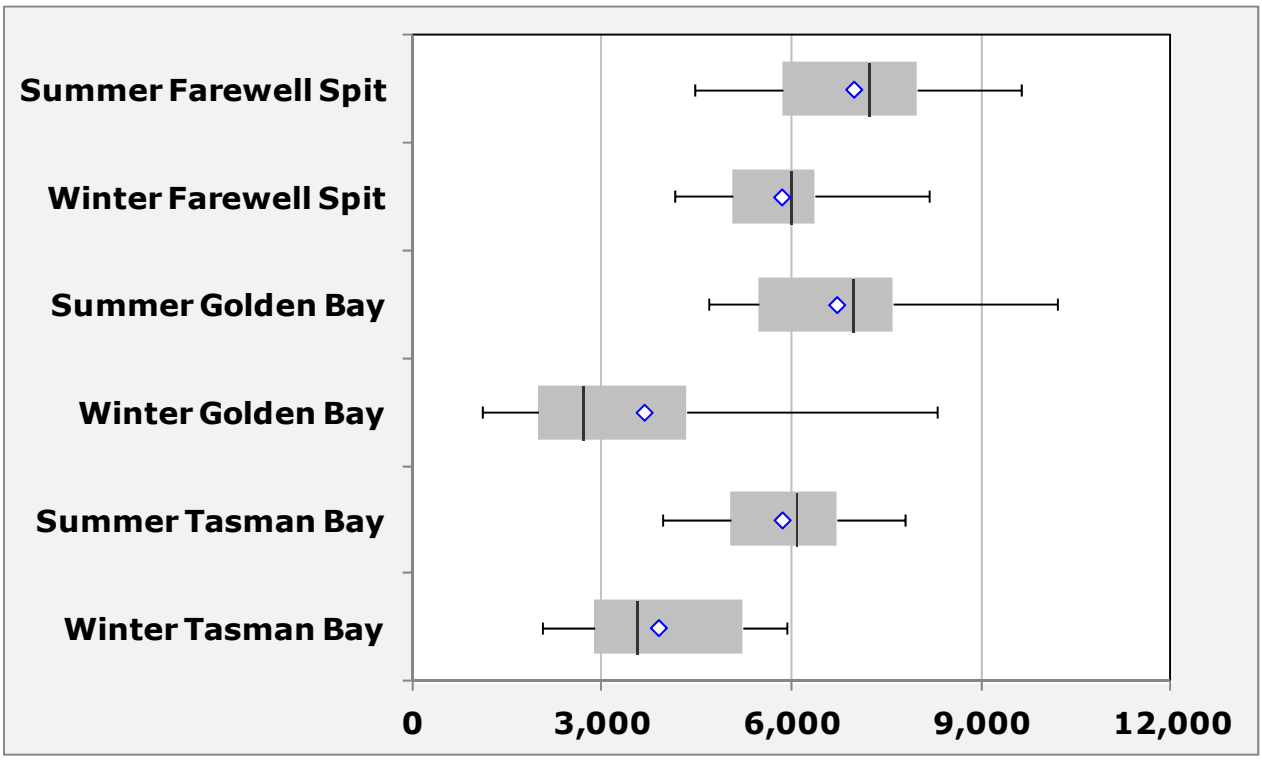

Figure 15 South Island Pied Oystercatchers numbers: comparison between summer and winter numbers.

Farewell Spit hosted on average 6,980 South Island Pied Oystercatchers, 7.0% % of the total population, during the summer; maximum 9,622. The site is of international importance for the species during summer, winter and spring.

Golden Bay/Westhaven had on average 6,710 South Island Pied Oystercatchers during the summer (maximum 10,192). Rototai, Collingwood and Pakawau hosted on average more than 1% of the total population of South Island Pied Oystercatchers (Appendix 2).

Tasman Bay had on average 5,773 (maximum of 7,417) in the summer, this being about 7.5% of the total population. Motueka Sandspit and East Waimea Inlet hosted on average more than 1% of the total population (Appendix 2).

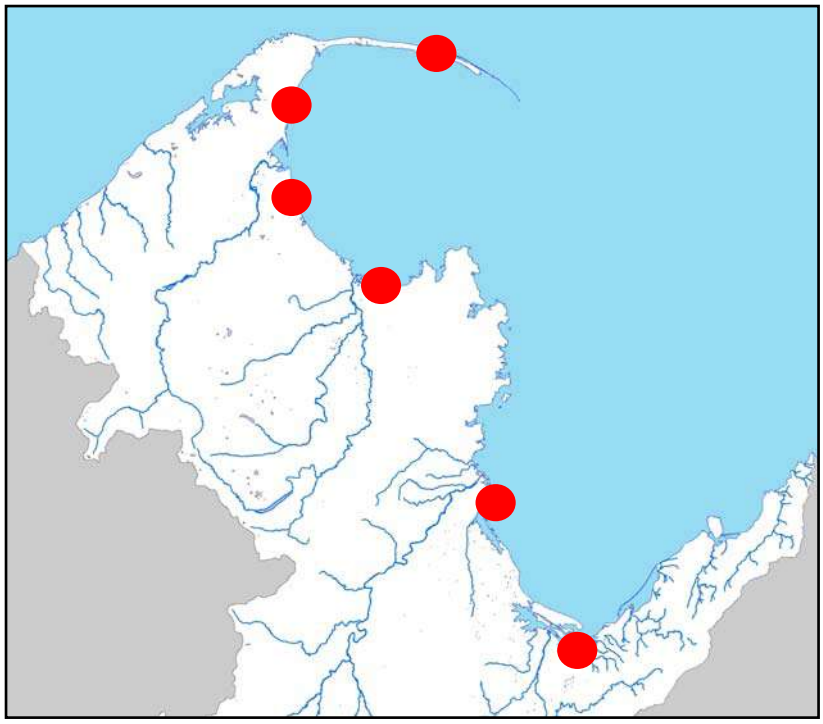

Figure 16 Sites of international importance for South Island Pied Oystercatcher in the Top of the South Island (red circle).

4.4.6 Pied Stilt

Most Pied Stilts in the Top of the South Island visit estuaries during the winter after breeding. On average 600 individuals are recorded in the winter, 2.0 % of the estimated national population of 30,000 birds.

Farewell Spit does not host Pied Stilt in numbers that are of national importance.

Golden Bay/Westhaven had on average 79 Pied Stilts. There are no sites in Golden Bay/Westhaven that are of national importance for this species.

Tasman Bay had on average 498 Pied Stilts in the winter. All sites hosted less than 1% of national population of Pied Stilts.

4.4.7 Banded Dotterel

Banded Dotterels occur in high numbers in the Top of the South Island. On average, 1,335 Banded Dotterels were recorded, this being some 2.7% of the Wetlands International (2013) population estimate.

Farewell Spit is one of the three most important wintering sites for Banded Dotterel in New Zealand (Dowding & Moore 2006). In winter it supported, on average, 819 birds, (maximum 1,921), equivalent to 1.6% of the Wetlands International (2013) population estimate. Farewell Spit is of international

importance for Banded Dotterel during both summer and winter (Figure 17, Appendix 2).

Golden Bay/Westhaven had on average, 321 Banded Dotterels (maximum 495), equivalent to 0.6% of the Wetlands International (2013) population estimate. Westhaven Inlet hosted on average 283 Banded Dotterels in the winter, and is of national importance for this species[6] (Figure 17, Appendix 3)

Tasman Bay had an average of 196 Banded Dotterels in winter, just short of the 1% threshold of 200 birds. The maximum was 289, recorded in the winter of 2004. There are no sites of national importance during the winter in Tasman Bay. On average, Motueka Sandspit hosted 131 Banded Dotterels in February; these are likely to include birds moving from breeding to wintering grounds, in which case the site would meet the 0.25% threshold for the staging criterion of the East Asian–Australasian Flyway Partnership (section 1.5). The number of Banded Dotterels at Westhaven in February would also meet the EAAFP staging threshold, both sites can therefore be regarded as being of international importance under the EAAFP criteria.

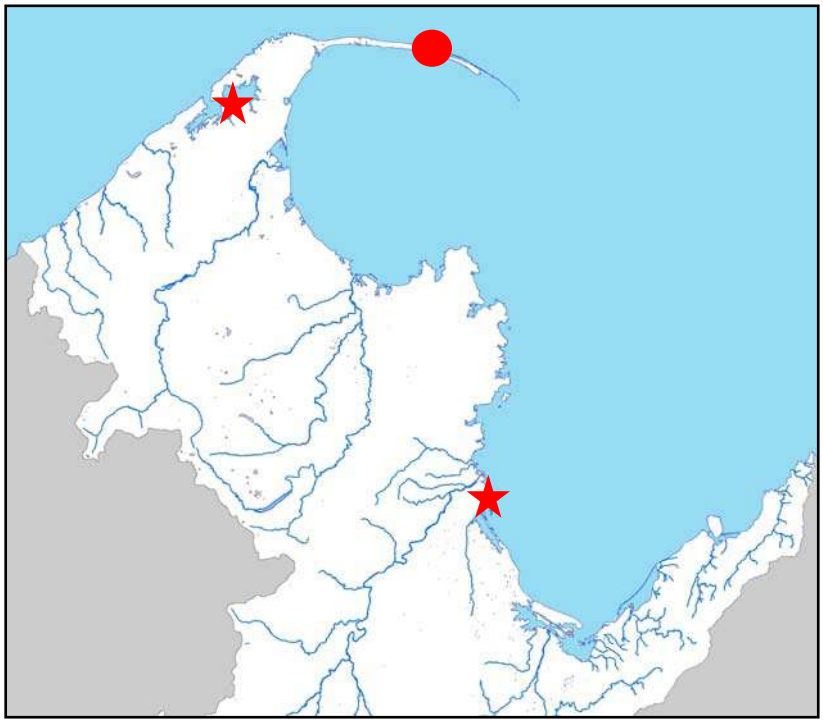

Figure 17 Site of international (red circle) importance for Banded Dotterel in the Top of the South Island. Site of international importance as a staging site (red star) for East Asian-Australasian Flyway.

[6] The national population of Banded Dotterel in winter is less than in summer since c60% of the total population is in Australia.

4.4.8 Wrybill

Most information about Wrybills has been obtained by OSNZ members outside the usual count programme as the count dates do not fit the timing of migration for this species, thus the standard counts give an inaccurate picture of occurrence and abundance.

Wrybills use Tasman Bay as a staging site on southward migration. The highest numbers of Wrybills are recorded in East Waimea Inlet, and at Motueka Sandspit, but occasionally large numbers are recorded at other sites as well (e.g. 60 Wrybills at Kina Peninsula on 11 February 2012). Small numbers may occur at other sites, e.g. Nelson Haven (five on 5 September 2009 Peter Field *pers. comm*.).

The main period of southward migration is August with the highest numbers usually being recorded mid-month (103 on 14 August 2009; 253 on 15 August 2012). Observations of some marked birds indicates that they may stay for between 3 and 13 days (Willie Cook *pers.com*.), however it is not possible to provide an estimate of the total population that is staging in East Waimea Inlet since turn-over rates are notoriously difficult to establish.

Bell Island Shellbank in East Waimea Inlet consistently had the highest numbers in the Top of the South Island. During August there was an average of 66 Wrybills present on Bell Island Shellbank (Willie Cook unpublished), and in all of the four years for which there are data in the period 2001-2012 the maximum counts exceeded 45 birds (84, 103, 76, 253), This site is of international importance for Wrybills. During the OSNZ formal count programme Bell Island Shellbank had an average of 29 birds (maximum of 60 recorded in winter 2012).

A similar data set of August counts of Wrybill is not available for Motueka Sandspit.

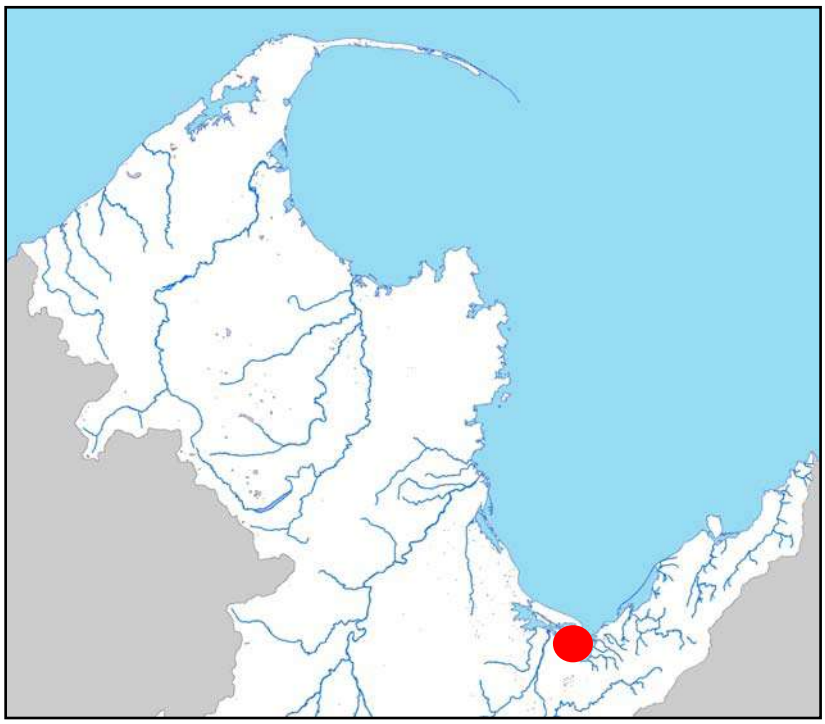

Figure 18 Site of international importance for Wrybill in the Top of the South Island (red circle).

4.5 Trends in shorebird numbers in Top of the South Island

4.5.1 Shorebird comparison 1983-2000 and 2001-2011

The results of shorebird counts between 1983 and 2001 were reviewed by Schuckard (2002), the last counts being included in that report being for November 2000, February and June 2001. Here we assess population trends for shorebirds in the Top of the South Island by comparing the average of spring (November) counts for migratory shorebirds between the periods 1983-2000 and 2001-2011. For endemic shorebirds the winter (June) counts between the periods 1984-2001 and 2002-2012 were compared.

The average number of all migratory shorebirds in the Top of the South Island in spring during the period 1983-2000 was 34,236 (Schuckard 2002). In the period 2001-2011, the average number was 25,247, a decline of 26% - most of the decline occurred between the mid 1980s and mid 2000s (section 4.1). In terms of total numbers, Red Knot have declined by about 4,700 birds, Bar-tailed Godwit by about 5,100 birds, and Ruddy Turnstone by about 500 birds. Although the numbers of Red Knots in Tasman Bay show an increase (Table 5), these numbers are small in comparison with the overall decline at Farewell Spit, where the population shows a reduction from about 13,000 to 8,000 birds over the two periods.

Populations of endemic shorebirds appear to be stable or showing a slight increase of about 7%. Three species are stable, South Island Pied Oystercatcher, Banded Dotterel and Wrybill. Two species, Pied Stilt and Variable Oystercatcher are increasing. At Farewell Spit, numbers of all species are decreasing, apart from Variable Oystercatchers (Table 5).

Table 5 Trends in spring shorebird populations in the Top of the South Island.

	Farewell Spit	Golden Bay	Tasman Bay	Trend in Top of South Island
Comparison November counts 1983-2000 with 2001-2011 for migratory species				
Red Knot	-37%	-55%	74%	Decline
Bar-tailed Godwit	-31%	1%	-19%	Decline
Ruddy Turnstone	-42%		-59%	Decline
Comparison June counts 1984-2001 with 2002-2012 for endemic species				
Variable Oystercatcher	46%	149%	161%	Increase
South Island Pied Oystercatcher	-20%	61%	-1%	Stable
Pied Stilt			103%	Increase
Banded Dotterel	-14%	64%	78%	Stable
Wrybill			3%	Stable

Legend: red = decline (more than -25% decline); yellow = stable (between -25% and 25% change); green = increase (more than 25% increase) in the respective population counts.

4.5.2 Red Knot

Red Knot numbers are decreasing at all sites apart from Tasman Bay. Overall the population in the Top of the South Island declined from about 13,700 to 9,000; a decline of about 35%. The species is assessed to be in 'decline'.

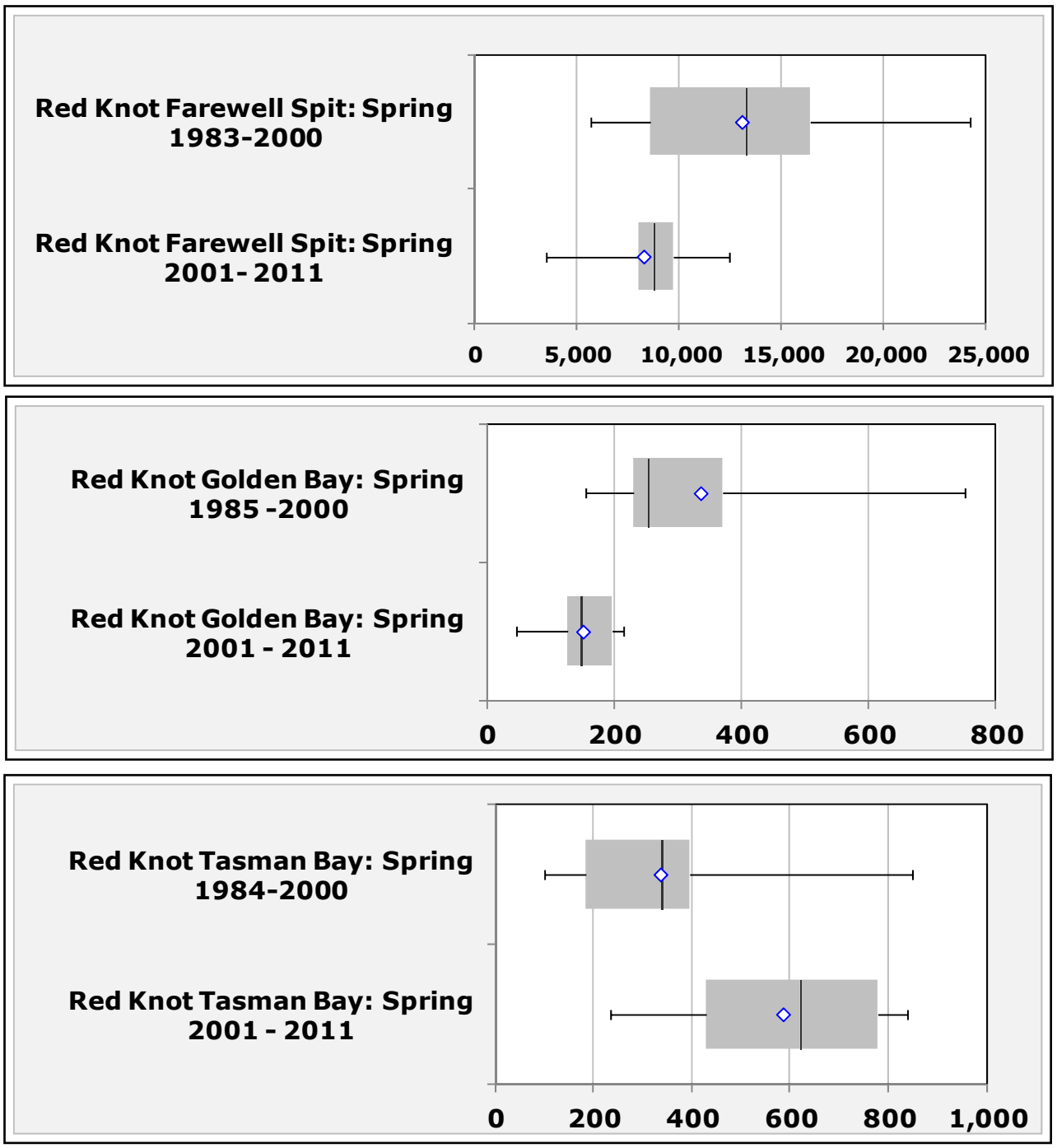

Figure 19 Population trends of Red Knot in the Top of the South Island. (Note: start of data set varied between three areas for 1983-2000 period).

4.5.3 Bar-tailed Godwit

Bar-tailed Godwit numbers are decreasing at all sites in the Top of the South Island. Overall the population in the Top of the South Island has declined from about 28,000 to 15,700, a decline of about 25%. The species is assessed to be in 'decline'.

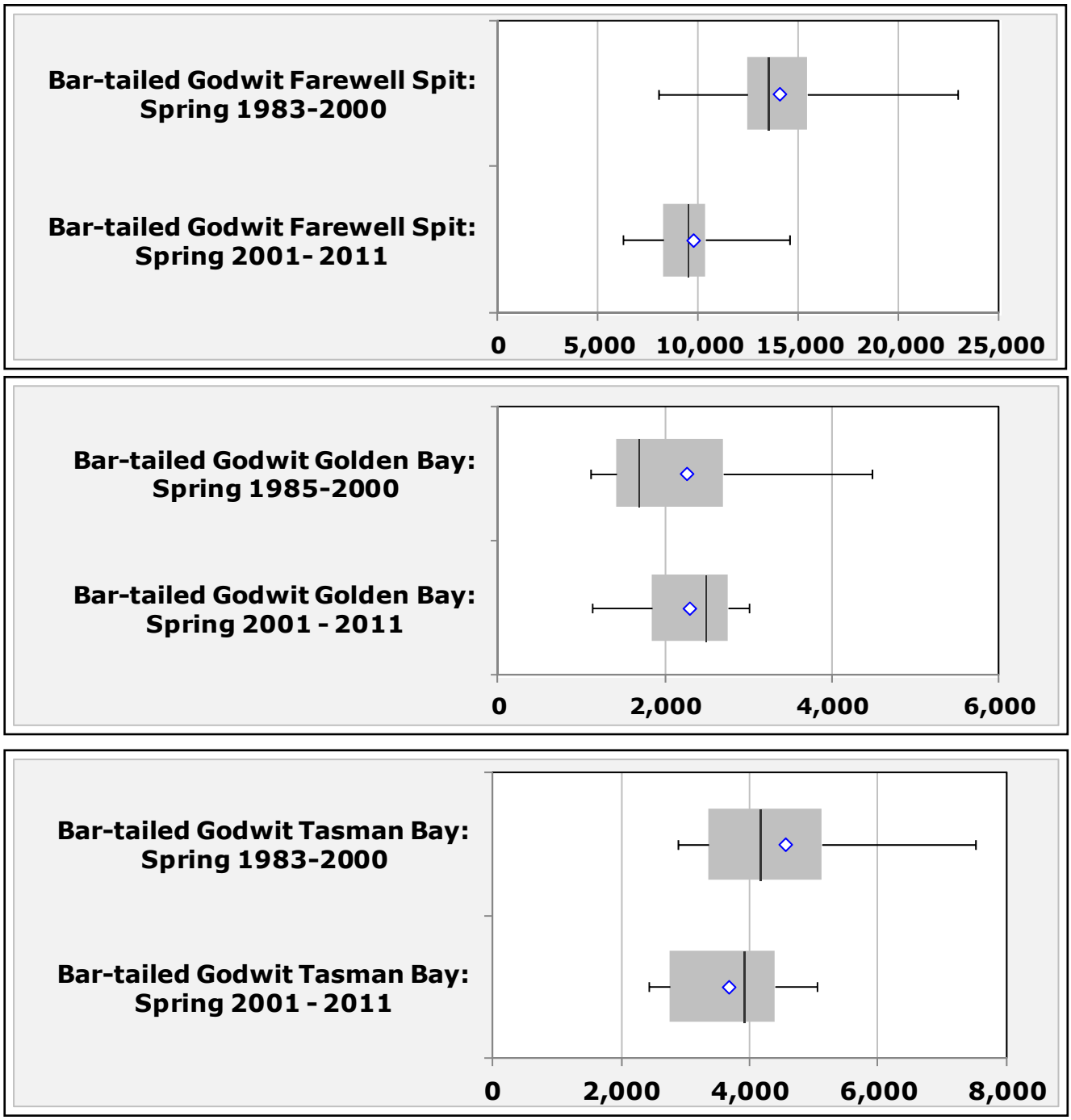

Figure 20 Population trends of Bar-tailed Godwit in the Top of the South Island. (Note: start of data set varied between three areas for 1983-2000 period).

4.5.4 Ruddy Turnstone

Ruddy Turnstones only occur in Tasman Bay and at Farewell Spit. Numbers have decreased at all sites from about 1,000 to 540, a decrease of about 47%. The population in the Top of the South Island is assessed to be in 'decline' (Figure 21).

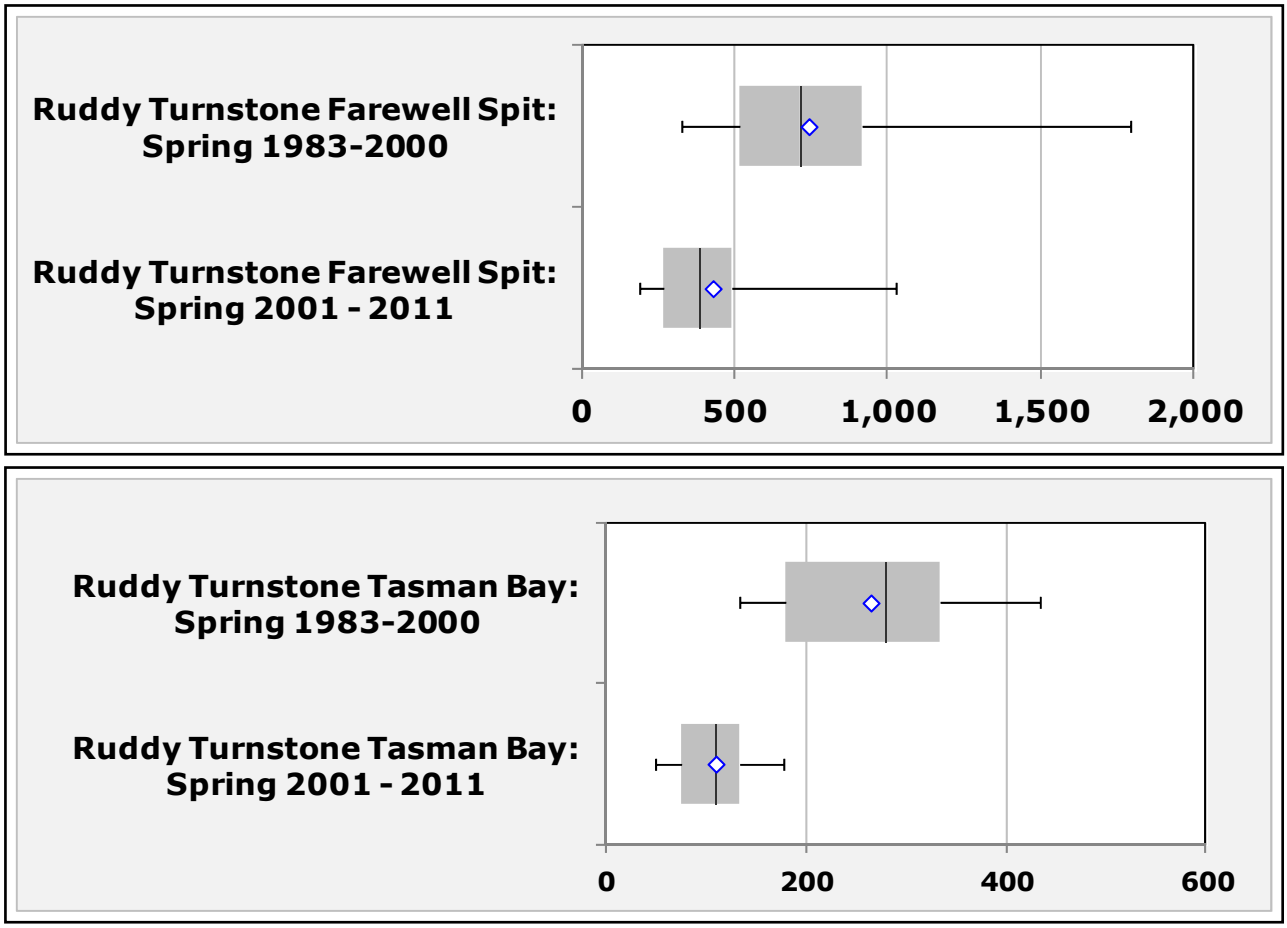

Figure 21 Population trends of Ruddy Turnstone in Tasman Bay and Farewell Spit.

4.5.5 Variable Oystercatcher

Variable Oystercatchers have increased significantly in the Top of the South Island, from about 310 to 730 birds, an increase of about 134%. The overall population is assessed to be 'increasing' (Figure 22). It should be noted that Tasman Bay appears to act as a regional 'nursery' for young Variable Oystercatchers from at least as far away as Kaikoura (Rowe 2011, OSNZ unpublished).

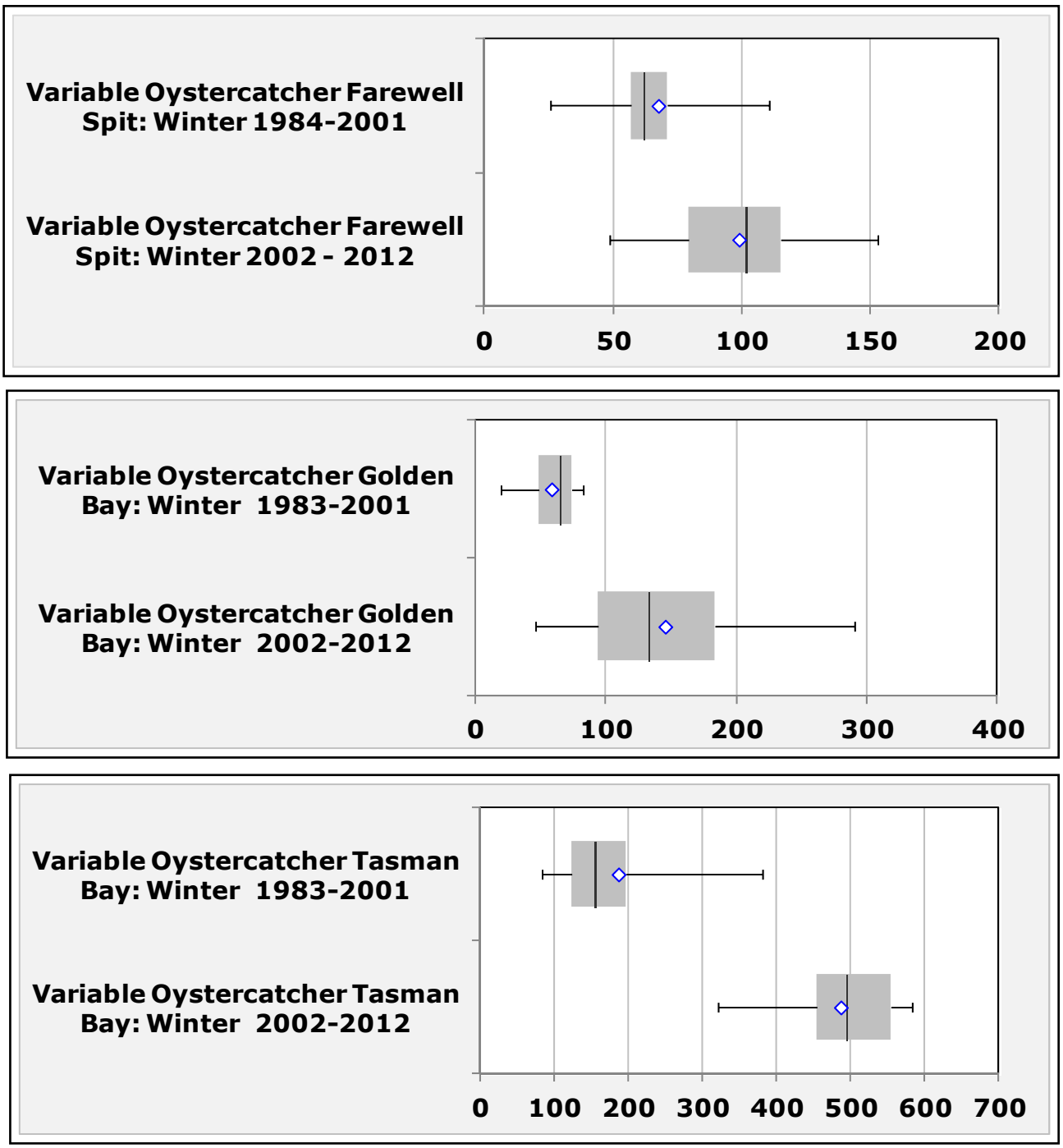

Figure 22 Population trends of Variable Oystercatcher in the Top of the South Island. Note: the start of the data set varies between the three survey areas for the period 1983-2000.

4.5.6 Pied Oystercatcher

South Island Pied Oystercatcher numbers have been stable in Tasman Bay, increased in Golden Bay/Westhaven and decreased at Farewell Spit. The overall the population in the Top of the South Island decreased slightly from 13,630 to 13,550, a decrease of about 0.6%. The overall population is assessed to be 'stable' (Figure 23).

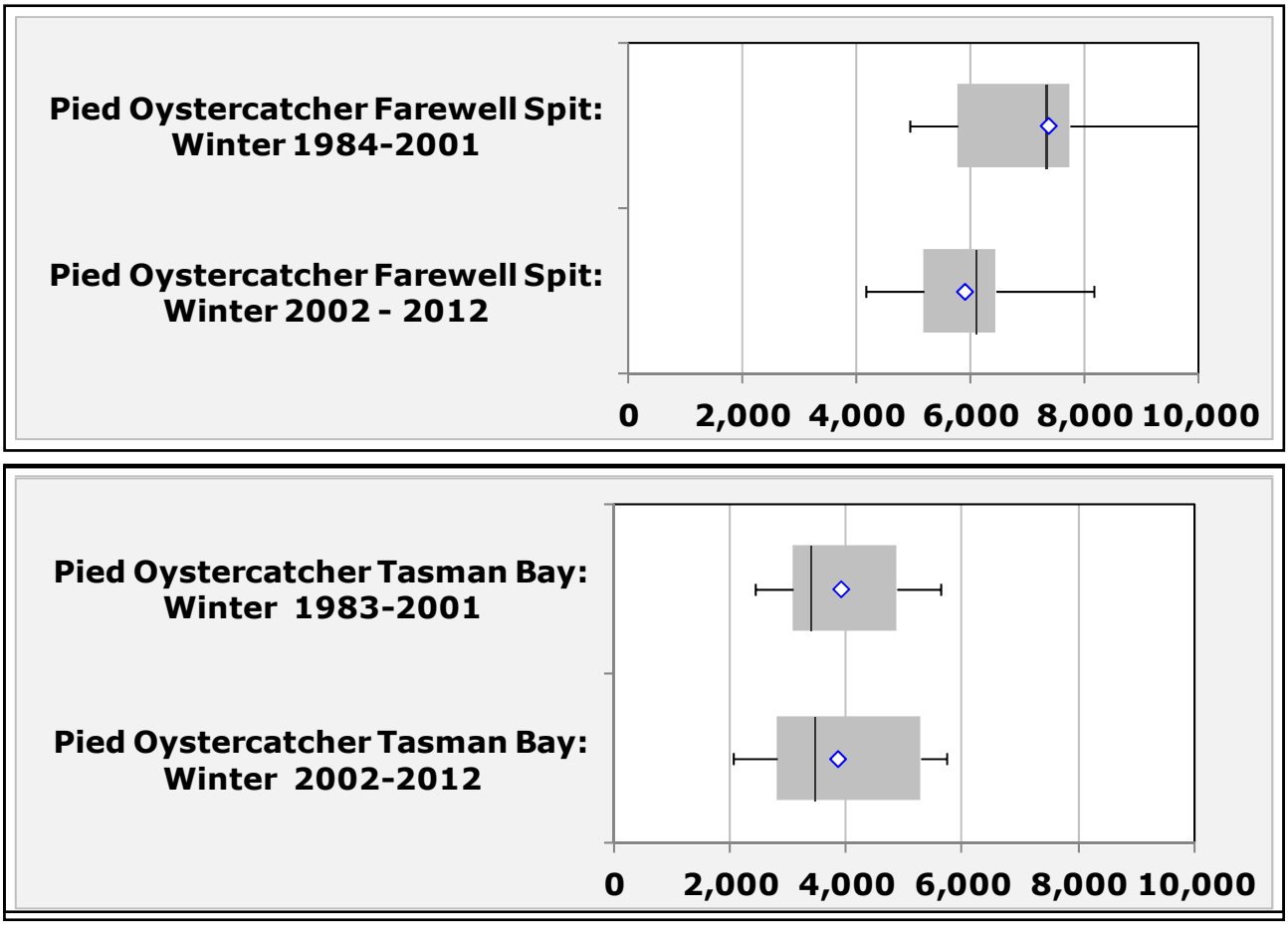

Figure 23 Population trends of South Island Pied Oystercatcher in the Top of the South Island. Note: the start of the data set varies between the three survey areas for the period 1983-2000.

4.5.7 Pied Silt

Pied Stilts in Top of the South Island only occur in significant numbers in Tasman Bay. The overall population increased from 245 to 500 birds, and increase of about 103%, and is assessed to be 'increasing' (Figure 24).

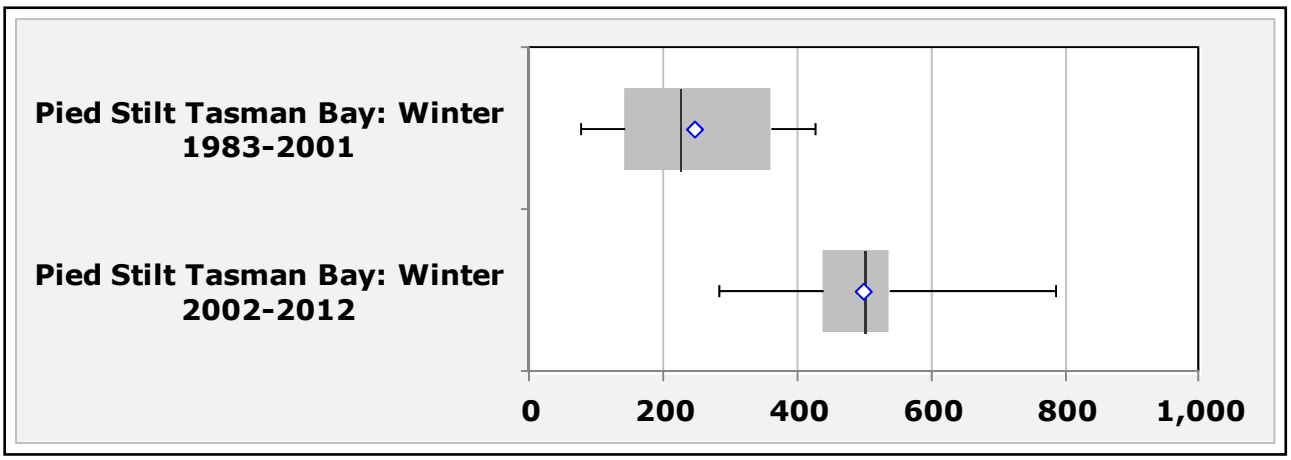

Figure 24 Population trends of Pied Stilt in Tasman Bay.

4.5.8 Banded Dotterel

Banded Dotterels have increased in Golden Bay/Westhaven and Tasman Bay but decreased at Farewell Spit. Overall the population in the Top of the South Island has increased from about 1,200 to 1,340, or 6%. The population is assessed to be 'stable' (Figure 25).

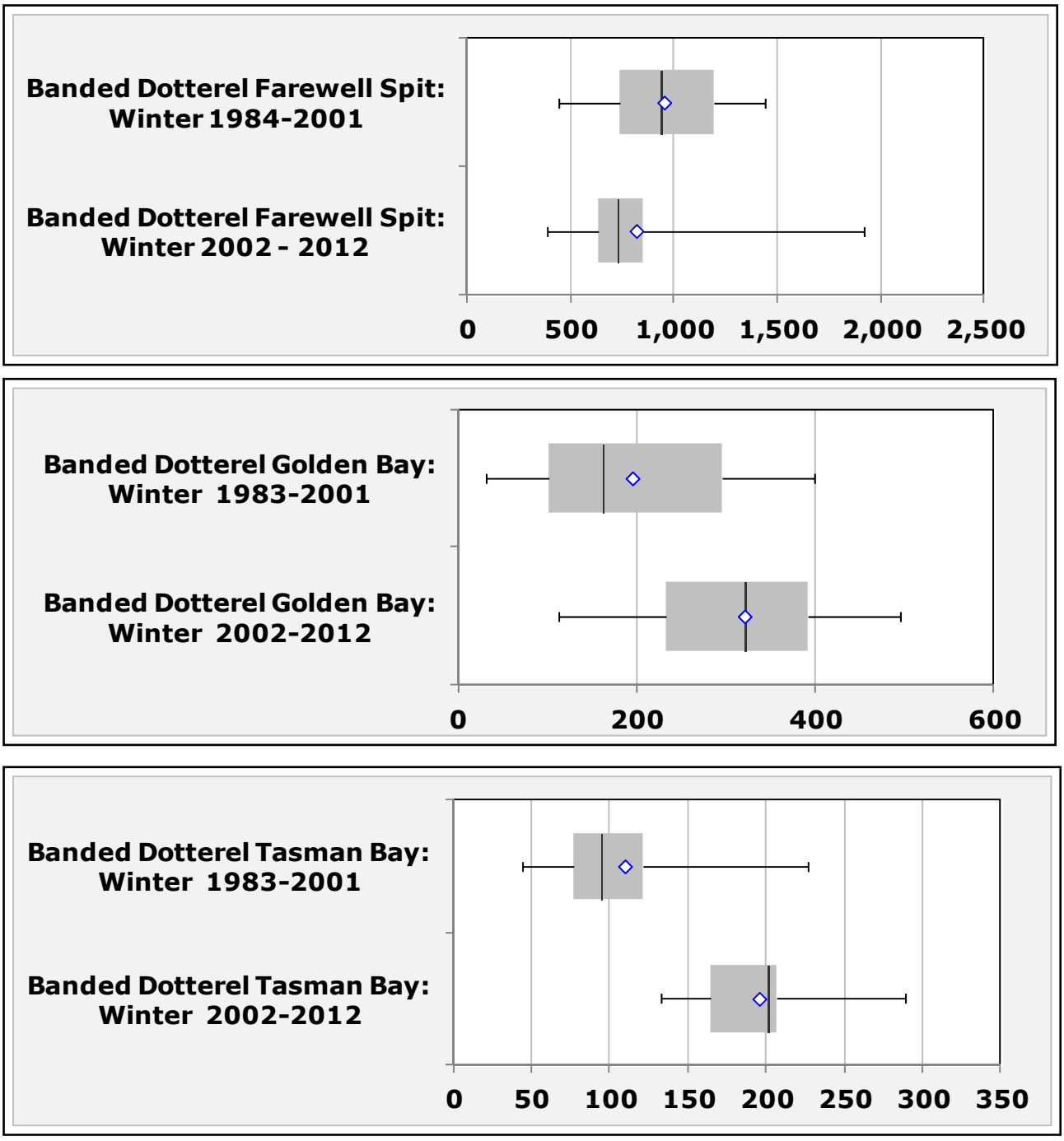

Figure 25 Population trends of Banded Dotterel in the Top of the South Island. Note: the start of the data set varies between the three survey areas for the period 1983-2000.

4.5.9 Wrybill

Wrybills in the Top of the South Island only occur in significant numbers in Tasman Bay. Overall, the population in the Top of the South Island increased from 39 to 40 birds and is assessed to be 'stable' (Figure 26).

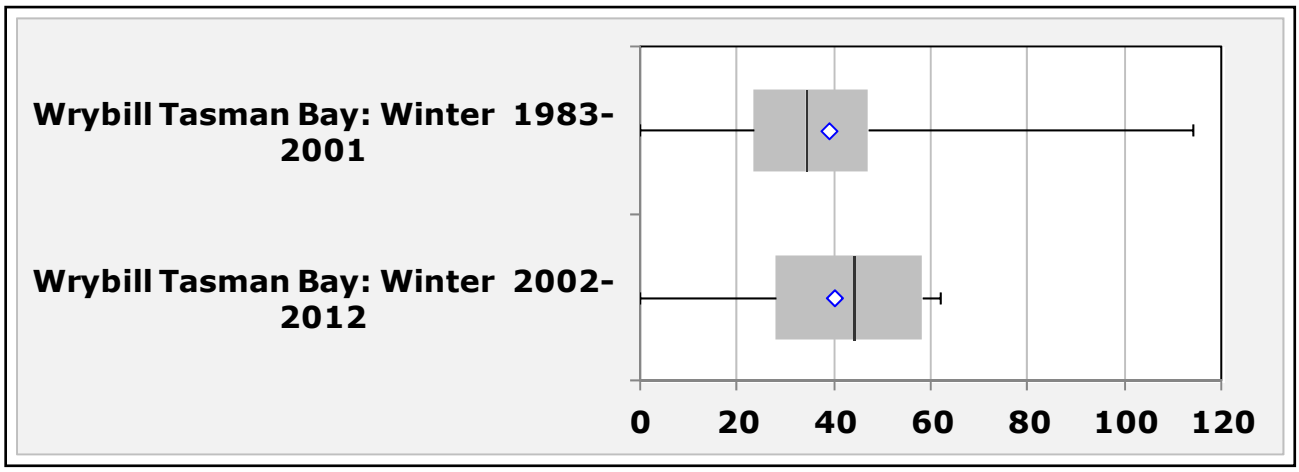

Figure 26 Population trends of Wrybill in the Tasman Bay.

4.5.10 Important shorebird sites in Top of the South Island

Between 2001 and 2012, most of the shorebird sites in the Top of the South Island have been surveyed three times a year. Data for each site have been assessed with respect to the Ramsar criteria (see section 1.5).

In the Top of the South Island, eight sites are of international or national importance for at least one shorebird species (Table 6).

Farewell Spit is the most important site in the Top of the South, meeting the Ramsar criterion 5 and 6. Fairwell Spit regularly supports 20,000 or more waterbirds and 1% of the individuals of a population of one species or subspecies of a waterbird, respectively. Both criteria are of equal importance.

Motueka Sandspit and Waimea East both have three shorebird species that meet the Ramsar criterion 6 to qualify as internationally important sites.

Motueka Sandspit and Westhaven both have internationally important numbers of Banded Dotterel, assessed in accordance with EAAFP (for staging sites holding 0.25% of the fly way population).

Table 6 Sites of International and National Importance for shorebirds in the Top of South Island.

Important Shorebird Species at each Site		Shorebirds	Red Knot	Bar-tailed Godwit	Ruddy Turnstone	Variable Oystercatcher	South Island Pied Oystercatcher	Pied Stilt	Banded Dotterel	Wrybill
Farewell Spit[7]	6									
Golden Bay										
Westhaven Inlet	2								8	
Taupota Creek										
Pakawau	1									
Totara Avenue										
Collingwood	1									
Parapara										
Onekaka										
Paton's Rock										
Rototai	1									
Pohara										
Wainui Inlet										
Tasman Bay										
Awaroa										
Marahau										
Motueka Sandspit	5								8	
Moutere Inlet										
West Waimea Inlet	1									
East Waimea Inlet	5									
Nelson Haven										
Delaware Bay										

Legend: Sites of International Importance (dark grey) and National Importance (light grey) for shorebirds

[7] Farewell Spit is also of international importance for the number of shorebird (criterion 5>20,000 shorebirds)

[8]Assessed in accordance with EAAFP 0.25% criterion for staging sites.

4.6 Breeding shorebirds of the Top of the South Island

The sandy beaches and associated intertidal flats at the Top of the South Island provide important habitat for breeding shorebirds, including Variable Oystercatcher and Banded Dotterel. There has been no systematic survey of breeding shorebirds in the Top of the South but a summary of current information is presented in Table 7.

Variable Oystercatchers are generally distributed along the entire coastline, with concentrations of pairs at sites with fast water flows which appear to be associated with good foraging conditions, e.g. mussel beds. This is particularly apparent at Motueka Sandspit, for example, with high concentrations of pairs around the Raumanuka area at the base of the Spit and at the southern tip of the Spit; pairs are more dispersed along the remainder. Dowding & Moore (2006) assessed the breeding population of Variable Oystercatchers to be 2,000 pairs (taking into account immature and non-breeding adults in the total population), thus 1% of the breeding population is 20 pairs. Farewell Spit and Motueka Sandspit are of international importance for breeding Variable Oystercatchers.

Banded Dotterels are much scarcer with regular breeding attempts in Tasman Bay being restricted to Wakapuaka flats at the head of Nelson Haven, Kina Peninsula, Motueka Sandspit and Awaroa Bay.

Breeding productivity is generally low, with few young of either species fledging. High spring tides wash out some nests, and others are predated. Human activities on beaches result in high levels of disturbance to breeding shorebirds and this undoubtedly contributes to lowered breeding success.

Table 7 Sites of significance for breeding shorebirds.

Sites of significance for breeding shorebirds		Variable Oystercatcher Breeding pairs	Banded Dotterel Breeding pairs
Farewell Spit		ΔΔΔΔ	Δ
Westhaven		Δ	Δ?
Golden Bay	Taupata Creek	Δ	
	Pakawau	Δ	
	Totara Avenue	Δ	Δ
	Collingwood	Δ	Δ
	Parapara	ΔΔ	
	Onekaka	Δ	
	Paton's Rock	ΔΔ	
	Rototai	Δ	Δ
	Motupipi	Δ	Δ
	Pohara	Δ	
	Wainui Inlet	Δ	Δ
Tasman Bay	Awaroa	Δ	Δ
	Marahau	Δ	
	Riwaka Estuary	Δ	
	Motueka Sandspit	ΔΔΔΔ	ΔΔΔ
	Jacket Island	Δ	
	Kina Peninsula	Δ	Δ
	Moutere Inlet	ΔΔ	
	No Mans Island	ΔΔ	
	Bullivant Island	Δ	
	Rabbit Island	ΔΔ	
	Bell Island Shellbank	ΔΔ	
	Waimea Inlet	ΔΔ	
	Saxton Island	Δ	
	Pig Island	Δ	
	Sand Island	Δ	
	Airport Area	Δ	
	Haulashore Island	Δ	
	Nelson Haven		Δ
	Boulder Bank	ΔΔ	
	Delaware Bay	Δ	Δ

Legend
1- 5 pairs – Δ; 6-10 pairs – ΔΔ; 11-20 pairs – ΔΔΔ; ≥ 21 pairs – Δ Δ Δ Δ.

5. CONSERVATION ASSESSMENT

5.1 Sites of importance for shorebirds in the Top of the South Island

The conservation values of estuaries and coastal areas in the Top of the South have been assessed on 3 occasions during the past 20 years. Davidson *et al*. (1993) and Davidson & Preece (1994) undertook assessments for use in preparation of the Tasman and Nelson District Coastal Plans/Resource Management Plans, using criteria for the identification of areas of significant conservation value outlined in Schedule 2 of the draft (1992) New Zealand Coastal Policy Statement (Department of Conservation 1992). Notably, these did not include assessments against the Ramsar Criteria relating to waterfowl (see section 1.5). These criteria were adopted at the 4th Conference of the Parties to the Ramsar Convention in 1990, however information on 1% population thresholds did not become available until 1994 (Rose & Scott 1994).

Tasman District Council and Nelson City Council adopted the recommendations of Davidson *et al*. (1993) and Davidson & Preece (1994) in their plans.

Schuckard (2002) assessed sites against the Ramsar listing criteria using 1% population thresholds derived from Watkins (1993) and Bamford (2002 *in prep*., subsequently published as Bamford *et al*. 2008).

The current assessment uses the Wetlands International (2013) population estimates unless otherwise stated (section1.5). The results of the various assessments are compared in Table 8.

It is notable that a number of sites listed as being nationally important by Davidson *et al.* (1993) and Davidson & Preece (1994) are not included in the current assessment. This is due to the fact that different criteria have been used in the assessments, thus Tata Beach Estuary, for example, does not support important shorebird populations but is important for other species.

Table 8 Comparison of conservation assessments for estuaries in the Top of the South Island

Site	Davidson 1993, 1994 reports	Nelson / Tasman RMP categories	Schuckard 2002	This report
Westhaven Inlet	National	National	National	International
Farewell Spit	International	International	International	International
Puponga	National	National	NA	NA
Taupata Creek	NA	NA	N	N
Pakawau	National	National	N	International
Totara Avenue[9]	National	National	International	N
Ruataniwha Inlet	National	National	NA	NA
Collingwood	NA	NA	N	International
Parapara	National	National	N	N
Onekaka	National	National	N	N
Onahau / Paton's Rock	National	National	N	N
Waitapu estuaries	National	National	N	N
Rototai estuary	National	National	International	International
Pohara / Motupipi	NA	NA	N	N
Tata Beach estuary	National	National	NA	NA
Wainui Inlet	National	National	N	N
Abel Tasman NP estuaries	International[10]	International	N	N
Marahau	National[10]	National	N	N
Motueka delta / Sandspit	National	National	International	International
Moutere Inlet	National	National	N	N
Waimea Inlet	National[11]	National	International	International
West Waimea Inlet: Grossi Point & No-Mans Island	Included as Waimea Inlet		International	International
East Waimea Inlet: Bell Island Shellbank	Included as Waimea Inlet		International	International
East Waimea Inlet: Sand Island	Sand island not present			International
East Waimea Inlet: Airport Area	NA	NA	N	International
Nelson Haven	National	National	N	N
Delaware Inlet	National	National	N	N

Legend

NA Not assessed

N Not nationally or internationally important for shorebirds.

[9] Listed as Waikato Spit in Davidson *et al*. 1993

[10] Does not include shorebirds

[11] No Mans Island is considered of International significance due to presence of rare plants

Farewell Spit has been recognised as a Wetland of International Importance (Ramsar Site) since 1976. It is noteworthy that the current assessment supports that by Schuckard (2002) in recognising the international importance of Rototai, Motueka Sandspit, and Waimea Inlet for shorebirds. Two further sites in Golden Bay are assessed as being of international importance: Pakawau and Collingwood, while Totara Avenue, which was of international importance in 2002, no longer qualifies as being of even national importance. It is likely that the changing fortunes of these three sites relate, at least in part, to coastal processes which have resulted in the formation of new sandbars offshore which birds now use for roosting. This change in level of importance highlights the fact that roost sites are not 'fixed' entities, and that management planning needs to take account of the dynamic nature of coastlines.

All of the eight sites qualify for potential listing as Ramsar Sites (Wetlands of International Importance), or as East Asian-Australasian Flyway Network Sites. Neither of these designations offers any legal protection so appropriate recognition under local Resource Management Plans, byelaws etc. is still required.

6. COASTAL MANAGEMENT AND SHOREBIRDS

Much of the coast, especially around estuaries, in the Top of the South Island has been subject to intensive human activity since early settlement. Human activities can impact both directly and indirectly on breeding areas, hightide roost sites and intertidal foraging areas, thereby affecting shorebirds. This section briefly addresses a selection of issues relevant to ensuring the continued security of coastal habitats in the Top of the South Island for shorebirds, in particular the 9 sites that are of international importance (Section 5).

The Ramsar Convention requires (Article 3.1) that 'The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List [of Wetlands of International Importance], and as far as possible the wise use of wetlands in their territory'. New Zealand's Controller and Auditor General has identifed this as the 'key obligation' under the convention (Macdonald 2001). Wise use of wetlands is defined as 'the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development' (Anon. 2005).

The Resource Manngement Act and the New Zealand Coastal Policy Statement (Anon. 2010) provide a legal framework for adoption of the 'wise use' concept in

New Zealand, while the Tasman and Nelson Resource Manangement Plans provide for local implementation.

It is beyond the scope of this report to explore the potential implications of the presence of coastal sites of international importance that are outside the conservation estate (all sites other than Farewell Spit).

6.1 Habitat loss and degradation

It is estimated that 30% of saltmarsh in Tasman and Golden Bay (excluding the Abel Tasman area) has been lost since 1900 as a result of drainage and reclamation; 30% of active duneland has been lost since 1940; and 65% of the natural vegetated terrestrial 200m margin buffer that historically bordered shorelines in the Tasman region has been highly modified (Robertson & Stevens 2012).

Vehicle damage is significant around much of Tasman's coast. Vehicles are used to access whitebait stands, *maimais*, boat launching areas and key infrastructure such as power lines. Vehicles including quad bikes and motorbikes are also used for recreation over dunelands, saltmarsh and other sensitive habitats. Often this recreation involves sustained loss of traction resulting in vegetation loss.

Excessive disturbance (see below) can result in birds abandoning an area (Section 6.6) which effectively results in a loss of habitat (Stillman *et al*. 2007).

Robertson & Stevens (2012) have recommended various actions to monitor changes in the extent of habitats and proposed future management for restoration.

There is increasing public interest in coastal restoration planting projects in both Golden and Tasman Bays (Hall *et al*. 2013). There is potential for these to adversely impact shorebirds if open coastlands become densely vegetated, even if native plants are used. This highlights the value of holistic planning approaches to coastal management and biodiversity conservation.

6.2 Aquaculture and fisheries

Mussel farming is practised in Golden Bay, including areas near Farewell Spit. Mussels are known to feed on zooplankton as well as phytoplankton and thus potentially could impact on recruitment of benthos in intertidal areas. Following a submission by the Ornithological Society of New Zealand, the Ministry of Fisheries determined that it was 'not satisfied that full development of interim AMA1 would not have an undue adverse effect on the sustainability of important shorebird populations (including Bar-tailed Godwit, Red Knot) associated with the internationally important Farewell Spit Ramsar site' (Ministry of Fisheries

2008). There remains uncertainty as to the potential impacts of mussel farming on nearby intertidal areas and shorebird prey species.

Schmeckel (2001) found that the mechanical harvesting of cockles in the intertidal areas of Golden Bay could adversely affect prey species of shorebirds and recommended a precautionary approach in which potentially sensitive areas (those with high cockle densities and tube-dwelling polychaetes) are set aside from harvest until the impacts on sediment structure and sustainability of the fisheries are better understood'.

6.3 Pollution

The structure and function of estuaries in Tasman may be affected by high levels of silt input - 50% of the estuaries in Golden and Tasman Bays are excessively muddy (Robertson & Stevens 2012). Despite moderate to high levels of nutrient runoff to some Tasman estuaries, due to high flushing rates they have a low to moderate eutrophication status (Robertson & Stevens 2012). Increases in mud or nutrient loads could impact benthos and thus result in changes in food stocks and availability for shorebirds. Should there be increases in macroalgae, such as sea lettuce *Ulva*, this could reduce foraging opportunities for shorebirds (Cabral *et al*. 2006).

Robertson & Stevens (2012) recommended a reduction of fine suspended sediment inputs to estuaries to a mean sedimentation rate of ~1mm/year, taking climate change into account.

6.4 Exotic organisms

Introduced exotic species may impact shorebirds. The invasive cordgrass *Spartina* spp., originally introduced to promote sediment stabilisation and land growth, caused the loss of exposed intertidal flats. *Spartina* is now a 'total control pest' in the Tasman-Nelson area (Anon. 2012a), and has been eradicated from some areas, but 64 active sites for control remain, including 56 in Waimea Inlet (Brown & Raal 2013). Pacific Oysters *Crassostrea gigas*, having first been recorded in New Zealand in the 1960s (Dinamani 1971), are now widespread and are occasionally preyed upon by Variable Oystercatchers, however whether this compensates for the loss of the original habitat and biota is unknown. Occasionally exotic species may benefit shorebirds, for example through the provision of a new food source (Hockey & van Erkom Schurink 1992, Caldow *et al*. 2007).

Exotic organisms have impacted the coasts of the Top of the South island, and new species are regularly being discovered – a survey of Port Nelson in 2002 recorded at least 14 non-indigenous species, 6 of which had not previously been

recorded in New Zealand (Inglis *et al.* 2006). Responsibility for continued surveillance and monitoring rests with the Ministry for Primary Industries.

6.5 Climate change and sea level rise

Climate change is expected to impact coastal margins through:

- coastal inundation, causing landward displacement of estuaries, wetlands and marshes
- erosion and shoreline change
- increased vulnerability to coastal storm damage

Current planning guidance in New Zealand recommends using 'a base value sea-level rise of 0.5 m by the 2090s relative to the 1980–1999 average, along with an assessment of the potential consequences from a range of possible higher sea-level rises. At the very least, all assessments should consider the consequences of a mean sea-level rise of at least 0.8 m relative to the 1980–1999 average' (Ministry for the Environment 2008, 2009).

Globally sea-level rise is expected to adversely affect shorebirds (Galbraith *et al*. 2002, Iwamura *et al*. 2013). Prediction of impacts is difficult due to the multiplicity of both physical and ecological factors involved (Austin & Rehfisch 2003), including, for example, cascade effects through changes in parasite populations in invertebrate shorebird prey species (Poulin & Mouritsen 2006).

The Ministry for the Environment (2009) notes that 'Where the landward retreat of the high-water mark is constrained due to morphology, geology (e.g., rock outcrop) or coastal defences, intertidal areas and their associated ecosystems may be reduced and potentially 'squeezed out''. Currently 28% of Tasman Bay and 12% of Golden Bay have hard armoured margins (Robertson & Stevens 2012), highlighting that landward movement of the coastal margin is unlikely to occur without human intervention.

Coastal realignment, which allows for the creation of intertidal habitat behind former sea defences with the establishment of new coastal habitats, is increasingly being promoted to compensate for losses due to development and sea-level rise.

This is an evolving field of conservation management; while there are some encouraging British examples (Scott 2007, Friess *et al*. 2008), it remains unclear how effective such actions may be in the long-term (Atkinson *et al*. 2001, 2004, Rupp-Armstrong & Nicholls 2007, Morris 2013). The Wakapuaka flats at the head of Nelson Haven are currently being considered for restoration as a wetland (Neal 2013).

6.6 Disturbance

6.6.1 Human activities

Humans can disturb birds in many ways, including various land-based and water-based recreational activities. Whilst the impact of some disturbance events may be trivial there are a number of ways in which disturbance can potentially impact birdlife at the population level through increased mortality and/or reduced fecundity. The Ornithological Society of New Zealand submitted a review of potential disturbance impacts on birds to Tasman District Council in 2002 (Melville 2002), hence this report only highlights issues of particular concern.

Human activities in coastal areas that may adversely impact shorebirds include:

On land

- Walking
- Dog exercising
- Horse riding
- Vehicle driving

On water

- Sailing
- Kiteboarding
- Parasailing
- Jet skiing

Airborne

- Fixed wing aircraft, including microlights, and helicopters
- Hovercraft

Internationally there has been a growing amount of research into impacts on waterbirds as a result of disturbance from both recreational and construction activities. While there has been very little research into the effects of disturbance on shorebirds in New Zealand, it is very likely that the impacts will be similar to those found overseas given the range of studies across countries and different coastal beach types and the consistent effects across birds of similar habit.

Human use of the coastal area is strongly seasonal. Whilst there is some use throughout the year the greatest numbers of people are present during the summer months. In the case of Abel Tasman National Park 20% of annual use is in the 4 weeks from Christmas to the end of January, and 80% of annual use is between November and April (Anon. 2012b); a generally similar pattern is found elsewhere in the region.

Thus the period of greatest human use coincides with the breeding season of local shorebirds and the period when Arctic breeding species are fattening prior to migration.

6.6.2 At risk breeding birds

Beaches of The Top of the South Island support important populations of 'at risk' Variable Oystercatcher and 'threatened' Banded Dotterel (Section 4.6), as well as several other species. Such birds can be adversely affected by direct damage to eggs and chicks e.g. by trampling, and indirect effects such as heat stress and death of embryos when parents leave the nest for prolonged periods, as well as reduced feeding rates of oystercatcher chicks (Verhulst *et al*. 2001).

Currently very few pairs of either Banded Dotterel or Variable Oystercatcher fledge young from nests on Motueka Sandspit (OSNZ unpublished), and other sites in Tasman Bay, although less studied, appear to be similarly unproductive. In the case of Banded Dotterel, at least, accidental trampling of nests is probably the major cause of loss. Fencing of nests at Motueka Sandspit in 2010 allowed several pairs of Banded Dotterels to fledge young, and fencing has proved very effective for other plover species overseas (Lafferty *et al*. 2006, Liley & Sutherland 2007).

6.6.3 At risk migrant birds

Arctic-breeding shorebirds arrive in New Zealand in September/October; in the case of Bar-tailed Godwits this is after an11,000 km non-stop flight from Alaska (Gill *et al*. 2009). They leave New Zealand in March-April on migrations which, at least in the case of Bar-tailed Godwit and Red Knot, take them on a 10,000km non-stop flight to the Yellow Sea (Battley *et al*. 2012, Pavel Tomkovich unpublished). The birds double their weight prior to migration (Fig. 27) to provide the energy stores required for a flight that takes about 7 days and nights continuous flying.

Recently arrived Bar-tailed Godwit on 2 October 2012, thin and emaciated

Same Bar-tailed Godwit in good body condition on 19 March 2013, prior to the northward migration **(Photos: Jesse Conklin)**

Figure 27 Bar-tailed Godwits double their weight prior to migrating from New Zealand to the Yellow Sea.

Migrant birds are particularly susceptible to adverse effects from disturbance as energy gets used up avoiding disturbance, rather than being lain down as fat and protein to fuel migration. The rate of fuelling depends on how much energy is taken in minus the amount spent on maintenance, including flight.

Even if foraging birds are not flushed, intake rates can be reduced by human disturbance (Coleman *et al*. 2003), and foraging success has been found to decrease with increasing numbers of people on beaches (Gray 2006). Most disturbance in the Top of the South occurs at hightide roost sites rather than when birds are foraging on intertidal flats.

The South Island Pied Oystercatcher migrates through the Top of the South Island in January-March and large numbers stop off and undergo moult in the region. Moult is a highly energy demanding process and thus disturbance could adversely impact moulting birds.

6.6.4 Land-based disturbance

Many of the region's beaches are used extensively for recreation including walking, dog exercising, fishing and in some instances horse riding and driving, as at Rabbit Island. Heavily used beaches, such as at Tahunanui and the central area of Rabbit Island, are so disturbed that no shorebirds attempt to nest, although small numbers may forage and roost, even during the busy summer months. At Pakawau, Golden Bay there is a regular hightide shorebird roost in early summer, but once the Christmas holiday season starts and humans and

dogs frequent the small beach area the site is abandoned and birds move elsewhere to roost – in particular to the base of Farewell Spit, some 12km away. The fact that birds are able to find another roost site could suggest that there is no adverse effect, however this cannot be assured in view of the fact that shorebirds prefer to roost close to their foraging areas to reduce energy expenditure (Dias *et al*. 2006, Rogers *et al*. 2006).

In recent years there has been a considerable amount of research on the disturbance impacts of dog exercising. Taylor *et al*. (2005) found that 'A walker with a dog may provoke a bird disturbance response at greater distances and for longer periods than stimuli from other recreational activities, including people without dogs', and similar results have been found by many other studies (Thomas *et al.* 2003, Phalan & Nairn 2007, Kyne 2010). All studies suggest that dogs off a leash are likely to disturb shorebirds, and generally that walkers with a dog on a leash cause more disturbance than a walker without a dog.

Flight initiation distances (FID), the distance at which a bird will take flight when subject to a stimulus (usually a single person walking), have been used to assess potential disturbance impacts on birds, and may be used to establish buffer distances for sensitive sites (Weston *et al*. 2012). It should be recognised that FIDs measured in one region may not be applicable to the same species in another area (Laursen *et al*. 2005), and that a variety of factors need to be taken into account when using them for coastal management (Triplet *et al*. 2007). Lord *et al*. (2001) determined FID in New Zealand Dotterels *Charadrius obscurus* – this appears to be the only shorebird studied in New Zealand.

6.6.5 Water-based disturbance

Vessel passage usually does not disturb shorebirds unless vessels are close inshore. Existing Bylaws for both Nelson and Tasman state that vessels should not exceed 5 knots within 200m of the shore unless using a designated water ski access lane or in a reserved area. Following a submission from the Ornithological Society of New Zealand the boundary of a water ski area in East Waimea Inlet was revised to avoid access to the area around the Bell Island Shellbank which is an internationally important hightide roost site.

However small sailing boats operated by inexperienced sailors inside Motueka Sandpsit have flushed birds from hightide roosts. Kitesurfing can cause considerable disturbance to shorebirds (Anon. 2011, Linaker 2012); currently kiteboaders use the Motueka Sandspit area only occasionally but the there is potential for very considerable disturbance at this internationally important site if the activity is not controlled related to disturbance impacts on birds.

6.6.6 Aircraft disturbance

Aircraft, including floatplanes, operating at low levels and hovercraft have the potential can cause disturbance to birds. Recent examples of aircraft operating at very low levels and/or landing in areas used by internationally important populations of shorebirds include a helicopter operating over the shorebird roost at the East End of Rabbit Island and a seaplane operating off Motueka Sandspit.

Farewell Spit and the adjacent intertidal areas are a 'restricted area' under Part 71 of the Civil Aviation Rules - no aircraft are allowed to fly below 2,000 ft, this being to reduce disturbance to birds. Elsewhere in the region there are no height restrictions.

Low flying by aircraft in areas with large populations of shorebirds not only is likely to result in disturbance to the birds but also increases the risk of birdstrike to the aircraft.

Seaplanes are prohibited from landing in the Waimea Inlet (Tasman District Council Consolidated Bylaw Chapter 5, Navigation Safety, Schedule 2). Elsewhere in Tasman District landing or takeoff is a permitted activity if it is at least 500m seaward of MHWS in any coastal areas identified as nationally or internationally important – detailed in Schedule 25D of the Tasman Resource Management Plan. In Nelson City, operation of seaplanes is prohibited within Nelson Harbour, except in an emergency; however this area does not include most of Nelson Haven (Nelson City Council Navigation Safety Bylaw 2012, Section 2.23). Hovercraft occasionally operate in Nelson Haven and Waimea Inlet.

7. COMMUNITY EDUCATION AND PUBLIC AWARENESS

There is growing evidence that increased awareness can lead to reduced conflict between human recreational activities and wildlife, although methods to achieve this may be complex (Kazmierow *et al*. 2000, Burger *et al*. 2004, Williams *et al*. 2009, Ormsby & Forys 2010).

Currently there is some interpretive signage at a number of beaches around both Golden and Tasman Bays but no studies have been undertaken to assess their impact. In Northland Bridson (2000) found that signs were of limited value in areas where New Zealand Dotterel and New Zealand Fairy Terns *Sterna nereis* were breeding and beaches were used for surfing, fishing and boating.

In a number of instances voluntary codes of conduct have been found useful, e.g. for kitesurfing in Jersey, Channel Islands (Jersey Kite Surfing Association

undated), however in other areas such codes of conduct only relate to human safety (Northland Regional Council, undated). Personal watercraft clubs may play an important role in education and awareness (Burger & Leonard 2000, Whitfield & Roche 2007).

Motueka's 'Welcome to the Godwits' has been very successful in raising awareness of the international importance of Motueka Sandspit for Bar-tailed Godwits and other shorebirds and there is scope for similar activities elsewhere in the Top of the South. In Australia 'Dog's Breakfast' events (Anon. 2012c), where dog owners and their dogs are invited to share some breakfast and learn about how they can help conserve shorebirds have proved popular and have been successful in raising awareness. Also campaigns such as 'I am a wet sand walker' have been successful in encouraging people to walk on the beach below the hightide line to avoid disturbance to breeding shorebirds.

8. RECOMMENDATIONS

8.1 Monitoring and Research

Surveys conducted by the Ornithological Society of New Zealand have shown that the Top of the South Island supports internationally and nationally important populations of 7 species of shorebirds.

Continued monitoring of populations, as currently conducted by OSNZ, is required to:

- contribute to ongoing international assessments of flyway populations and
- determine the effectiveness of management of the coastal environment including RMA compliance.

8.1.1 Breeding bird survey

There has been no comprehensive survey of costal breeding shorebirds in the Top of the South Island, but it is thought that internationally important numbers of Variable Oystercatcher and Banded Dotterel are present. A survey should be undertaken in 2014/2015.

8.1.2 Bar-tailed Godwit

Continue individual colour-banding of Bar-tailed Godwits (and Red Knot and Ruddy Turnstone) to allow determination of annual survival rates. This is of particular importance in view of current habitat loss overseas, especially the Yellow Sea, and will allow comparison with ongoing studies by the Global Flyway Network[12].

8.1.3 Variable Oystercatcher

Continue OSNZ long-term project to understand population dynamics, and role of Tasman Bay as a regional nursery area.

8.1.4 South Island Pied Oystercatcher

Catching and individual marking to better understand the importance of Tasman Bay as a staging (and moulting) site. This project will also contribute to a better understanding of migration throughout New Zealand. (2014-2019)

8.1.5 Wrybill

Targeted monitoring of Wrybill in Waimea Inlet to better understand population turnover (using individually identifiable birds marked elsewhere) (2014-2019)

8.1.6 Flight Initiation Distances (FID)

A study to determine Flight Initiation Distances for shorebirds in the Top of the South Island to inform planning for the establishment of buffer areas around sensitive sites, and for the development of community education and public awareness programmes.

8.1.7 Distribution of shorebird foraging areas

This study has only assessed populations of shorebirds at high tide root sites. If the 'wise use' principle of the Ramsar Convention is to be implemented then foraging areas need to be safeguarded in addition to roost sites. A study to map the distribution of foraging shorebirds over the course of the tidal cycle would inform planning decisions.

[12] http://globalflywaynetwork.com.au/

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APPENDIX 1: Shorebirds recorded from the Top of the South Island

Common name	Scientific name	Endemic[1]	NZ threat status[2]	IUCN threat status[3]
Red Knot	*Calidris canutus*			
Great Knot	*Calidris tenuirostris*			Vulnerable
Sanderling	*Calidris alba*			
Curlew Sandpiper	*Calidris ferruginea*			
Sharp-tailed Sandpiper	*Calidris acuminatea*			
Pectoral Sandpiper	*Calidris melanotos*			
Red-necked Stint	*Calidris ruficollis*			
Western Sandpiper	*Calidris mauri*			
Eastern Curlew	*Numenius madagascariensis*			Vulnerable
Whimbrel	*Numenius phaeopus*			
Little Whimbrel	*Numenius minutus*			
Bar-tailed Godwit	*Limosa lapponica*			
Black-tailed Godwit	*Limosa limosa*			Near Threatened
Hudsonian Godwit	*Limosa haemastica*			
Wandering Tattler	*Tringa incana*			
Grey-tailed Tattler	*Tringa brevipes*			
Common Greenshank	*Tringa nebularia*			
Marsh Sandpiper	*Tringa stagnatilis*			
Lesser Yellowlegs	*Tringa flavipes*			
Terek Sandpiper	*Tringa cinerea*			
Ruddy Turnstone	*Arenaria interpres*			
Grey Phalarope	*Phalaropus fulicaria*			
Red-necked Phalarope	*Phalaropus lobatus*			
Variable Oystercatcher	*Haematopus unicolor*	E	At risk, recovering	
South Island Pied Oystercatcher	*Haematopus finschi*	E	At risk, declining	
Pied Stilt	*Himantopus himantopus*		At risk, declining	
Black Stilt	*Himantopus novaezelandiae*	E	Nationally critical	Critically endangered
Pacific Golden Plover	*Pluvialis fulva*			
Grey Plover	*Pluvialis squatarola*			
New Zealand Dotterel	*Charadrius obscurus*	E	Nationally critical	Endangered
Banded Dotterel	*Charadrius bicinctus*	(E)	Nationally vulnerable	
Lesser Sand Plover	*Charadrius mongolus*			
Greater Sand Plover	*Charadrius leschenaultii*			
Wrybill	*Anarhynchus frontalis*	E	Nationally vulnerable	Vulnerable
Black-fronted Dotterel	*Elseyornis melanops*			
Shore Plover	*Thinornis novaeseelandiae*	E	Nationally critical	Endangered
Spur-winged Plover	*Vanellus miles*		Not threatened	
Oriental Pratincole	*Glareola maldivarum*			

[1] Endemic – found only in New Zealand

[2] After Miskelly *et al.* 2008.Note that migrant species that do not breed in New Zealand are not assessed

[3] IUCN Red List of threatened species - http://www.iucnredlist.org/

APPENDIX 2: Sites of international importance for shorebirds in the Top of the South Island

Species	Site	International Importance threshold 1%	Average number recorded 2001-2012	Season
Red Knot	Farewell Spit	≥ 1,100	8,236	Spring (n = 10)
Red Knot	Farewell Spit	≥ 1,100	8,260	Summer (n = 11)
Bar-tailed Godwit	Farewell Spit	≥1,300	1,401	Winter (n = 11)
Bar-tailed Godwit	Farewell Spit	≥1,300	9,734	Spring (n = 10)
Bar-tailed Godwit	Farewell Spit	≥1,300	11,872	Summer (n = 11)
Bar-tailed Godwit	Westhaven Inlet	≥1,300	1,453	Summer (n = 10)
Bar-tailed Godwit	Motueka Sandspit	≥1,300	1,399	Spring (n = 11)
Bar-tailed Godwit	Motueka Sandspit	≥1,300	2,137	Summer (n = 11)
Variable Oystercatcher	Farewell Spit	≥45	99	Winter (n = 11)
Variable Oystercatcher	Farewell Spit	≥45	60	Spring (n = 10)
Variable Oystercatcher	Farewell Spit	≥45	73	Summer (n = 11)
Variable Oystercatcher	Motueka Sandspit	≥45	98	Winter (n = 11)
Variable Oystercatcher	Motueka Sandspit	≥45	76	Spring (n = 11)
Variable Oystercatcher	Motueka Sandspit	≥45	87	Summer (n = 11)
Variable Oystercatcher	West Waimea Inlet	≥45	77	Winter (n = 11)
Variable Oystercatcher	West Waimea Inlet	≥45	56	Spring (n = 11)
Variable Oystercatcher	West Waimea Inlet	≥45	64	Summer (n = 10)
Variable Oystercatcher	East Waimea Inlet	≥45	167	Winter (n = 11)
Variable Oystercatcher	East Waimea Inlet	≥45	124	Spring (n = 11)
Variable Oystercatcher	East Waimea Inlet	≥45	164	Summer (n = 11)
Pied Oystercatcher	Farewell Spit	≥1,000	5,893	Winter (n = 11)
Pied Oystercatcher	Farewell Spit	≥1,000	1,366	Spring (n = 11)
Pied Oystercatcher	Farewell Spit	≥1,000	6,980	Summer (n = 11)
Pied Oystercatcher	Rototai	≥1,000	1,317	Summer (n = 11)
Pied Oystercatcher	Collingwood	≥1,000	1,343	Summer (n = 11)
Pied Oystercatcher	Pakawau	≥1,000	1,230	Summer (n = 11)
Pied Oystercatcher	Farewell Spit	≥1,000	6,980	Summer (n = 11)
Pied Oystercatcher	Rototai	≥1,000	1,317	Summer (n = 11)
Pied Oystercatcher	Motueka Sandspit	≥1,000	2,136	Summer (n = 11)
Pied Oystercatcher	East Waimea Inlet	≥1,000	1,476	Winter (n = 11)
Pied Oystercatcher	East Waimea Inlet	≥1,000	2,250	Summer (n = 11)
Banded Dotterel	Farewell Spit	≥500	819	Winter (n = 11)
Banded Dotterel	Farewell Spit	≥500	730	Summer (n = 11)
Wrybill[4]	East Waimea Inlet	≥45	66	August (n = 20)

[4] The standard OSNZ counts do not include the main migration passage season for this species and so August counts are used. The average figure is based on 20 counts over 4 years within the period 2001-2012.

APPENDIX 3: Sites of national importance for shorebirds in the Top of the South Island

Species	Site	National Importance threshold 1%	Average number	Season
Red Knot	East Waimea Inlet	≥ 420	493	Summer (n = 11)
Bar-tailed Godwit	East Waimea Inlet	≥800	1,263	Spring (n = 11)
Bar-tailed Godwit	East Waimea Inlet	≥800	1,167	Summer (n =11)
Ruddy Turnstone	Motueka Sandspit	≥25	109	Spring (n = 11)
Ruddy Turnstone	Motueka Sandspit	≥25	220	Summer (n = 10)
Banded Dotterel	Westhaven Inlet	≥200	283	Winter (n = 9)

APPENDIX 4: Sites of international importance for shorebirds staging during migration in the Top of the South Island

Species	Site	Staging threshold	Average number	Season
Banded Dotterel[5]	Westhaven Inlet	≥125	142	Summer (n = 10)
Banded Dotterel[5]	Motueka Sandspit	≥125	131	Summer (n = 11)

[5] Banded Dotterels counted in February (summer) may be regarded as staging, in which case the 0.25% East Asian Australasian Flyway Partnership criterion may be applied.