

MONTHLY ABUNDANCE OF EASTERN BAR-TAILED GODWIT *LIMOSA LAPPONICA BAUERI* IN CENTRAL CANTERBURY, SOUTH ISLAND, NEW ZEALAND

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INTRODUCTION

The Eastern Bar-tailed Godwit *Limosa lapponica baueri* breeds in Alaska and migrates mainly to New Zealand and eastern Australia where it spends the austral summer on inter-tidal mudflats and coastal wetlands. Recent satellite-tracking studies have confirmed that the Eastern Bar-tailed Godwit is arguably the World's greatest migratory shorebird in terms of endurance flight, flying a round-trip migration of around 30,000 km, including an 11,000+ km non-stop flight across the Pacific, performed in as little as 8 days (Gill *et al.* 2008).

The islands of New Zealand form part of the southern terminus for the migrations of the Eastern Bar-tailed Godwit and several other shorebird species using the East Asian-Australasian Flyway (Melville & Battley 2006). Regular counts of shorebirds in terminus areas are the most practical way of monitoring the health of flyway populations (Wilson 2001; Gosbell & Clemens 2006; Melville & Battley 2006). In New Zealand a structured monitoring programme was set up in 1983 with the advent of the "National Wader Count", a nation-wide census carried out by members of the Ornithological Society of New Zealand (OSNZ). This usually takes place in June-July (winter) and November - early December (spring) each year, although over the last three years, an additional February (late summer) census has been trialled. The results of counts from the period 1983 to 1994 were published in Sagar *et al.* (1999), while a report on more recent counts is due for publication shortly (Southey in prep.).

Recently there has been some debate amongst New Zealand shorebird experts as to whether November is the best month for the spring national wader count. This month was chosen in the early 1980s, based on a series of counts at two major sites in the Auckland Region, North Island. These counts indicated that numbers at these two sites were most stable during November. After more than 20 years of monitoring it now seems clear that not all regions experience peaks in November and there is a suspicion that some inbound migrants transit through Australia and may be arriving in New Zealand during December or later (Riegen 2000; Minton *et al.* 2006), and are therefore missed by the November counts. Besides these technical issues there is also the "synchrony problem" of New Zealand's national shorebird census not currently aligning with those of other countries on the Flyway. Australia's summer census is conducted in January and February (Gosbell & Clemens 2006), while most other countries undertake shorebird counts in mid January as part of the Asian Waterbird Census, co-ordinated by Wetlands International (Li & Mundkur 2004).

The purpose of this paper is to cast some constructive light on the relative abundance of Bar-tailed Godwits

throughout the course of the year by focusing on a discrete region within New Zealand, monitoring local distribution and distinguishing the intra-regional circulation of birds from genuine inward and outward movements.

STUDY AREA

The Central Canterbury region, located on the east coast of the South Island between latitudes 43° 15' and 43° 51' S, forms one of about ten core areas for migratory shorebirds in New Zealand. This area comprises approximately 15 coastal shorebird habitats, of which 6 (Ashley-Saltwater Creek Estuary, Brooklands Lagoon, Avon-Heathcote Estuary, Upper Lyttelton Harbour, Lake Forsyth and Lake Ellesmere) regularly hold Bar-tailed Godwits (see Figure 1).

The Central Canterbury region constitutes a "closed system" as defined by Wilson (2001) and consists of a cluster of godwit wintering sites, isolated from other populations by long sections of unfavourable coastline. North of the study area the nearest godwit populations occur on coastal lagoons in Marlborough (206 km, NE) and estuaries in Tasman Bay, Nelson (218 km, NNE). To the south the nearest sites with sizeable annual godwit flocks are the North Otago estuaries, the closest being Shag River Estuary (219 km, SW).

METHODS

A full census of Eastern Bar-tailed Godwits was made at each site within Central Canterbury once per month from May 1992 to July 1993. Site counts were usually undertaken between the 11th and 30th of the month, with all sites covered within the space of 3-7 days. Two censuses were made in November 1992 (the current spring census month) to see if there was any difference in godwit numbers between early and later in the month.

Godwits were counted at high tide roosts at Brooklands Lagoon, Avon-Heathcote Estuary and Upper Lyttelton Harbour, by mid-tide scanning of mudflats at Ashley-Saltwater Creek Estuary and by scanning exposed lake edge habitats at Lakes Forsyth and Ellesmere. All counts were made by the same author using 25x60 spotting scope and 10x50 binoculars.

RESULTS

Bar-tailed Godwits were recorded in Central Canterbury in every month of the year with total numbers ranging from winter lows of 198 in May and June 1992 to a summer peak of 2798 in January 1993, followed by a subsequent winter low of 246 in June 1993 (see Table 1). The number of non-breeding birds (assumed to be juveniles and sub-adult birds)

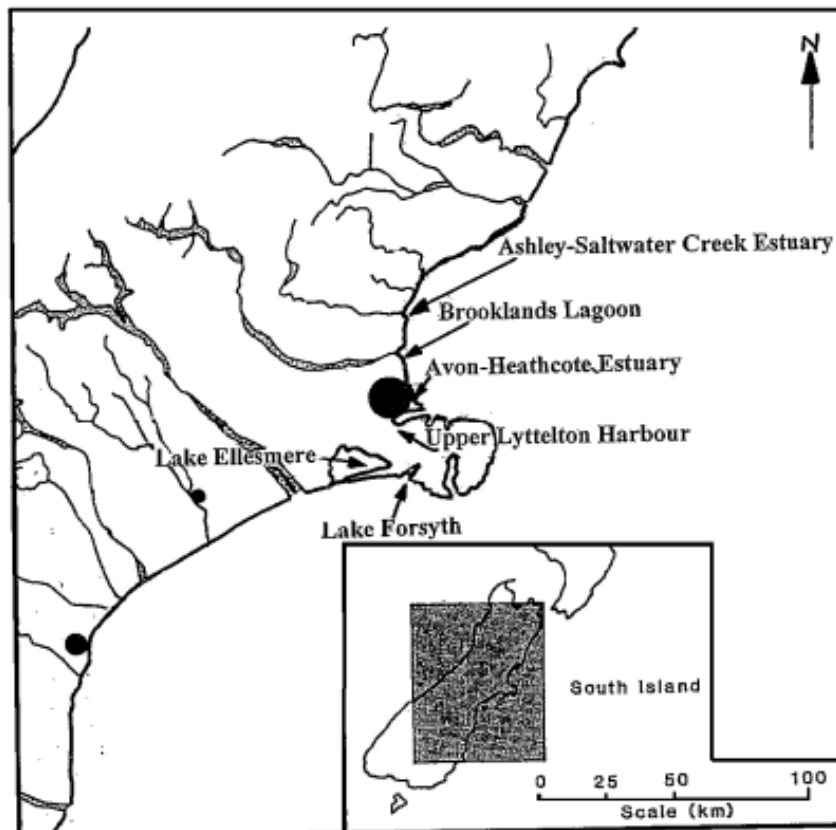


Figure 1. Map of South Island, New Zealand showing Central Canterbury study sites

in winter 1993 was 8.8% of the peak population in the preceding summer.

National Wader Count totals for June 1992 (11,733 Bar-tailed Godwits), November 1992 (86,138) and June 1993 (14,000) (Sagar *et al.* 1999) indicate that the Central Canterbury Region supported 1.69%, 3.0% and 1.76% of Bar-tailed Godwits counted in New Zealand over these respective census periods.

Within Central Canterbury, highest annual numbers were recorded at different sites at different times. Three sites held highest numbers during September and October (the migrant

arrival period); two sites in December (summer) and one site in February (just prior to the migrant departure period). Peak godwit numbers for the region as a whole occurred in January – a month interestingly when no one site recorded its highest count.

Regionally, periods of population stability were the winter months of May-June 1992 and May-June-July 1993, as well as October-November-December 1992. The fact that the population was so stable from late October to late December indicates that although there was internal trading between sites, there was no apparent movement of Bar-tailed

Table 1. Bar-tailed Godwit counted in Central Canterbury per month May 1992 – July 1993. Peak counts are shaded. Ash = Ashley-saltwater Creek Estuary; Brk = Brooklands lagoon; A-H = Avon-Heathcote Estuary; Lyt = Upper Lyttelton Harbour; For = Lake Forsyth; Ell = Lake Ellesmere.

Site	May	Jun	Jul	Aug	Sep	Oct	Nov early	Nov late	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Ash	25	22	22	21	135	119	119	119	118	118	106	47	4	0	0	0
Brk	3	3	0	0	36	169	168	168	158	148	126	23	19	13	0	0
A-H	148	173	181	186	986	2052	1979	1902	1708	1944	1466	195	212	235	246	249
Lyt	22	0	0	0	122	188	274	348	489	465	398	60	24	0	0	0
For	0	0	0	0	0	0	0	0	0	30	139	20	0	0	0	0
Ell	0	0	0	0	80	56	33	53	105	93	66	0	0	0	0	0
Total	198	198	203	207	1359	2584	2573	2590	2578	2798	2301	345	259	248	246	249

Godwits in or out of the Central Canterbury region over the late spring-early summer period.

The influx of newly arriving international migrants started between 17 and 21 September 1992 (see table 2). Peak numbers at Ashley-Saltwater Estuary, Brooklands Lagoon and Avon-Heathcote Estuary all occurred during the migrant arrival period. Godwit numbers at the first two sites dropped slowly through the rest of summer, while numbers on the Avon-Heathcote Estuary declined through November and December, but increased again (by an influx of c.240 birds) during January 1993 (table 2).

Numbers on Upper Lyttelton Harbour followed a pattern consistently observed at that site throughout 20+ years of regular monitoring (1986 to 2008) (Crossland in prep.), with numbers increasing progressively each month from September through to December or January, then either a slight decline (as occurred in 1993) or stable numbers through to the departure period.

Bar-tailed Godwit numbers on Lake Ellesmere fluctuated monthly with the highest counts recorded in December and January (summer). Lake Forsyth only held godwits during the period January to March (the pre-departure period).

Between the January and February 1993 counts, the Central Canterbury godwit population decreased by 497 birds, including an exodus of 460 birds from the Avon-Heathcote Estuary between 21 January and 12 February (table 2). These dates seem too early for a migration departure and are likely to have been a movement of birds to other parts of New Zealand.

In 1993 the genuine departure of migrating godwits commenced some time between 27 February and 15 March. All migrants had left by 29 March, leaving residual flocks of presumed non-breeding birds at 4 sites. By May 1993 all godwits remaining in Central Canterbury had consolidated into a core wintering flock on the Avon-Heathcote Estuary. This has been the normal pattern over many years of observation (Crossland 1993, AC pers. obs. 1984–2009) but unusually in 1992, a small flock of c.22 birds remained on the Ashley-Saltwater Creek Estuary right through the winter months.

DISCUSSION

Synchronised monitoring of Bar-tailed Godwits within Central Canterbury has provided a much clearer picture of regional distribution and monthly abundance than was previously available from the twice-yearly National Wader Counts and from casual shorebird surveys at individual sites. We now have greater clarity as to when and where Godwits arrive in spring; how numbers build up; when population stability occurs and for how long this lasts; when and how numbers decrease in autumn; and where non-migrating birds congregate over winter.

Peak regional abundance in relation to the timing of the National Wader Count

During this study, the month with highest numbers was January 1993, when 2798 Bar-tailed Godwit were counted in Central Canterbury.

Table 2. Counts of Eastern Bar-tailed Godwit at the Avon-Heathcote Estuary: May 1992 to July 1993

Date	Count
12-May-92	148
29-May	173
11-June	173
2-July	173
6-July	173
23-July	181
6-Aug	188
19-Aug	188
31-Aug	186
12-Sept	174
17-Sept	176
21-Sept	420
27-Sept	986
2-Oct	1266
5-Oct	1510
10-Oct	1870
15-Oct	2032
27-Oct	2052
4-Nov	2020
14-Nov	1979
23-Nov	1902
22-Dec	1708
13-Jan-93	1926
21-Jan	1944
12-Feb	1484
27-Feb	1466
15-Mar	1160
29-Mar	195
16-Apr	212
4-May	231
29-May	235
26-June	246
26-July	249

November is the established summer wader census period for New Zealand. A comparison of godwit numbers between early November and late November 1992 showed very little difference at the regional level (2573 v 2590), but there was some variation within individual sites. Godwit numbers in November were similar to numbers recorded in October (2584) and December (2578), but approximately 8% lower than the peak month of January.

Godwit numbers recorded in February 1993 were 17.8% lower than those recorded in January 1993 and 11.2% lower than numbers in late November 1992. The count data and observations confirming that birds did not relocate to other local wetlands (AC pers. obs.) show that a portion of the Central Canterbury population moved out of the region during late January-early February, the early timing of which suggests movement to another part of New Zealand rather than international migration. This would be consistent with past observations by Hawkins (1980) of substantial, but brief influxes of Bar-tailed Godwit in Nelson Haven (c.227 km NNE of Central Canterbury) in early March 1978 and late February 1979, although there was little evidence from a

recent colour-banding study conducted by OSNZ supporting such movements (Battley *et al.* in press).

Differences in seasonal abundance patterns amongst sites

The Avon-Heathcote Estuary is clearly the core site for Bar-tailed Godwit in Central Canterbury, supporting 64-100% of the regional population. This site had peaks during the migrant arrival and departure periods and hosted the consolidated regional winter flock.

The Ashley-Saltwater Creek Estuary and Brooklands Lagoon appear to be independent sites that receive birds from direct migration. Both sites received their full complements of godwits during the migrant arrival period and were not augmented by birds from elsewhere later in the season. Count data in the 1992-93 study period suggest that there was little, if any, interchange of birds between the Ashley-Saltwater Creek Estuary or Brooklands Lagoon and other localities. Confirmation that this pattern is consistent in all years could potentially come from banding data. From 2004 onwards, over 80 Bar-tailed Godwits have been colour-banded by OSNZ on the Avon-Heathcote Estuary, but resightings to date on the Ashley-Saltwater Creek Estuary and Brooklands Lagoon have been too few to provide definitive conclusions. Hopefully these will come in the next few years.

Upper Lyttelton Harbour appears to receive direct migrants as well as collect additional birds as summer progresses. This probably involves a combination of Avon-Heathcote birds transferring to Lyttelton, as well as possibly "homeless" birds moving southwards along the South Island's east coast and collecting at the head of this north-eastward orientated harbour.

There is some evidence from count data that Upper Lyttelton Harbour and Lake Ellesmere receive at least some of their Bar-tailed Godwits from the Avon-Heathcote Estuary. For example, between late November and December 1992 the regional population was relatively stable (2590 v 2578) but 194 birds left the Avon-Heathcote while 141 and 52 birds (= 193) arrived at Lyttelton and Ellesmere respectively.

Lakes Forsyth and Ellesmere are non tidal and lack polychaete worms, shellfish and crab food resources for Bar-tailed Godwits, but provide a seasonal abundance of midges (*Chironomus* sp.) and lake flies (*Ephydra* sp.). Availability of shorebird feeding habitat depends a great deal on water levels and whether the lake outlets are open to the sea or closed. Consequently, Godwit occurrence on these sites tends to be more sporadic than on the tidal estuaries.

Lake Forsyth is orientated south-westward and confined by hills (up to 800 m high) on three sides. Godwits were not recorded during the migrant arrival period or early summer, but did occur during January, February and March (the pre-departure period). Mobile godwits from further south following the coastline northwards may be drawn into the narrow funnel of Lake Forsyth and fly the 6.7 km to the head of the lake. Another possibility is that godwits visiting Lake Forsyth come from other sites in Central Canterbury, although that would mean a flight over several ranges of hills from all sites other than Lake Ellesmere.

In Conclusion, this study has shown the value of undertaking synchronised counts across all key sites in a region to gain a much better understanding of the seasonal abundance and distribution patterns of a species. Hopefully similar projects will eventually be undertaken in other parts of New Zealand, building up our knowledge of both migratory shorebirds and also the many native waterbird species that reside on New Zealand's coastal wetlands and estuaries.

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