Wader Breeding Success in the 2011 Arctic Summer, based on Juvenile Ratios of Birds which Spend the Non-breeding Season in Australia

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Introduction

Each year the Victorian Wader Study Group (in south-east Australia, SEA) and the Australasian Wader Studies Group (in north-west Australia, NWA) put a great deal of fieldwork effort into trying to catch satisfactory samples of the main migratory wader species in each area to enable estimates to be made of breeding success in the preceding Arctic summer (Minton et al. 2000, 2011). Fieldwork is carried out in the period November/March when wader populations are reasonably stable i.e. when most adults and juveniles have arrived in their non-breeding areas and before adults commence their northward migration the following year. The breeding success (really an *index* of breeding success) is measured by the proportion of juveniles in catches made with cannon-nets at a range of locations/dates in each region.

Breeding productivity is one of the key parameters (the other is survival rate) controlling population levels. It is therefore important, especially at the present time when population levels are changing markedly, to try and obtain quantitative information on breeding success to measure year-to-year variations and, potentially more importantly, changes over time. It is practically difficult to find large numbers of nests of waders in their Northern Hemisphere (mainly Arctic) breeding grounds and to follow them through to obtain hatching/fledging success rates. It is even more difficult, and prohibitively expensive, to do this over an extended period of many years and for a wide range of species.

The current alternative of "percentage juvenile sampling" has its limitations, but it has been shown to be practical over prolonged periods (33 years now for some species in SEA). There are undoubtedly many variables which can affect the number of juvenile birds in a sample of birds caught for banding. It has long been known that mist-netting produces an inordinately high proportion of juveniles, perhaps because of their relative naivety compared with adults (Pienkowski & Dick 1976). Only cannon-net catches are therefore incorporated into the data used to calculate the juvenile ratios each year. Some locations seem to consistently have a higher proportion of young birds than others, so a range of different catching sites are sampled if possible. Also the composition of individual catches at any site can vary significantly, sometimes for unknown reasons, so the larger the number of samples obtained the more likely the figure is to be representative of the population of a species in a region. The distribution of juveniles in a large roosting flock can also be non-homogenous with young birds sometimes clumping and at other times segregating to the outer fringes of a flock. Being less wary, juveniles may also enter/roost in the cannon-net catching area more readily than adults. Finally it should be pointed out that the measurement obtained is the proportion of young birds in the population some six months on average after the juvenile birds have first fledged. The figure is therefore not an estimate of how many birds fledged but how many also successfully carried out their first southward migration and then survived for some months afterwards.

The above limitations on the data used to calculate juvenile ratios therefore need to be recognized when assessing the conclusions drawn (Minton et al. 2005). Year to year comparisons are probably more accurate than absolute figures. At the very least the breeding success categorization each year (good, average, poor etc.) is probably correct (Minton et al. 2005).

This paper presents the results of percentage juvenile sampling of waders in SEA and NWA during the November 2011 to March 2012 non-breeding season, thereby giving an estimate of wader breeding success in the 2011 Northern Hemisphere summer for a range of species.

Methods

Data were collected in the usual way. In SEA this was via a large number of catches at a wide range of locations throughout the period, between mid-November and late March. In NWA most of the data were collected during a concentrated three-week period of fieldwork at Roebuck Bay (Broome) and 80 Mile Beach between 18 February and 11 March 2012.

Information collected is compared with previous data – long-term median figures for SEA where datasets are long (18 to 33 years) and long-term average for NWA where datasets are shorter (13 years). A general assessment of breeding success is then made for each species in each region.

Results

The figures for 2011/12 are given in Table 1 (SEA) and Table 2 (NWA). This year it was possible to sample all of the main species in SEA because Curlew Sandpiper* and Sharp-tailed Sandpiper mostly returned to their traditional non-breeding areas along the coasts rather than stopping off at ephemeral wetlands present extensively in central Australia in the previous year. Similarly in NWA all of the principal species sampled annually were caught in reasonable numbers and, additionally, good samples of Ruddy Turnstone and Broad-billed Sandpiper (for the second consecutive year) were obtained. However Sanderling and Sharp-tailed Sandpiper – species which are only occasionally sampled adequately – again only produced small catch totals.

Tables 3 and 4 show the annual percentage juveniles in catches for each of the main species in each year since 1998/99 (when annual sampling commenced in NWA). The average figure thus gives an estimate of typical percentage juveniles in catches in recent years against which the most recent results can be compared.

Discussion

2011 was clearly a far less satisfactory breeding season than 2010 for almost all species of waders which come to Australia in the non-breeding season from breeding grounds in the Northern Hemisphere.

Only one (Red Knot) of seven species monitored in SEA had a breeding success rating higher than average. Two species (Curlew Sandpiper and Sanderling) were rated “very poor” and Sharp-tailed Sandpiper as “poor”.

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* – scientific names are given in tables

In NWA none of the main species had breeding success higher than average and three (Curlew Sandpiper, Terek Sandpiper and Red Knot) were classed as "very poor". Great Knot also appeared to have poor breeding success and Bar-tailed Godwit and Greater Sand Plover had percentage juvenile ratios below average. Only Broad-billed Sandpiper, of which adequate samples are only obtained occasionally, seem to have had a good breeding season in 2011.

Factors affecting breeding success

Analyses of breeding success data on a range of species worldwide has shown that a number of factors can affect breeding success, particularly in Arctic breeding birds. These include the date of snowmelt, average temperatures in June and/or July, the occurrence of late snowfalls (particularly at the time of chick hatching in early July) and predator levels (Arctic Foxes, Stoats, Minks, skuas etc.) (Boyd et al. 2005). The strongest correlations have been shown with predator levels, which in turn are related to lemming numbers and which in the past often occurred in a regular three-year annual cycle in northern Central Siberia (Summers & Underhill 1987, Soloviev et al. 2006).

Analysis of the Australian data has not so far shown any clear pattern of correlation with any single parameter. This is probably partly because the wader species coming to Australia in the non-breeding season come from a wide range of longitudes and latitudes in Siberia and Alaska where conditions may be far from uniform for any of the above parameters each year. With these local variations and with several of these influencing factors probably varying simultaneously but independently it is not surprising that this confounds the data and masks any correlation with a single factor.

Professor Marcel Klaassen of Deakin University and one of his students, Yaara Rotman, are currently re-examining all of the Australian juvenile ratio data and testing for correlations with climatic/predation factors. A synthesis is expected to be completed later in 2012.

Conclusion

Overall 2011 was a poor breeding season for most wader species which come to Australia. This was not unexpected given that the two previous breeding seasons both appear to have been above average (with 2010 being particularly good).

Sampling will continue in SEA and NWA in the 2012/2013 season. Let us hope for an improved outcome.

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References

Boyd, H., Minton, C. & Rogers, K. 2005. Has the timing of snowmelt in Eastern Siberia affected the numbers of juvenile Waders wintering in South-east Australia? **–** *Stilt* 48: 2-9.

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

Minton, C., Jessop, R. & Hassell C. 2011. Record Wader Breeding Success in the 2009 Arctic Summer. **–** *Arctic Birds* 12: 53-56.

Minton, C., Jessop, R., Collins, P. & Gosbell, K. 2005. Monitoring wader breeding productivity by the proportion of first year birds in wader populations in S. E. Australian non-breeding areas. – *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. Pp. 73-85.

Pienkowski, M.W. & Dick, W.J.A. 1976. Some biases in cannon- and mist-netted samples of wader populations. – *Ringing & Migration*, 1: 105-107.

Soloviev M.Y., Minton C., Tomkovich P.S. 2006. Breeding performance of tundra waders in response to rodent abundance and weather from Taimyr to Chukotka, Siberia. – *Waterbirds Around the World*. Eds. G.C. Boere, C.A. Galbraith & D.A. Stroud. The Stationery Office, Edinburgh, UK. Pp. 131-137.

Summers, R.W. & Underhill, L.G. 1987. Factors related to breeding production of Brent Geese *Branta b. bernicla* and waders (Charadrii) on the Taimyr Peninsula. **–** *Bird Study* 34: 161–171.

Table 1. Percentage of juvenile/first year waders in cannon-net catches in south-east Australia in 2011/2012

Species	No. of catches		Total caught	Juv./ 1st year		Long term median* % juvenile (years)	Assessment of 2011 breeding success
	Large (>50)	Small (<50)		No.	%		
Red-necked Stint *Calidris ruficollis*	8	5	3869	611	**15.8**	14.3 (33)	Average
Curlew Sandpiper *C. ferruginea*	2	4	304	11	**3.6**	10.0 (32)	Very poor
Bar-tailed Godwit *Limosa lapponica*	2	1	184	34	**18.5**	18.5 (22)	Average
Red Knot *C. canutus*	0	4	34	23	**67.6**	58.0 (18)	Good
Ruddy Turnstone *Arenaria intepres*	2	6	177	17	**9.6**	9.6 (21)	Average
Sanderling *C. alba*	2	2	348	7	**2.0**	12.2 (20)	Very poor
Sharp-tailed Sandpiper *C. acuminata*	1	4	115	6	**5.2**	10.7 (30)	Poor

All birds cannon-netted in period 15 November to 28 February except for Red-necked Stint, Ruddy Turnstone, and Sanderling, for which catches up to 29 March are included.
* Does not include the 2011/2012 figures

Table 2. Percentage of juvenile/first year waders in cannon-net catches in north-west Australia in 2011/2012

Species	No. of catches		Total caught	Juv/1st year		Assessment of 2011 breeding success
	Large (>50)	Small (<50)		No.	%	
Great Knot *Calidris tenuirostris*	9	5	1369	89	6.5	Poor
Bar-tailed Godwit *Limosa lapponica*	2	8	491	38	7.7	Below average
Red-necked Stint *C. ruficollis*	0	8	90	22	24.4	Average
Red Knot *C. canutus*	0	4	77	6	7.8	Very poor
Curlew Sandpiper *C. ferruginea*	0	6	79	1	1.3	Very poor
Ruddy Turnstone *Arenaria intepres*	1	2	58	8	13.8	Average?
Sanderling C. *alba*	0	3	3	-	(-)	-
Sharp-tailed Sandpiper *C. acuminata*	0	0	0	0	(-)	-
Non-arctic northern migrants						
Greater Sand Plover *Charadrius leschenaultii*	6	6	544	102	18.8	Below average
Terek Sandpiper *Xenus cinereus*	1	8	225	12	5.3	Very poor
Grey-tailed Tattler *Heteroscelus brevipes*	2	9	285	57	20.0	Average
Broad-billed Sandpiper *limicola falcinellus*	0	2	46	13	28.3	Good?
All birds cannon-netted in period 1 November to mid-March						

Table 3. Percentage of first year birds in wader catches in south-east Australia 1998/1999 to 2011/2012

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**	***Average (13yrs)***
Ruddy Turnstone *Arenaria intepres*	6.2	29	10	9.3	17	6.7	12	28	1.3	19	0.7	19	26	10	*14.2*
Red-necked Stint *Calidris ruficollis*	32	23	13	35	13	23	10	7.4	14	10	15	12	20	16	*17.2*
Curlew Sandpiper *C. ferruginea*	4.1	20	6.8	27	15	15	22	27	4.9	33	10	27	(-)	4	*17.6*
Sharp-tailed Sandpiper *C. acuminata*	11	10	16	7.9	20	39	42	27	12	20	3.6	32	(-)	5	*20.0*
Sanderling *C. alba*	10	13	2.9	10	43	2.7	16	62	0.5	14	2.9	19	21	2	*16.7*
Red Knot *C. canutus*	(2.8)	38	52	69	(92)	(86)	29	73	58	(75)	(-)	(-)	78	68	*56.7*
Bar-tailed Godwit *Limosa lapponica*	41	19	3.6	1.4	16	2.3	38	40	26	56	29	31	10	18	*23.9*

All birds cannon-netted between mid November and 25 March (except Sharp-tailed Sandpiper and Curlew Sandpiper to end February only). Averages (for previous 13years) exclude figures in brackets (small samples) and exclude 2011/2012 figures

Table 4. Percentage of first year birds in wader catches in north-west Australia 1998/1999 to 2011/2012

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	Average (13yrs)
Red-necked Stint *Calidris ruficollis*	26	46	15	17	41	10	13	20	21	20	10	17	18	24	*21.0*
Curlew Sandpiper *C. ferruginea*	9.3	22	11	19	15	7.4	21	37	11	29	10	35	24	1	*19.4*
Great Knot *C. tenuirostris*	2.4	4.8	18	5.2	17	16	3.2	12	9.2	12	6	41	24	6	*13.1*
Red Knot *C. canutus*	3.3	14	9.6	5.4	32	3.2	(12)	57	11	23	12	52	16	8	*19.8*
Bar-tailed Godwit *Limosa lapponica*	2.0	10	4.8	15	13	9.0	6.7	11	8.5	8	4	28	21	8	*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	*23.6*
Terek Sandpiper *Xenus cinereus*	12	(0)	8.5	12	11	19	14	13	11	13	15	19	25	5	*14.4*
Grey-tailed Tattler *Heteroscelus brevipes*	26	(44)	17	17	9.0	14	11	15	28	25	38	24	31	20	*21.3*

All birds cannon-netted in the period 1 November to mid March. Averages (for previous 13 years) exclude figures in brackets (small samples) and exclude 2011/2012 figures