

Displaced by riverbed flooding; quantifying numbers and distribution of refugee wrybill (*Anarhynchus frontalis*) on Canterbury coastal wetlands in October–November 2013

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Abstract: We undertook a survey of coastal wetlands in Canterbury (NZ) during a widespread river flooding event in Spring 2013 to quantify numbers and distribution of wrybill (*Anarhynchus frontalis*). We found 740 birds, of which 685 (92.6%) were at Lake Ellesmere/Te Waihora. We calculate that 15.8% of the estimated effective wrybill breeding population were displaced from breeding rivers by floods at this time. Our findings support the evaluation by Dowding & Moore (2006) that the network of wetlands along the Canterbury coast appears to be of critical importance to wrybill as breeding season flood refugia.

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Key words: wrybill, *Anarhynchus frontalis*, coastal Canterbury wetlands, river floods

INTRODUCTION

The wrybill (*Anarhynchus frontalis*) breeds between late August and early February on a number of braided river systems in Canterbury and North Otago (Hay 1985; Riegen & Dowding 2003). The breeding rivers are susceptible to large spring-summer floods, during which time high water flows can cause large-scale nest/brood losses and dramatically reduce food availability (Pierce 1979; Hay 1984; Hughey 1985; Sagar *et al.* 1999). O'Donnell (1985) observed that annual peak numbers of wrybill at Lake Ellesmere/Te Waihora, Canterbury, occurred in October and November – the period when the river breeding grounds are frequently flooded. At such times, breeding attempts are abandoned with adults resorting to the lake to wait out the floods. Breeding-plumaged

wrybill observed at the lake in these months can therefore be considered “flood refugees” as they appear well before the annual influx of adults that have completed breeding and newly fledged juveniles, which pass through the lake from late December until April (O'Donnell 1985; Riegen & Dowding 2003). The only other wrybill present at this time are immature non-breeders which start arriving from the North Island in mid-October (Hay 1984; Marchant & Higgins 1993). These appear on both the breeding grounds (J.R. Hay *pers. comm.*), and on Canterbury coastal wetlands (ACC *unpubl. data*).

Dowding & Moore (2006) speculated that estuaries, lagoons, and river mouths on the east coast of the South Island are probably important breeding-season refuges and feeding areas for wrybill when large floods occur in the central South Island breeding rivers. Lake Ellesmere/Te Waihora has been confirmed as such, with O'Donnell (1985)

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reporting annual peaks of *c.* 400 wrybill during the spring flooding period in October–November 1983, and Allen (2001) reporting counts of 701 birds on 11 October 1998 and 450 on 24 November 1998. Other notable Canterbury coastal congregations of wrybill during spring floods include 81 at Lake Ki-Wainono in October 1969 (Pierce 1980), 112 on 1 November 1987 (Maloney 1989), 194 on 6 November 1998 (Butcher 2001), and 131 on 9 December 2009 (Allen 2009). Counts of 57 wrybill at the Ashley Estuary on 27 October 1988 (Crossland *et al.* 1990) and 32 at Washdyke Lagoon on 11 October 2016 (P.M. Sagar *pers. comm.*) are also notable. This paper details a survey of wrybill on Canterbury coastal wetlands during a breeding season flooding event in October–November 2013.

METHODS

During the period 14 October to 2 November 2013 many Canterbury rivers were in flood with peak

flows recorded as 3,704 m³/s in the Rakaia (14 October), 1,175 m³/s in the Rangitata (14 October), and 714 m³/s in the Waitaki (29 October) (NIWA 2013; T. Gray, ECAN *pers. comm.*). This compares to normal spring seasonal flows for these rivers (calculated as means of September, October, and November flows over the 10-year period, 2010–2019) of 229 m³/s in the Rakaia, 104 m³/s in the Rangitata and 343 m³/s in the Waitaki (T. Gray, ECAN *pers. comm.*). During a regular bird monitoring survey at Kaitorete Spit tip on 29 October 2013, we became aware of a sizeable influx of wrybill, counting >180 birds. This was a substantial increase on the single bird present during September and early October (ACC *unpubl. data*). While we did not have opportunity to search for other flocks elsewhere on 29 October, we undertook a full survey of Lake Ellesmere on 6 November 2013 and surveyed other Canterbury coastal wetlands between 1 and 11 November. We surveyed most of the area identified

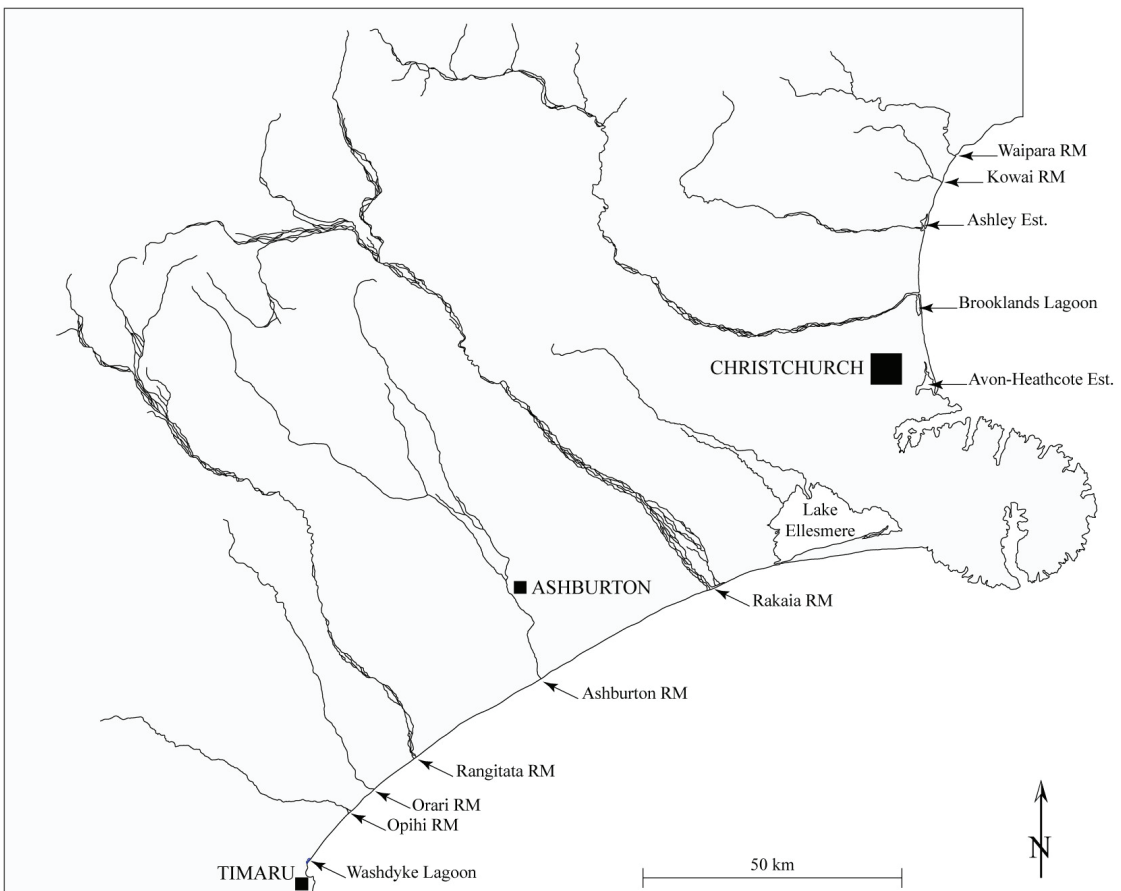


Figure 1. The Canterbury coastline showing sites surveyed for wrybill (map prepared by A. Riegen).

by Marchant & Higgins (1993) who noted that wrybill occur on coastal wetlands between northern Pegasus Bay and Lake Ki-Wainono. Our search area spanned *c.* 180 km of coastline (excluding the circumference of Banks Peninsula) from Waipara river mouth (43°09'S) in the north to Washdyke lagoon (44°22'S), near Timaru in the south (Fig. 1). Fourteen known wrybill sites were visited over this period, with a 15th site, Akaroa Harbour, visited slightly earlier on 24 October 2013. Birds were searched for at either high-tide roosts on estuaries, or over mudflats, sand, cobble, salt meadows, or lake shore at non-tidal sites. We are confident that all counts accurately reflect numbers at each site. Unfortunately, we were not able to survey one key site, Lake Ki-Wainono (44°42'S) in South Canterbury, 35 km south of Washdyke Lagoon.

RESULTS

We found a total of 740 wrybill at 6 of the 15 sites surveyed (Table 1). Consistent with previous observations of wrybill distribution in coastal Canterbury (Dowding & Moore 2006; Crossland *et al.* 2012), Lake Ellesmere held the majority, 685 birds or 92.6%. These were distributed around the lake, with the main concentrations on expansive salt meadow and mudflat habitats at Kaitorete Spit Tip (320 birds) (Fig. 2), Clarks Road to Embankment Road (209), and Embankment Road to Yarrs Lagoon (123). Elsewhere in the region, smaller congregations (all comprising adult wrybill only) were found at Ashley Estuary (10 birds), and Brooklands Lagoon (2) in North Canterbury, as well as at Rangitata river mouth (5 birds), Opihi river mouth (21), and Washdyke Lagoon (17) in South

Table 1. Survey of wrybill on Canterbury coastal wetlands, 1–11 November 2013.

Site	Date	No. of wrybill	Adult %	Imm %
Waipara RM	9 Nov 13	0	-	-
Kowai RM	9 Nov 13	0	-	-
Ashley Estuary	9 Nov 13	10	100	0
Brooklands Lagoon	9 Nov 13	2	100	0
Avon-Heathcote Est	1 Nov 13	0	-	-
Akaroa Harbour	24 Oct 13	0	-	-
Upper Lyttelton Harbour	12 Nov 13	0	-	-
Lake Forsyth	12 Nov 13	0	-	-
Lake Ellesmere	6 Nov 13	685	est. 84.3	est. 15.7
<i>Kaitorete Spit Tip</i>		320	-	-
<i>Kaitorete Spit</i>		0	-	-
<i>Kaituna Lagoon</i>		0	-	-
<i>Halswell RM</i>		0	-	-
<i>Greenpark Huts</i>		0	-	-
<i>Jarvis-Clarks</i>		30	-	-
<i>Clarks-Embankment</i>		209	-	-
<i>Embankment-Yarrs</i>		123	-	-
<i>Yarrs-LII</i>		3	-	-
<i>LII-Selwyn RM</i>		0	-	-
<i>Western shore</i>		0	-	-
Rakaia RM	11 Nov 13	0	-	-
Ashburton RM	11 Nov 13	0	-	-
Rangitata RM	3 Nov 13	5	100	0
Orari RM	3 Nov 13	0	-	-
Opihi RM	3 Nov 13	21	100	0
Washdyke Lagoon	3 Nov 13	17	100	0
Total		740		



Figure 2. Part of a flock of Wrybill at Kaitorete Spit, Lake Ellesmere/Te Waihora, 6 November 2013 (Photograph: A.C. Crossland).

Canterbury. No wrybill were found at the sites satellite to Lake Ellesmere/Te Waihora, including the Rakaia river mouth, Avon-Heathcote Estuary, Lake Forsyth, Upper Lyttelton Harbour or Akaroa Harbour. Once the river flooding abated almost all wrybill left Lake Ellesmere and a total lake census on 7 December 2013 recorded just 19 birds (OSNZ summer wader count data).

Among the large numbers of wrybill at Lake Ellesmere/Te Waihora were many metal-banded birds. These are likely to be birds banded at Pūkoro Mirānda, Firth of Thames, in past years but unfortunately their breeding rivers are unknown (J.E. Dowding *pers. comm.*). In addition, three colour-banded birds were photographed at Kaitorete Spit Tip on 6 November 2013 (Fig.



Figure 3. Colour-banded wrybill (L-R) WG-YO & BW-BY from the Upper Rakaia River, and C60 from the Upper Rangitata River, Kaitorete Spit, 6 November 2013 (Photographs: A.C. Crossland).

3). Details are as follows: WG-YO was banded as a breeding female in the Upper Rakaia River in October 2011 and BW-BY was banded as a breeding female on the same river in October 2012. Both birds were reported breeding in the Upper Rakaia in the 2013-14 breeding season, but their breeding attempts were not closely monitored (J.E. Dowding *pers. comm.*). C60 was banded as a breeding male on 30 September 2013 in the upper Rangitata River. Its nest was flooded on 17 October 2013 and it was not re-sighted on the breeding grounds for the remainder of the 2013-14 breeding season (P. Langlands *pers. comm.*).

From photographs (totalling 165 birds in discrete sub-flocks) taken at Kaitorete Spit Tip (Lake Ellesmere) on 6 November 2013, some 139 birds (84.3%) were adults in breeding plumage and 26 birds (15.7%) were immatures. The latter leave North Island wintering sites well after the adults, in October–November (Hay 1984; Hughey 1985, Marchant & Higgins 1993; Davies 1997; Dowding & Moore 2006), so may either have been displaced from riverbeds or had already been in residence on Lake Ellesmere/Te Waihora at the time of the floods. No recently fledged juveniles were seen, which is to be expected as they do not usually appear on the coast until some weeks later, in December (O'Donnell 1985; Davies 1997).

DISCUSSION

In attempting to assess the habitat networks used by wrybill, Dowding & Moore (2006) identified some information gaps, including the extent and importance of the habitat network on the South Island east coast. They stated that more information is required on the importance of east-coast sites to juveniles, migrating adults, and breeding adults during spring floods. They made the important caveat that although South Island east coast sites may only be used by wrybill for short periods this does not lessen their importance for the species. Not only do coastal wetlands provide temporary refugia during river flooding events, they also provide a rich food resource – in contrast to a flooded or receding river where the scouring effect of high flows causes a substantial decline in food availability which then takes time to replenish (Pierce 1979; Hughey 1985; Sagar 1983; J.E. Dowding *pers. comm.*). It may be that this rich coastal food resource enables female wrybill to maintain body condition, feed up quickly, and return to the breeding grounds to lay replacement clutches within a short turnaround time (J.E. Dowding *pers. comm.*).

Our survey total of 740 adult and immature wrybill present on Canterbury coastal wetlands in October–November 2013 represents 13.5–14.8% of the estimated 5,000–5,500 total population (Dowding 2013). It probably, however, represents

a higher proportion of the effective breeding population (estimated at 2,000 pairs by Dowding & Moore 2006). If the ratio of 84.3% adults from the sample of 165 birds aged from photographs at Kaitorete Spit was extrapolated across our total Lake Ellesmere/Te Waihora count, this would equate to 577 adults taking refuge on the lake. Combining this number with the 55 adults counted at other coastal sites gives a total of 632 wrybill displaced by flooding. This represents 15.8% of the estimated effective breeding population, i.e. approximately 1 in 6 breeding wrybill. Note, however, that Lake Ki-Wainono in South Canterbury was not surveyed. Based on counts in previous years and the fact that nearby rivers were in flood, it is likely that another c. 100 wrybill were present there.

During the 2013-14 breeding season a succession of large floods (in the range of 1,000–3,000 m³/s on the Rakaia for example) occurred on Canterbury braided rivers, which resulted in poor breeding success across the region, particularly on the snow-fed rivers like the Rakaia (J.E. Dowding *pers. comm.*), Rangitata (P. Langlands *pers. comm.*) and Waimakariri (N. Muga *pers. comm.*). The three colour-banded birds photographed confirm that wrybill from both the Rakaia and Rangitata rivers used Lake Ellesmere/Te Waihora as a refuge during riverbed floods. The source rivers for birds seen at other coastal wetlands in the survey are unknown but we assume it is braided rivers within close proximity to a given site, i.e. we assume that Ashley and Lower Waimakariri birds go to the Pegasus Bay estuaries; Ashburton birds go to the Ashburton river mouth and probably elsewhere as only small numbers occur there (ACC *unpubl. data*); Rakaia birds go to Lake Ellesmere/Te Waihora; Rangitata birds also go to Lake Ellesmere/Te Waihora and to the chain of coastal wetlands between the Rangitata river mouth and Washdyke Lagoon; Waitaki River birds go to Lake Ki-Wainono. Where birds breeding on the Mackenzie Basin rivers seek refuge during floods is unknown, but higher terraces on wide braided riverbeds (J.E. Dowding *pers. comm.*) and lake deltas (Crossland 2010; ACC *pers. obs.*) are both likely refuges.

Importance of Lake Ellesmere/Te Waihora for wrybill

Over the past 30+ years the case for recognition of Lake Ellesmere/Te Waihora as a site of national and international importance for waders and waterbirds has been well documented (O'Donnell 1985; Cromarty & Scott 1996; Hughey & O'Donnell 2009; Crossland *et al.* 2015). Dowding & Moore (2006) listed Lake Ellesmere/Te Waihora as nationally important for four indigenous-breeding waders, including wrybill, and listed the lake as the third most important site for the species nationally,

after the Firth of Thames and Manukau Harbour. Crossland *et al.* (2012) confirmed the importance of Lake Ellesmere/Te Waihora as a staging site for wrybill during southward migration in August–September. O'Donnell (1985), Crossland *et al.* (2015), and Waihora Ellesmere Trust (2018) quantified the value of the lake as an important post-breeding habitat from late November to April, while O'Donnell (1985), supported by this study, confirm the importance of the lake as a breeding season flood refuge in September–November. Although the lake may only be used by large numbers (hundreds) of wrybill for short periods each year, these are all important stages in the annual lifecycle of the species. During this study, Lake Ellesmere/Te Waihora supported up to 685 birds, representing 92.6% of all wrybill counted on Canterbury coastal wetlands and over 10% of the total population. These numbers confirm the national and international importance of the lake as a key site for the conservation and maintenance of the wrybill population.

Importance of other Canterbury coastal wetlands

Our survey data and independent observations by others (recorded in CSN, eBird, national wader count database, Southern Bird, Wrybill regional newsletter, *etc.*) show that other coastal sites in Canterbury support far fewer wrybill than Lake Ellesmere/Te Waihora, although Lake Ki-Wainono (not covered in our survey) can support well over 100 birds and highest numbers occur there in September and October – during the spring river flooding period (Pierce 1980). An updated measure of wrybill occurrence at Lake Ki-Wainono is needed and we endorse the call by Dowding & Moore (2006) for investigations into the extent to which wrybill use the smaller Canterbury estuaries, river mouths, and lagoons.

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