WADER BREEDING SUCCESS IN THE 2015 ARCTIC SUMMER, BASED ON JUVENILE RATIOS OF BIRDS WHICH SPEND THE NON-BREEDING SEASON IN AUSTRALIA

CLIVE MINTON[1], ROZ JESSOP[2] & CHRIS HASSELL[3]

[1] *165 Dalgetty Road, Beaumaris, Victoria 3193, Australia. e-mail: mintons@ozemail.com.au*
[2] *Phillip Island Nature Park, PO Box 97, Cowes, Victoria, 3922, Australia. e-mail: rjessop@penguins.org.au*
[3] *PO Box 3089, Broome, Western Australia 6735, Australia. e-mail: turnstone@wn .com.au*

INTRODUCTION

Wader populations in many of the Flyways around the world are closely monitored. There is a strong downward trend in many populations, particularly over the last 20 years (Amano et al. 2010, Wilson et al. 2011, MacKinnon et al. 2012). Populations will only change if there are changes in one or more of the three key parameters – reproductive rate, survival rate or age of first breeding. If population changes are to be explained ongoing measurements of the above need to be made.

For the last 38 years in south-east Australia and 18 years in north-west Australia the main catching programs of the Victorian Wader Study Group and the Australasian Wader Studies Group respectively have been oriented to obtaining annually an estimate of the proportion of young birds in the population of each of the main migratory wader species during the non-breeding season. The proportion of juveniles in catches, albeit some six months on average after these birds have first fledged, is taken as a proxy for breeding success. This method of gaining an estimate of reproductive success is used because it is impractical to obtain comprehensive fledging rate data on the breeding grounds, particularly for a range of species on an annual basis and over an extended period of years.

Each year since 2000 the results of the 'percentage juvenile' monitoring have been published in Arctic Birds Bulletin and (or) on the Arctic Birds website, as well as in the AWSG journal Stilt (Minton et al. 2000, Minton Jessop & Hassell 2016). Earlier data, going back to the 1978 breeding season for some species in south-east Australia, was published in a previous paper (Minton et al. 2005). There are now, therefore, breeding success measurements for a range of species going back 38 years in south-east Australia and 18 years in north-west Australia.

This paper gives the results obtained during the 2015/2016 non-breeding season in Australia. These indicate the apparent breeding success of a wide range of wader species during the 2015 northern hemisphere wader breeding season.

METHODS

Throughout the period of monitoring a standard method of collecting data has been used so that results can be comparable from year to year and for each species/region. Details have been provided each year (Minton et al. 2000, 2016), and as the same methods were used in the 2015/2016 season they are not repeated here in detail. As usual, only birds caught by cannon-netting are included. Samples were obtained only when it is considered that virtually all adult birds and juvenile birds were present in the study area, and therefore were available for sampling.

Note, again, that the breeding success index obtained refers to the proportion of juvenile birds present in the population some six months after fledging. Actual breeding success will have been higher. Mortality is typically quite high in all species soon after fledging, especially if a long-distance migration has to be undertaken in this period. Since, however, the key information required in this study is comparative data (year-to-year and species-to-species variations, long-term trends) it does not matter if the figures are not the 'actual' reproductive rate. It can be reasonably expected that there are unlikely to be marked year-to-year variations in mortality between the date of fledging and the middle of the subsequent non-breeding season some six months later.

RESULTS

The 2015/2016 data is presented in the usual format in Tables 1 – 4.

In south-east Australia results are given for the usual seven main study species (Table 1). The Red Knot sample was again small and, this year, Sanderling also proved particularly hard to catch. Nevertheless the outcomes of the breeding season were especially clear, with five of the seven species having particularly poor breeding success. On Curlew Sandpiper and Ruddy Turnstone there was an almost complete breeding failure. In contrast, Bar-tailed Godwit had a good breeding outcome and Red Knot an especially good breeding success.

Good data was collected on all the usual main wader study species in north-west Australia (Broome and 80 Mile Beach). Additionally, this year, good samples were obtained of seven additional species which are not able to be caught annually for breeding success estimates (Table 2). Breeding success rates were extremely low for many species, with only three out of seventeen species monitored being rated 'good' or 'very good' – Broad-billed Sandpiper, Oriental Plover and Eastern Curlew. As in south-east Australia, Curlew Sandpiper and Ruddy Turnstone had almost total breeding failures, and in this region Red Knot also.

DISCUSSION

The 2015 northern hemisphere breeding season was clearly the worst recorded so far in wader populations which migrate to Australia. Most of the high-Arctic breeding species had an almost total breeding failure. The poor results, however, seemed to occur almost throughout the northern hemisphere breeding range. Even Greater Sand Plover, mainly nesting in Mongolia and northern China, had their second lowest breeding success recorded in 18 years of monitoring (Table 4). For Curlew Sandpipers in north-west Australia and in south-east Australia it was the lowest ever result (Table 3). It was noticeable that, unusually, Sharp-tailed Sandpipers fared slightly better than Red-necked Stint and Curlew Sandpipers.

The only exceptions to the widespread disastrous 2015 breeding season were Bar-tailed Godwits in north-west Australia, which had an average result, and Bar-tailed Godwits and Red Knots in south-east Australia which were classed as 'good'/'very good' respectively. The latter two of these breed further east than all the other species, with the Red Knot spending the breeding season in the far north-east of Siberia in Chukotka and the Bar-tailed Godwit in Alaska. Presumably whatever unfortunate combination of weather conditions and predation levels which caused the markedly unsuccessful breeding did not extend to those regions.

One of the important outcomes of these long data series of the percentage of juveniles in wader populations in the non-breeding areas in Australia is that there is no apparent downward trend in annual productivity (Tables 3 and 4 and Minton et al. 2005). This is somewhat surprising given the marked downward trajectory of many of these wader populations. It suggests that the decrease in population levels is entirely the result of reduced survival rates. This is logical given that the population decreases seem to be closely linked with extensive losses of intertidal feeding habitat at the critical migratory stopover locations for most species, in the Yellow Sea. The apparent lack of a trend in breeding success rate also suggests that this parameter is not density dependent on the breeding grounds for these wader populations.

CONCLUSION

It is particularly unfortunate that there should have been such a marked and widespread poor breeding outcome in 2015 for most of the wader populations which spend their non-breeding season in Australia. Given the downward pressures on many of these populations what is ideally needed is above average breeding output, preferably over an extended period. Let us hope that, in particular, the 2016 reproductive rates return to normal or, preferably, above normal levels. The VWSG and AWSG will continue their annual monitoring programs.

ACKNOWLEDGEMENTS

Greatest thanks are, as always, owed to the fieldwork teams of VWSG and AWSG which have persevered over many months each non-breeding season to obtain the necessary catch samples. This requires between 30 and 50 days of fieldwork by a large (15-25 people) team on each occasion, often working in less than comfortable climatic conditions. Repeated attempts sometimes have to be made to fill particularly difficult slots in the required spectrum of data.

Thanks are also due to the various Parks authorities in Victoria, Western Australia, South Australia and Tasmania who granted the necessary ethics and scientific research permits, as well as the Australian Bird and Bat Banding Scheme in Canberra.

Chris Hassell was again funded by the 2014 Spinoza Prize to Theunis Piersma from the Netherlands Organisation for Scientific Research (NWO)

REFERENCES

Amano, T., Szekely, T., Koyama, K., Amano, H., and Sutherland, W. J. (2010). A framework for monitoring the status of populations: an example from wader populations in the East Asian–Australasian Flyway. *Biological Conservation* 143(9), 2238–2247. doi:10.1016/j.biocon.2010.

Arctic Birds website: http://www.arcticbirds.net/doc.html and http://www.arcticbirds.net/docs/minton_AB2014.pdf.

MacKinnon, J., Verkuil, Y. I., and Murray, N. J. (2012). IUCN situation analysis on East and Southeast Asian intertidal habitats, with particular reference to the Yellow Sea (including the Bohai Sea). Occasional Paper of the IUCN Species Survival Commission No. 47. International Union for Conservation of Nature, Gland, Switzerland, and Cambridge, UK.

Minton, C., R. Jessop, P. Collins & K. Gosbell. 2005. Monitoring Wader Breeding Productivity by the proportion of first year birds in wader populations in S.E. Australian non-breeding areas. Pp. 73-85. *In:* Straw, P. (Ed.) Status and Conservation of Shorebirds in East Asian-Australasian Flyway. Proceedings of the Australian Shorebirds Conference, Canberra, Dec. 2003. IWSG Special Publication 17 and Wetlands International Global Series 18.

Minton, C., R. Jessop, P. Collins & C. Hassell. 2000. 1999 Arctic breeding success from Australian perspective. *Arctic Birds* 2: 19-20.

Minton, C., R. Jessop & C. Hassell. 2016. Wader breeding success in the 2014 Arctic summer, based on juvenile ratios of birds which spend the non-breeding season in Australia. *Stilt* 68: 46-48.

Wilson, H. B., Kendall, B. E., Fuller, R. A., Milton, D. A., and Possingham, H. P. (2011*a*). Analyzing variability and the rate of decline of migratory shorebirds in Moreton Bay, Australia. *Conservation Biology* 25(4).

Table 1. Percentage of juvenile (first year) waders in cannon-net catches in south-east Australia 2015/2016.

Species	No. of catches		Total caught	Juveniles		Long term median* % juvenile (years)		Assessment of 2015 breeding success
	Large (>50)	Small (<50)		No.	%			
Red-necked Stint *Calidris ruficollis*	7	7	1904	115	**6.0**	16.0	(37)	Poor
Curlew Sandpiper *C. ferruginea*	1	5	206	4	**1.9**	10.0	(36)	Very Poor
Bar-tailed Godwit *Limosa lapponica*	0	1	30	8	**26.7**	18.0	(26)	Good
Red Knot *C. canutus*	0	1	15	15	**100**	62.5	(19)	Very Good
Ruddy Turnstone *Arenaria interpres*	1	15	305	7	**2.3**	9.3	(25)	Very Poor
Sanderling *C. alba*	0	1	29	2	**6.8**	12.2	(24)	Poor
Sharp-tailed Sandpiper *C. acuminata*	3	3	459	41	**8.9**	14.8	(34)	Poor

All birds cannon-netted in the period 2th November to 25th March except Sharp-tailed Sandpiper and Curlew Sandpiper to end February only and some Ruddy Turnstone and Sanderling to early April and one Sanderling catch in late April (2015).

*Does not include the 2015/2016 figures.

Table 2. Percentage of juvenile (first year) waders in cannon-net catches in north-west Australia in 2015/2016.

Species	No. of catches		Total caught	Juveniles		Assessment of 2015 breeding success
	Large (>50)	Small (<50)		No.	%	
Great Knot *Calidris tenuirostris*	8	4	1,642	93	5.7	Poor
Bar-tailed Godwit *Limosa lapponica*	4	6	194	20	10.3	Average
Red-necked Stint *C. ruficollis*	4	4	487	54	11.1	Poor
Red Knot *C. canutus*	1	4	109	3	2.7	Very Poor
Curlew Sandpiper *C. ferruginea*	2	4	281	2	0.7	Very Poor
Ruddy Turnstone *Arenaria interpres*	1	4	84	1	1.2	Very Poor
Sanderling *C. alba*	0	5	7	0	-	Very Poor
Grey Plover *Pluvialis squatarola*	0	2	18	1	7.1	Below Average
Non-arctic northern migrants						
Greater Sand Plover *Charadrius leschenaultii*	5	5	523	55	10.5	Poor
Terek Sandpiper *Xenus cinereus*	0	10	131	12	9.2	Below Average
Grey-tailed Tattler *Heteroscelus brevipes*	3	7	380	34	8.9	Poor
Oriental Plover *C. veredus*	0	5	32	14	44	Very Good
Black-tailed Godwit *L. limosa*	1	2	94	8	8.5	Below Average
Oriental Pratincole *Glareola maldivarum*	1	2	92	24	26.0	Average
Common Greenshank *Tringa nebularia*	0	3	52	4	7.7	Below Average
Eastern Curlew *Numenius madagascariensis*	0	2	45	5	11.1	Good
Broad-billed Sandpiper *C. falcinellus*	0	5	30	15	50.0	Very Good

All birds cannon-netted in period 1 November to mid-March

Table 3. Percentage of juvenile birds in wader catches in south-east Australia 1998/1999 to 2015/2016.

Species	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	*Average (17yrs)*
Ruddy Turnstone *Arenaria interpres*	6.2	29	10	9.3	17	6.7	12	28	1.3	19	0.7	19	26	10	2.4	38	17	2.3	*14.7*
Red-necked Stint *Calidris ruficollis*	32	23	13	35	13	23	10	7.4	14	10	15	12	20	16	22	17	19	6.0	*17.5*
Curlew Sandpiper *C. ferruginea*	4.1	20	6.8	27	15	15	22	27	4.9	33	10	27	(-)	4	3.3	40	5.1	1.9	*16.5*
Sharp-tailed Sandpiper *C. acuminata*	11	10	16	7.9	20	39	42	27	12	20	3.6	32	(-)	5	18	19	16	8.9	*18.5*
Sanderling *C. alba*	10	13	2.9	10	43	2.7	16	62	0.5	14	2.9	19	21	2	2.8	21	14	6.8	*15.0*
Red Knot *C. canutus*	(2.8)	38	52	69	(92)	(86)	29	73	58	(75)	(-)	(-)	78	68	(-)	(95)	(100)	(100)	*58.1*
Bar-tailed Godwit *Limosa lapponica*	41	19	3.6	1.4	16	2.3	38	40	26	56	29	31	10	18	19	45	15	26.7	*23.9*

All birds cannon-netted between 15th November and 25th March, except Sharp-tailed Sandpiper and Curlew Sandpiper to end February only and some Ruddy Turnstone and Sanderling to early April and one Sanderling catch in late April (2015). Averages (for previous 17 years) exclude figures in brackets (small samples) and exclude 2015/2016 figures

Table 4. Percentage of first year birds in wader catches in north-west Australia 1998/1999 to 2015/2016

Species	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**	**03/04**	**04/05**	**05/06**	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**Average (17yrs)**
Red-necked Stint *Calidris ruficollis*	26	46	15	17	41	10	13	20	21	20	10	17	18	24	15	19	10	11.1	*20.1*
Curlew Sandpiper *C. ferruginea*	9.3	22	11	19	15	7.4	21	37	11	29	10	35	24	1	1.9	23	18	0.7	*17.6*
Great Knot *C. tenuirostris*	2.4	4.8	18	5.2	17	16	3.2	12	9.2	12	6	41	24	6	6.6	5	6	5.7	*11.6*
Red Knot *C. canutus*	3.3	14	9.6	5.4	32	3.2	(12)	57	11	23	12	52	16	8	1.5	8	13	2.7	*16.9*
Bar-tailed Godwit *Limosa lapponica*	2.0	10	4.8	15	13	9.0	6.7	11	8.5	8	4	28	21	8	7.6	17	5	10.3	*10.8*
Non-arctic northern migrants																			
Greater Sand Plover *Charadrius leschenaultii*	25	33	22	13	32	24	21	9.5	21	27	27	35	17	19	28	21	20	10.5	*23.4*
Terek Sandpiper *Xenus cinereus*	12	(0)	8.5	12	11	19	14	13	11	13	15	19	25	5	12	15	12	9.2	*13.6*
Grey-tailed Tattler *Heteroscelus brevipes*	26	(44)	17	17	9.0	14	11	15	28	25	38	24	31	20	18	16	19	8.9	*20.5*

All birds cannon-netted in the period 1 November to mid-March. Averages (for previous 17 years) exclude figures in brackets (small samples) and exclude 2015/2016 figures