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# Numbers of bar-tailed godwits (*Limosa lapponica baueri*) in New Zealand and Australia during the austral summer of 2019–2020

ROB SCHUCKARD\*

PO Box 98, Rai Valley 7145, New Zealand

DAVID S. MELVILLE

1261 Dovedale Road, RD2 Wakefield, Nelson 7096, New Zealand

ADRIAN RIEGEN

231 Forest Hill Rd, Waiatarua, Auckland 0612, New Zealand

PETER DRISCOLL

PO Box 6227, Mooloolah Valley, Queensland 4053, Australia

JORIS DRIESSEN

BirdLife Australia, 2-05/60 Leicester St, Carlton Victoria 3053, Australia

LINDALL R. KIDD

BirdLife Australia, 2-05/60 Leicester St, Carlton Victoria 3053, Australia

**Abstract:** Bar-tailed godwits (*Limosa lapponica*) were counted throughout New Zealand and on the east coast of Australia during the 2019–2020 austral summer, in the first attempt to assess the total population of the subspecies *baueri* on the southern hemisphere non-breeding grounds. Survey coverage in New Zealand was nationwide (158 sites surveyed); surveys in Australia covered 314 sites between Great Sandy Strait in southern Queensland, and the Gulf St Vincent in South Australia. Areas north of Great Sandy Strait were either partially counted or were not visited over this survey period. Partial surveys were excluded from the survey results. The total number of godwits counted was 116,446. If allowance is made for an additional ~10,000 birds expected to have been present in northern Queensland (based on previous surveys), the total population of *baueri* in New Zealand and Australia would have been about 126,000. The 2019 breeding season was very successful, with the highest recorded number of juvenile birds since 2011 and 2012.

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## INTRODUCTION

Bar-tailed godwits (*Limosa lapponica baueri*) breed in coastal Alaska, USA (McCaffery & Gill 2001) and spend the non-breeding season in the southern hemisphere, principally in New Zealand and

eastern Australia (Higgins & Davies 1996; Conklin *et al.* 2014). The first population estimate for *baueri* (330,000) was provided by Rose & Scott (1994), but is confounded as it included birds breeding in Russia that are currently recognised as *Limosa lapponica menzbieri* (Portenko 1936) and those that were subsequently separated as *Limosa lapponica anadyrensis* (Engelmoer & Roselaar 1998). Since then

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\*Correspondence: [rschckrd@xtra.co.nz](mailto:rschckrd@xtra.co.nz)

there have been a number of updates and revisions based on information from both staging grounds in Alaska (Gill & McCaffery 1999; McCaffery *et al.* 2006) and the non-breeding grounds (Bamford *et al.* 2008; Hansen *et al.* 2016). Reported declines in non-breeding populations (Studds *et al.* 2017) have been used to extrapolate the total population (Conklin *et al.* 2014; Wetlands International 2020) and assess threat status (Garnett *et al.* 2011; Clemens *et al.* *In press*).

The Ornithological Society of New Zealand (now Birds New Zealand) initiated a national wader census in 1983 (Sagar *et al.* 1999). Numbers of bar-tailed godwits in New Zealand appear to have declined over the past ~35 years (Melville & Battley 2006), dropping from ~101,000 in 1983–1993 (Sagar *et al.* 1999) to ~95,000 in 1994–2003 (Southey 2009), to ~78,000 in 2005–2019 (Riegen & Sagar 2020). This is thought to be, at least in part, associated with habitat loss and degradation in the northward migration staging area in the Yellow Sea (Studds *et al.* 2017; Murray *et al.* 2018). The population processes associated with this overall decline appear to be complex, since reduced annual survival of marked birds suggests a greater rate of decline than what has been recorded from census results (Conklin *et al.* 2016).

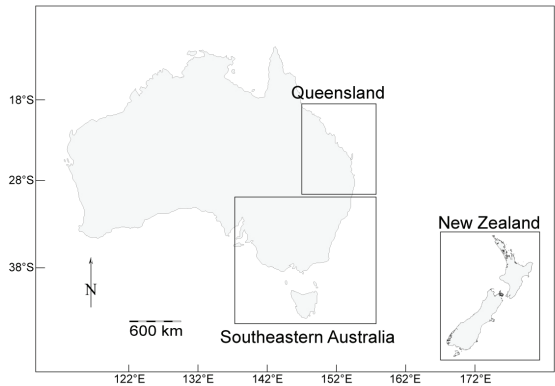
The US Geological Survey was able to undertake an aerial survey of post-breeding staging sites of bar-tailed godwits in Alaska in August 2019 (D.R. Ruthrauff *unpubl. data*) – the first complete survey since 1997 (Gill & McCaffery 1999). This stimulated an interest in New Zealand and Australia to undertake a synchronised census during the following non-breeding season to contribute to a review of the total population of *baueri* (D.R. Ruthrauff *unpubl. data*). This paper reports the results of counts undertaken in New Zealand and eastern Australia during the 2019–2020 austral summer.

## METHODS

Bar-tailed godwits were counted in New Zealand and eastern Australia (Fig. 1).

### New Zealand

Since 1983, nationwide biannual shorebird counts in November and June have been undertaken by members of the Ornithological Society of New Zealand (OSNZ) and other volunteers. New Zealand undertakes a national wader census in November, but there is evidence that some bar-tailed godwits apparently arrive in the country after this (Schuckard *et al.* 2020). ‘Summer’ wader counts in Australia are made between 1 December and 28 February – ideally mid-January – and therefore, Birds New Zealand organised an additional count



**Figure 1.** Areas surveyed for bar-tailed godwits (*Limosa lapponica baueri*) in New Zealand and Australia during the 2019–2020 austral summer.

of bar-tailed godwits focused on the period 8 to 14 February 2020, during a prolonged spring tide series, to produce a more comparable trans-Tasman data series. Priority sites for counting were selected based on previous counts: ~97% of the national population of bar-tailed godwit occurs at 34 sites – 20 sites in the North Island and 14 in the South Island. All priority sites were covered, together with additional sites, thus ensuring that no important sites were omitted from the census. Counts were undertaken by experienced volunteers familiar with the sites over high tide (generally 2 hours before to 2 hours after) when birds were concentrated at roosts. As far as possible, counts in larger wetlands with a number of high tide roosts were coordinated between different sites to avoid potential double-counting. Bar-tailed godwits in New Zealand, in particular adults, are strongly site faithful (Battley *et al.* 2011) reducing the risk of movement between sites. Sites were usually visited on foot, but the larger harbours in the Far North of New Zealand were surveyed by helicopter from which all roosting flocks were photographed and subsequently counted (Feasey 2020). The survey concentrated on bar-tailed godwits, but in many instances, observers also counted other waders if time permitted.

### Southeastern Australia

In Australia (apart from Queensland), shorebirds are counted as part of BirdLife Australia's National Shorebird Monitoring Program. In southeastern Australia, all surveys are conducted biannually (during the austral summer and winter) within designated shorebird areas, as part of the National Shorebird Monitoring Program (Hansen *et al.* 2018). Shorebird survey sites are based on mapped

shorebird areas from field experience extending back several decades which correspond with the non-breeding home range of a group of migratory shorebirds (Clemens *et al.* 2014). Larger shorebird areas are broken down into smaller count areas to facilitate data collection. The summer count period runs from 1 December to 28 February, with the ideal count date being 15 January. Shorebird count data are based on a single census of each shorebird area undertaken within this timeframe. All surveys are run by volunteers and based on local knowledge. Count logistics for each shorebird area are site specific. For instance, a small shorebird area could be counted by one or two surveyors, whereas a large shorebird area is usually counted by a group of people. All smaller count areas within a shorebird area are counted simultaneously. A breakdown of all shorebird areas within Australia can be accessed online at BirdLife Australia's online data portal *birdata* (<https://birdata.birdlife.org.au>). All waterbirds within a shorebird area are counted during these censuses and bar-tailed godwit data presented here are taken from the austral summer 2019/2020 count. Bar-tailed godwits were counted at shorebird areas in New South Wales, Victoria, Tasmania, and parts of South Australia, which cover the known distribution for the Alaskan-breeding population of *baueri* (Wilson *et al.* 2007). There is overlap in South Australia between Alaskan-breeding *baueri* and Siberian-breeding *menzbieri*. A study of photographs of flying birds from South Australia (M. Christie *unpubl. data.*) shows that in Gulf St Vincent, where most of South Australia's bar-tailed godwits occur, about 50% are *menzbieri*. There were a few records of *menzbieri* between Gulf St Vincent and the Victorian border, where the majority of godwits were *baueri* (M. Christie *unpubl. data.*). For the purpose of this overview, all godwits recorded in South Australia were considered to be *baueri* – this, however, only relates to a few hundred birds (Table 1).

### Queensland

Wader counts in Queensland are undertaken by members of the Queensland Wader Study Group (QWSG) as part of an ongoing monthly count program that began in 1992 ([www.waders.org.au](http://www.waders.org.au)). Each month, all waterbirds are systematically counted by volunteers based on local knowledge. Sites are visited at the same time by different observers around high tide when birds are concentrated at roost sites. Historically, 80% of visits have been made within 2 hours of the time of high tide (Wilson *et al.* 2011). During the 2019/2020 period, shorebird roost sites were counted at Moreton Bay (49 sites) and Great Sandy Strait (23 sites). More details on the methodology of count data collected as part of the National Shorebird

Monitoring program and the QWSG database can be found elsewhere (Gosbell & Clemens 2006; Milton & Driscoll 2006; Wilson *et al.* 2011; Clemens *et al.* 2012, 2014, 2016).

## RESULTS

### New Zealand

Counts were made between 5 and 23 February, with 87% of the birds counted between 7 and 14 February 2020. A total of 81,549 bar-tailed godwits were counted in New Zealand (Table 1): 71% in the North Island and 29% in the South Island. A total of 158 sites were visited by a total of 182 counters. Of the visited sites, 116 sites had  $\geq 1$  godwit and 21 sites recorded  $\geq 1,000$  (Fig. 2) representing 75% of the national population of godwits. Of the sites with  $\geq 1,000$  godwits 14 were in the North Island and seven in the South Island.

**Table 1.** Numbers of bar-tailed godwits counted in New Zealand and eastern Australia during austral summer 2019–2020.

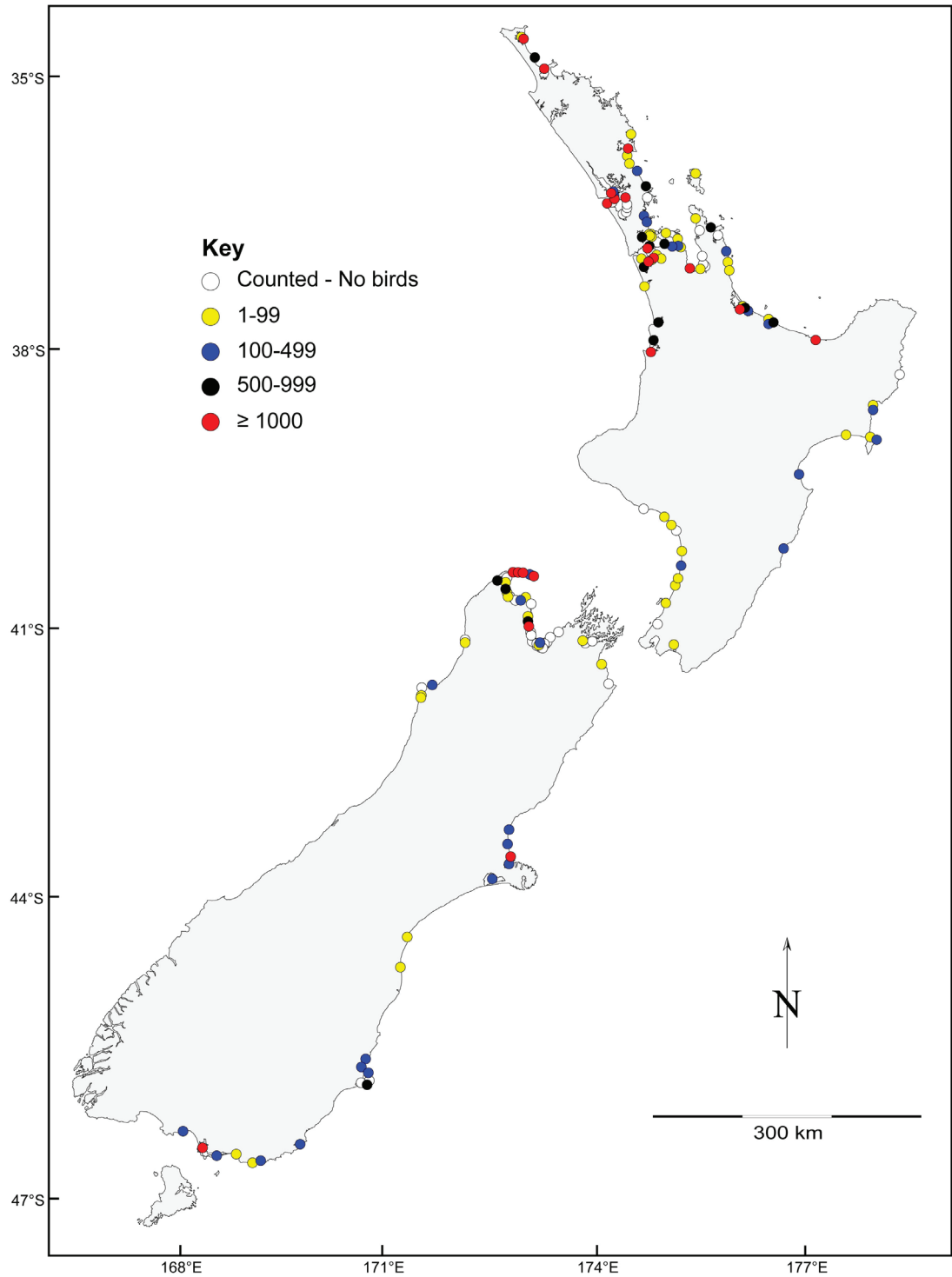
Area	Period of count	Total number
Southeast Queensland	January/February	22,675*#
New South Wales	January/February	2,361
Victoria	January/March	9,614
Tasmania	January/February	5
South Australia	January/February	242
New Zealand	February	81,549
<b>TOTAL</b>		<b>116,446</b>

\*Where more than one count was made at a site, the maximum has been used.

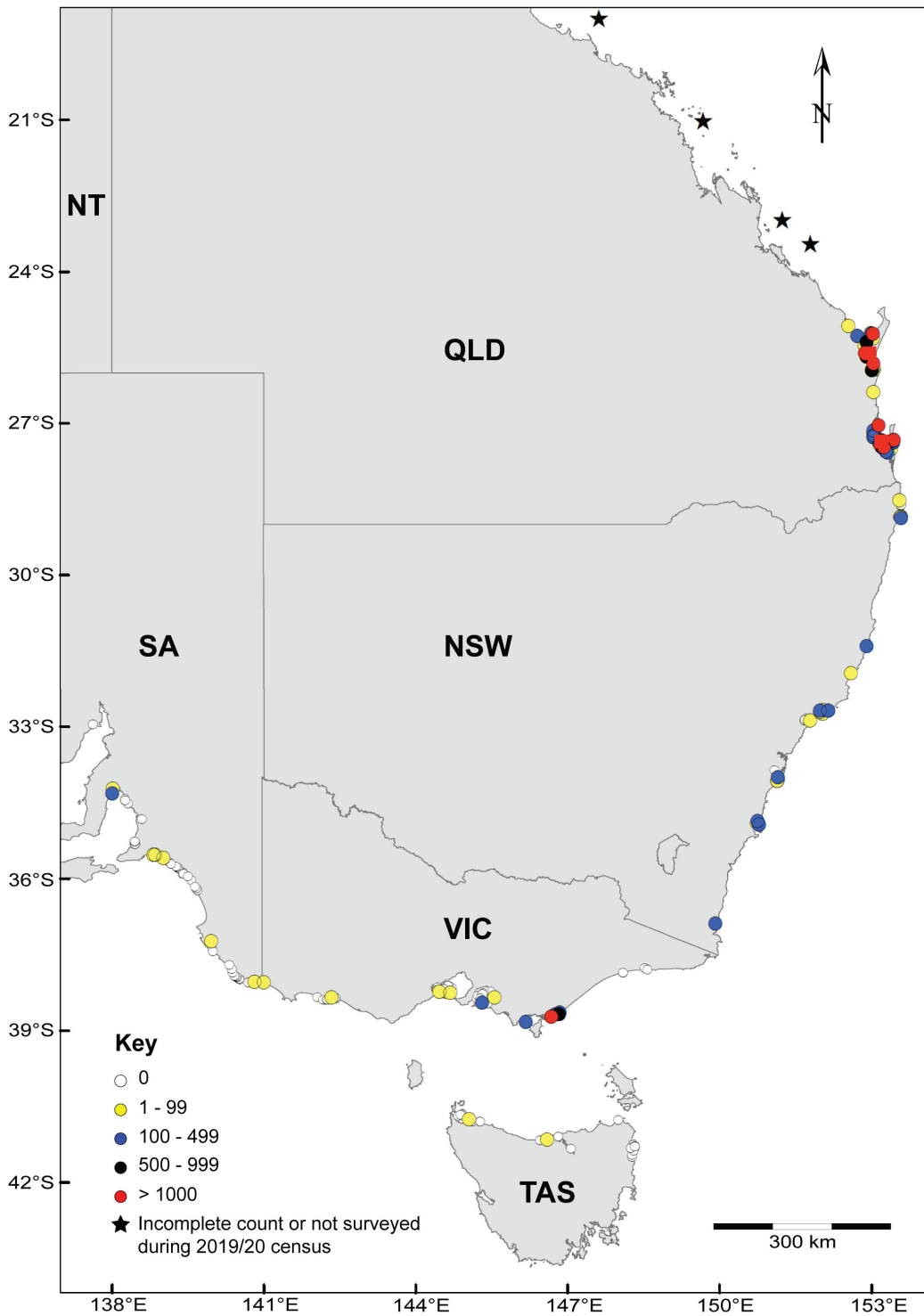
# In addition to the bar-tailed godwits counted in Queensland, it is thought that up to ~10,000 may have been present at sites that were not counted – see Discussion.

### Southeastern Australia

Counts were undertaken between 1 November 2019 and 12 March 2020, with 87% of birds counted between 14 February and 12 March 2020. A total of 242 sites were visited, of which 40 held bar-tailed godwits, totalling 12,222 individuals (Table 1; Fig. 3). Five coastal wetland complexes in Victoria (2) and New South Wales (3), together supported a total of 10,774 birds. The Corner Inlet wetlands in Victoria held the largest number (9,122) of bar-tailed godwits, including a single flock of 7,704 individuals. All shorebird areas known to support important numbers of bar-tailed godwits in southeast Australia were counted in the 2019–2020 season.



**Figure 2.** Distribution of bar-tailed godwits (*Limosa lapponica baueri*) in New Zealand, February 2020.



**Figure 3.** Distribution of bar-tailed godwits (*Limosa lapponica baueri*) in January and February 2020 in Queensland and southeastern Australia (parts of South Australia, Tasmania, Victoria, and New South Wales).

## Southern Queensland

A total of 72 sites were fully covered during the survey between 17 January and 23 February 2020 in southern Queensland. The total count of bar-tailed godwits for southern Queensland was 22,675 (Table 1; Fig. 3). Counts for other regions in Queensland were not available or incomplete for early 2020 (see Discussion).

## DISCUSSION

This is the first time that an attempt has been made to undertake a census of bar-tailed godwits at more-or-less the same time in both New Zealand and eastern Australia. The New Zealand and southeast Australia counts were undertaken without difficulty. However, some of the counts in northern Queensland, which is known to host significant numbers of bar-tailed godwits, were hindered by logistical constraints that limited coverage. The one important area that has not been part of any recent fieldwork by QWSG is Shoalwater Bay and Port Clinton, situated between Mackay and Rockhampton within a major military training area, and which is a designated Ramsar Site (Anon 2018).

Available additional information (PD *unpubl. data*) has been collated in an attempt to estimate the number of bar-tailed godwits that may have been excluded from the actual Queensland counts in early 2020. There is recent information (October 2019) for the Mackay region of approximately 2,900 godwits (accounting for about 10% of the Queensland total). There are less recent counts of godwits between Lucinda and the Burdekin River estuary, and between the Fitzroy River mouth and Rodd's Peninsula indicating that these regions usually account for some 5% and 8% of the total Queensland godwit population respectively (Choi *et al.* 2017). There is a range of miscellaneous scattered sites spread widely to as far north as Cairns with unknown godwit numbers (Pell & Lawler 1996). Shoalwater Bay and Port Clinton can host as many as 10% of the bar-tailed godwits in Queensland (Driscoll 1996). No count was made in the Gulf of Carpentaria where Driscoll (2014) estimated 1,318 godwits in the Southeast Gulf in 2014. The godwits in this region are an unknown mixture of *menzbieri* and *baueri* (PD & AR *unpubl. data*); we have conservatively excluded birds in the Southeast Gulf from the Queensland total for *baueri*.

It is estimated from earlier census work along the Queensland coast that at least 10,000 godwits may be missing from sites that were not visited in the 2019–2020 season (PD *unpubl. data*). Thus, although the actual count for Queensland was 22,675, the likely total is thought to be about  $22,675 + 10,000 = \sim 33,000$ , in which case the total *baueri* population in New Zealand and Australia in early 2020 was about 126,000.

Despite the uncertainties regarding total numbers in Queensland, this census is the most complete one done to date and, in combination with the 2019 Alaskan survey, provides a reasonably firm baseline for an assessment of the current flyway population (D.R. Ruthrauff *unpubl. data*).

Populations of bar-tailed godwits have declined at most major sites across Eastern Australia (Wilson *et al.* 2011; Cooper *et al.* 2012; Clemens *et al.* 2016). The 116,446 *baueri* godwits counted in New Zealand and Australia during the 2019–2020 austral summer is lower than Wetland International's (2020) current estimate (133,000) derived from 2007–2009 data. If the estimated ~10,000 birds that are thought to have been missed from the Queensland surveys are included, this brings the total close to the current Wetlands International estimate. However, this apparent concurrence should be treated with caution. 2019 appears to have been a successful breeding season with a high proportion of juveniles present in New Zealand and Victoria, which is likely to have increased the overall numbers. In the winter (June/July) of 2020, 13,300 juveniles/immatures were counted in New Zealand compared to 4,864 in the winter of 2019 – this being the highest number of juveniles/immatures since winter 2013 (Birds New Zealand *unpubl. data*). Similarly, the winter count of bar-tailed godwits in Corner Inlet (the main site for the species in Victoria) was 3,801 (*cf.* 645 in 2019), the highest winter count since 2006 (D.I. Rogers *In litt.*).

McCaffery *et al.* (2006) cautioned that interpretation of apparent population trends of *baueri* was problematic since there is 'evidence for large long-term fluctuations in godwits numbers' over several decades. This was also indicated by Conklin *et al.* (2016) who found apparent population stability of *baueri* in New Zealand despite declining adult survival. As such, a long-term declining trend may still be occurring.

IUCN currently assess the global conservation status of bar-tailed godwit as 'Near Threatened' (BirdLife International 2017). However, based on substantial documented population declines and projected further habitat loss of staging grounds on northward migration in the Yellow Sea, Conklin *et al.* (2014) considered that *baueri* qualified for classification as 'Vulnerable' at the East Asian-Australasian Flyway level. Although habitat loss due to land claim has greatly reduced in China (Melville 2018), the dramatic reduction of intertidal benthic prey stocks since 2012 at the Yalujiang National Nature Reserve, Liaoning, China, the most important staging site for *baueri* (Choi *et al.* 2015), has significantly reduced available prey for migrating godwits (Zhang *et al.* 2019) which could be reducing adult survival and/or breeding success.

Robertson *et al.* (2017) list *baueri* as 'At Risk – Declining' in New Zealand, and Garnett *et al.* (2011)

listed it as 'Vulnerable' in Australia – it is currently being re-assessed (Clemens et al. *In press.*). The Australian Commonwealth Environment Protection and Biodiversity Act lists *baueri* as 'Vulnerable', and this is also its status under state legislation in Queensland and Western Australia; South Australia lists bar-tailed godwit as 'rare', and there is no state listing status for Victoria, New South Wales or Tasmania (Department of the Environment 2020).

McCaffrey et al. (2006) noted the need for 'a special flyway-wide assessment of the status of *L. l. baueri* should be a conservation priority' – the present survey is an important contribution towards achieving that goal.

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