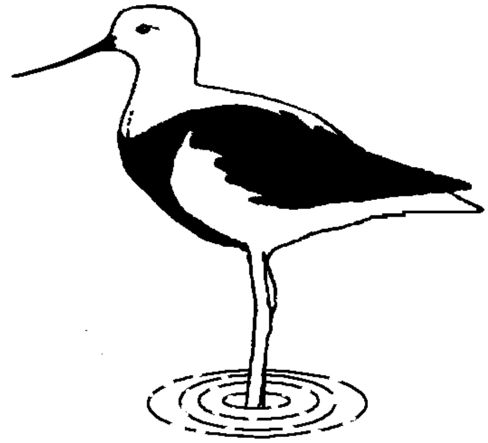
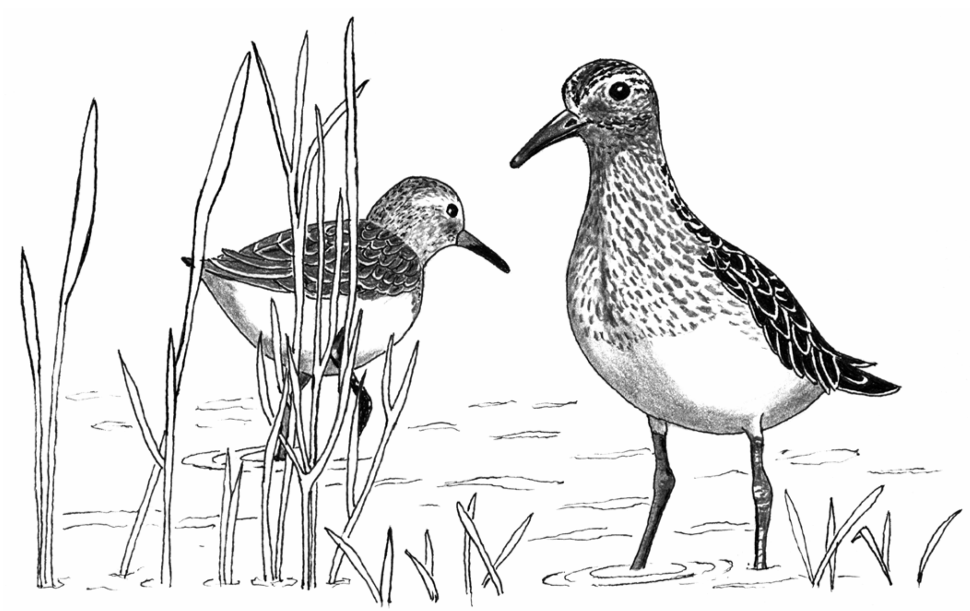
The
Stilt



The Bulletin of the East Asian-Australasian Flyway



Australasian
Wader
Studies
Group

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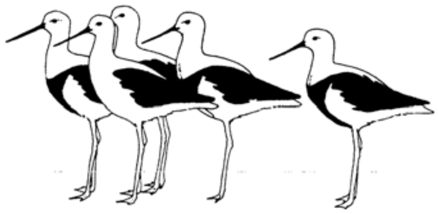

The Stilt

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MISSION STATEMENT
To ensure the future of waders and their habitats in Australia through research and conservation programmes and to encourage and assist similar programmes in the rest of the East Asian-Australasian Flyway.

OBJECTIVES

- To monitor wader populations through a programme of counting and banding in order to collect data on changes on a local, national and international basis.
- To study the migrations of waders through a programme of counting, banding, colour flagging and collection of biometric data.
- To instigate and encourage other scientific studies of waders such as feeding and breeding studies.
- To communicate the results of these studies to a wide audience through the *Stilt*, the *Tattler*, other journals, the internet, the media, conferences and lectures.
- To formulate and promote policies for the conservation of waders and their habitat, and to make available information to local and national governmental conservation bodies and other organisations to encourage and assist them in pursuing this objective.
- To encourage and promote the involvement of a large band of amateurs, as well as professionals, to achieve these objectives.

MEMBERSHIP OF THE AUSTRALASIAN WADER STUDIES GROUP
Membership of the AWSG is open to anyone interested in the conservation and research of waders (shorebirds) in the East Asian-Australasian Flyway. Members receive the twice yearly bulletin *The Stilt*, and the quarterly newsletter *The Tattler*. Please direct all membership enquiries to the Membership Manager at Birds Australia (RAOU) National Office, 415 Riversdale Rd, East Hawthorn, 3122. Vic., AUSTRALIA.
Ph: 03-9882 2622, fax: 03-9882 2677.
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AWSG WEB SITE:
www.tasweb.com.au/awsg/index.htm

Cover Illustration: Annie Rogers

AWSG ELECTIONS

Under the Rules of the AWSG, which is a Special Interest Group of Birds Australia, all positions on the Committee are open and nominations are sought for the following:

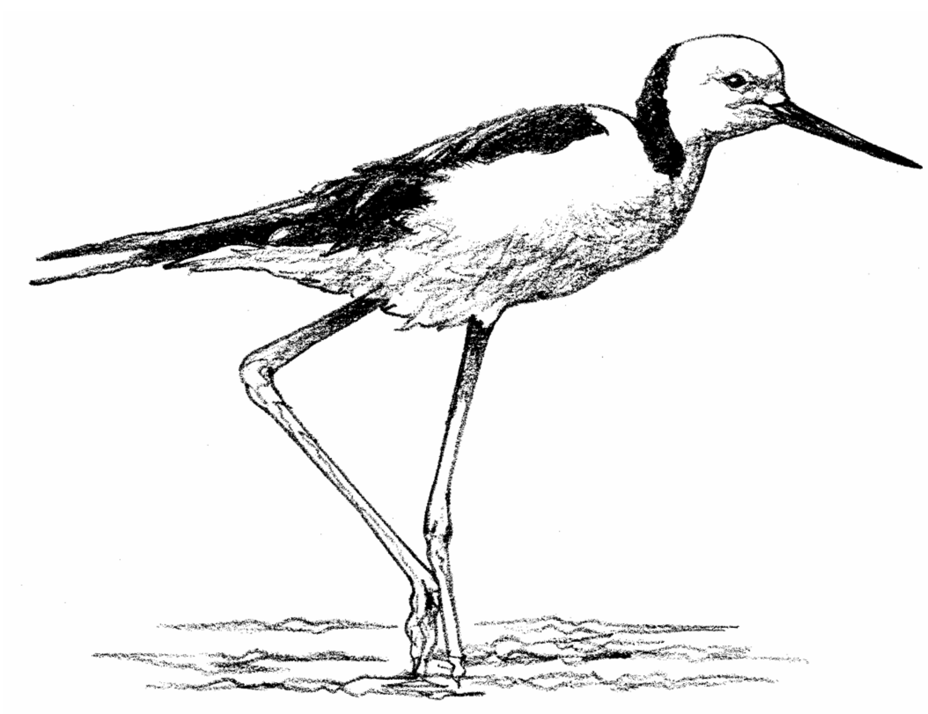
Chair
Vice-Chair
Scientific Committee Chair
Editor of Stilt
Secretary
Treasurer
Conservation Officer
Liaison Officer
Up to 8 Committee members.

The following office bearers and members of the committee will have completed their term of office in June 2006 and have volunteered for re-election: David Close, Peter Collins, Ken Gosbell, Chris Hassell, Rosalind Jessop, David Milton, Clive Minton, Hugo Phillips, Danny Rogers, Ken Rogers, Phil Straw and Doug Watkins.

Sandra Harding and Mike Bamford wish to step down from the committee and we would like to express our thanks to them for their contribution in so many ways. Sandra has served as Conservation Officer for several years and has effectively represented the AWSG's views in many forums and we would like to acknowledge the many hours she has contributed to this important task. Mike has resigned due to other commitments.

Nominations for the above positions, seconded by a Member of the group should be sent to the Secretary by 31 January 2006. Should an election be necessary ballot papers will be sent out with the April 2006 *Stilt.*

Ken Gosbell, *Secretay - Treasurer.*



HAS THE TIMING OF SNOWMELT IN EASTERN SIBERIA AFFECTED THE NUMBERS OF JUVENILE WADERS WINTERING IN SOUTH-EAST AUSTRALIA?

HUGH BOYD[1], CLIVE MINTON[2] & KEN ROGERS[3]

[1]1032 Pinewood Crescent, Ottawa, Ontario, Canada K2B 5Y5 hughboyd@magma.ca. [2]165 Dalgetty Road, Beaumaris, Melbourne 3193, Victoria, Australia mintons@ozemail.com.au. [3]340, Ninks Road, St Andrews, Victoria 3761, Australia.

We examined the effect of weather conditions in Siberia on the breeding success of six wader species. Proportions of juveniles in annual wader cannon-netting catches in south-east Australia in November to March were used as indicators of breeding success in eastern Siberia in the previous summer. Estimates of the timing of partial snow clearance in eastern Siberia were made from weekly maps of snow and ice cover derived from satellite imagery for the period 1981-1996. Average temperatures for the months of June and July for each year were available from weather stations along the coast of Arctic Siberia. Logistic models were used to examine the relationship between juvenile proportions and these variables. Some extreme data points were not used in model calibration. These could arise from the heterogeneous distribution of juveniles in wader flocks. Two species (Ruddy Turnstone and Red Knot) showed a statistically significant relationship with date of snow melt; the Red Knot result is considered tentative. Four species (Red-necked Stint, Curlew Sandpiper, Sharp-tailed Sandpiper, and Sanderling) showed a significant relationship with temperature. Over much of eastern Siberia winter snowfall is low, so that the spring snow cover on the tundra is shallow. The breeding success of waders in eastern Siberia does not seem to be primarily constrained by the condition of the tundra on their arrival, even in years when complete snow clearance is much delayed. Higher temperatures in July are generally associated with higher breeding success.

INTRODUCTION

Many of the waders nesting on the eastern Siberian tundra spend the non-breeding season in Australasia. Using the proportions of juveniles in cannon-netting catches in south-east Australia as indicators of the breeding success of four species, Soloviev *et al*. (2005) found that they bred more successfully in years when summer air temperatures were relatively high and when rodents (alternative prey for many predators on waders) were abundant. Temperatures in June, when egg-laying occurs, seemed to be less influential than those in July, when most chicks hatch and are susceptible to chilling by winds and rain. Those results suggest that Australian data may be poorly suited to provide information on the effects on breeding success of the conditions confronting waders when they first arrive in Siberia in spring. Soloviev *et al.* (2005) only had temperature and commented that other weather variables, including time of snowmelt, could have a major impact on breeding success. In other parts of the Arctic, the date when snowmelt starts, and the speed with which it is completed, have been seen to affect the start of nesting and the success of predators in taking eggs from nests (HB pers. obs.). This paper investigates the relationships between snowmelt dates and temperatures and the proportion of juveniles caught in south-eastern Australia.

METHODS

Weather

Weekly maps of snow- and ice-cover across the Northern Hemisphere have been prepared from satellite imagery by the U.S. National Oceanic and Aeronautical Administration (NOAA) since 1967. The satellites providing the data and the classification system used on the maps underwent several changes in the earlier years so that the maps did not become fully standardised until 1981.

We used paper copies of the maps for May-July, most of which had been transmitted by fax. On some sheets it was hard to distinguish between coastlines and the boundaries of the reflective zones. We defined the date at which some snow clearance had begun on the tundra as the midpoint of the interval between the dates when an area was last shown as class 3 (i.e. highly reflective, with total snow cover) and when it was first shown as class 2 (i.e. less reflective, due to partial clearance of snow). The intervals between the satellite passes on which the maps were based were 5-7 days. The pixel sizes (of about 0.5º x 0.5º) corresponded to surface areas of about 12 x 12 km at 72ºN, so that the resolution of the imagery was coarse by present-day standards. To check on the reliability of the interpretation of the maps by HB, three assessments were made several months apart. The first two covered the entire areas likely to be occupied by any of the Australian waders, while the third was limited to the coastal tundra. Differences between the assessments did not produce substantial discrepancies in the rankings of sectors in different years. In most cases class 2 images first appeared along the coast, where the winter climate is less severe than inland.

Although cannon-netting of waders in south-east Australia began in early 1979, we limited this study to the years 1981 to 1996 when the mapping technique was consistent. After 1996 the category ‘partial clearance’ was no longer shown on snow cover maps.

Temperature data used here are based on monthly figures from coastal stations, rather than the regional anomalies that

Soloviev *et al.* (2005) used. Averages of the daily temperatures for the months of June and July for each year were calculated from seven coastal stations, two in Taymyr, two in Yakut, and three in Chukotsk.

Waders caught in south-east Australia

Recoveries of ringed birds and re-sightings of colour-flagged individuals are providing increasingly detailed pictures of the breeding ranges and migration routes of the waders caught in Australia. This analysis considers only the breeding ranges of the wader populations that use south-eastern Australia. Most of these ranges (Table 1) are smaller than the entire Siberian and Alaskan breeding ranges of the species. The right-hand column of Table 1 provides brief summaries of the preferred breeding habitats of each species, based on comments by Rogacheva (1992), who divided the tundra, from north to south, into four zones: polar desert, Arctic tundra, typical tundra and shrub/southern tundra. These different choices may affect the ways in which newly-arrived individuals respond to the extent and persistence of snow cover, though the available data are unsuitable for exploring small-scale effects. The main breeding area of the Curlew Sandpipers caught in south-east Australia is in Yakut, although some have been found as far west as the Taymyr Peninsula, intermingled with much larger numbers of birds that move to western Europe in winter (Blomqvist *et al.* 2002, Wernham *et al.*(2002), Minton *et al.*(2005). Most of the other waders visiting south-east Australia also originate from eastern Siberia. They may be mixed with birds that will spend the non-breeding season elsewhere, whose arrivals in and departures from Siberia may be timed differently. There does not seem to be much published information on arrival dates of waders in Siberia, the period of spring break-up being a difficult time for High Arctic travelling.

We used the proportions of juveniles in the total seasonal catch as indicators of the breeding success of each species in the previous summer; e.g. the catch from November 1981 to March 1982 provided an index of success in the Arctic summer of 1981. The data in Table 2 are from Minton *et al.* (2005). The working assumptions here, as in previous studies, have been that losses on migration, very probably greater for juveniles than for adults, have been relatively constant for both adults and juveniles, while losses during the stay in Australia are small. As adult and juvenile waders migrate separately and at different times, the assumption that juveniles reared in any region spend the winter in the same areas as their parents (see Robinson *et al*. 2005) may not be met completely by any species. It is certainly not by the Red Knot.

Analysis

Logistic (or logit) regression analysis is used to quantify any relationships or associations which apply between the juvenile proportions estimated and the snow melt and temperature data which describe Siberian weather. The use of this technique is necessary because a proportion must lie within the limits of 0 and 1 and any method which does not provide this constraint must be rejected; in addition, there is stochastic error associated with the proportions observed. The size of this error depends on the value of the proportion and increases with decreasing sample sizes. Logit models are calibrated by an iterative process. The method of iteratively reweighted least squares (IRLS) of Box and Cox (1964) can be incorporated in this process. In this, at each iteration, the sample points are weighted by the inverse of the variance applying to their current estimate of the proportion. This allows data from small samples to be used. Statistical outliers are identified using the juvenile proportion estimated by the model to calculate the probability that observations are consistent with the model. Models were calibrated in the NONLIN procedure in SYSTAT 10 (SPSS 2000).

RESULTS

Dates of partial snow clearance

The estimated mean dates for the first appearance of snow-free patches from the Taymyr Peninsula eastward in successive sectors of 10º longitude across eastern Siberia are shown in Table 3. Each sector is *c.* 340 km, or 210 miles, wide at latitude 72ºN. For convenience of reference, we then grouped the three westernmost sectors as ‘Taymyr’, the four central sectors as Yakut (including the Lena delta), and the easternmost four as Chukotsk.

In nearly all years the start of snow clearance on the Taymyr Peninsula (sector means 21-27 June) was much later than further east (means 4-14 June). In all the longitudinal blocks, the apparent date of partial melt varied widely between years, especially in the central sectors. The first signs of snow clearance were seen most often in the sectors from 130ºE to 170ºE, where there were signs of clearing in late May in several years.

Table 1. Longitudinal breeding ranges in Siberia of waders caught in non-breeding areas in south-east Australia, derived from recoveries and sightings of individuals marked in Australia or Siberia; and their preferred breeding habitats (after Rogacheva 1992).

Species	Summer range	Breeding habitat
Red-necked Stint *Calidris ruficollis*	110ºE to 170ºW	Low altitude montane tundra
Curlew Sandpiper *Calidris ferruginea*	90ºE to 160ºE	Northern typical tundra
Sharp-tailed Sandpiper *Calidris acuminata*	120ºE to 155ºE	Damp hillock tundra, moss-sedge bogs
Sanderling *Calidris alba*	120ºE to 160ºE	Polar desert, north Arctic tundra
Red Knot *Calidris canutus*	170ºE to 170ºW	Rocky Arctic tundra, near large lakes
Ruddy Turnstone *Arenaria interpres*	120ºE to 170ºW	Arctic tundra, near sea or large lakes

Table 2. Total catches (Num) and proportions of juveniles (Juv. Prop.) caught in south-east Australia by cannon-netting in 1981-1996. Year refers to the arctic breeding year. Catch samples were from the subsequent non-breeding season (November of that year to mid-March of the following year).

Season	Red-necked Stint		Curlew Sandpiper		Sharp-tailed Sandpiper		Red Knot		Sanderling		Ruddy Turnstone	
	Num	Juv. Prop.	Num	Juv. Prop.	Num	Juv. Prop.	Num	Juv. Prop.	Num	Juv. Prop.	Num	Juv. Prop.
1981	2542	0.160	210	0.095	88	0.148	40	0.275	-	-	-	-
1982	1518	0.080	842	0.150	367	0.022	49	1.000	-	-	-	-
1983	1515	0.065	730	0.074	57	0.035	5	0.600	-	-	-	-
1984	3640	0.180	1175	0.046	451	0.075	63	0.143	-	-	-	-
1985	2280	0.180	832	0.089	9	0.000	91	0.418	-	-	-	-
1986	2795	0.068	1333	0.049	160	0.038	50	0.340	-	-	-	-
1987	4896	0.210	942	0.170	689	0.213	100	0.000	-	-	-	-
1988	5436	0.138	879	0.321	101	0.020	6	0.667	-	-	-	-
1989	2314	0.007	889	0.003	66	0.667	18	0.167	-	-	109	0.000
1990	3824	0.143	963	0.106	56	0.089	173	0.960	208	0.139	140	0.114
1991	1994	0.291	437	0.453	358	0.182	1	1.000	-	-	152	0.803
1992	4340	0.038	2232	0.003	119	0.000	33	0.242	35	0.171	78	0.026
1993	6015	0.148	1239	0.174	36	0.083	2	0.500	161	0.143	14	0.071
1994	3191	0.186	954	0.096	214	0.168	1	1.000	49	0.122	185	0.059
1995	1804	0.251	506	0.059	23	0.087	58	0.655	192	0.031	108	0.093
1996	3526	0.119	636	0.088	146	0.041	1	1.000	404	0.015	197	0.061
Median	2993	0.146	884	0.092	110	0.079	37	0.600	177	0.131	125	0.066
Minimum	1515	0.007	210	0.003	9	0.000	1	0.000	35	0.015	14	0.000
Maximum	6015	0.291	2232	0.453	689	0.667	173	1.000	404	0.171	197	0.803

Table 3. Mean dates of partial snow clearance on coastal tundra of northern Siberia in 1981-1996, in days from 31 May, in sectors of 10º longitude (e.g. 85ºE = 80ºE to 90ºE). Negative values are in May (e.g. -5 = 27 May).

Year	Taymyr			Yakut				Chukotsk			
	85ºE	95ºE	105ºE	115ºE	125ºE	135ºE	145ºE	155ºE	16º5E	175ºE	175ºW
1981	33	33	18	14	-3	-3	-3	-6	-6	-6	12
1982	24	24	22	17	11	11	11	11	11	11	10
1983	24	13	13	3	-12	-12	-12	3	3	-11	-6
1984	28	28	28	10	14	14	12	8	4	4	4
1985	22	22	22	10	18	18	18	10	6	8	8
1986	30	30	30	18	18	18	18	10	6	10	10
1987	34	33	33	21	10	10	10	10	10	21	18
1988	27	23	3	3	3	3	3	6	3	12	12
1989	28	28	23	10	10	1	-8	-8	9	9	9
1990	28	10	10	1	1	-7	-7	1	-3	-3	1
1991	25	25	25	25	25	1	1	1	25	25	25
1992	29	24	15	15	15	15	15	15	2	-3	8
1993	22	22	16	16	16	1	3	3	3	3	3
1994	34	34	22	22	4	2	4	4	4	4	9
1995	25	25	25	10	3	3	3	3	-7	3	3
1996	25	25	25	22	16	16	16	1	1	22	22
Mean	27.4	24.9	20.6	13.6	9.3	5.7	5.3	4.5	4.4	6.6	9.3
Minimum	22	10	3	1	-12	-12	-12	-8	-7	-11	-6
Maximum	34	34	33	25	25	18	18	15	25	25	25

In many years the beginning of partial melting on the Taymyr Peninsula showed little association with its onset further east. Snowmelt seems to have occurred later on the Taymyr Peninsula from 1981 to 1996, especially towards its eastern end. This may not reflect conditions in the lowland wetlands, as much of the peninsula is higher than the tundra plains further east and the satellite imagery may have been dominated by reflections from the high ground. The only similar trend further east was in the sector 120-130ºE.

Average June and July temperatures for Taymyr, Yakut, and Chukotsk are given in Table 4.

Table 4. Average temperatures (º C)

Year	June			July		
	Taymyr	Yakut	Chukotsk	Taymyr	Yakut	Chukotsk
1981	-0.50	2.95	3.30	2.10	5.75	5.20
1982	-0.85	0.50	1.50	3.50	7.05	4.95
1983	-0.20	1.70	1.15	2.00	6.30	5.65
1984	-0.30	0.75	3.20	4.70	4.55	5.95
1985	1.05	2.45	1.20	2.30	6.35	6.75
1986	-0.50	3.20	3.30	3.75	4.60	6.10
1987	-1.70	2.90	1.45	3.80	7.90	5.65
1988	0.10	2.90	1.70	2.30	8.35	6.95
1989	-1.70	2.75	2.60	2.05	5.30	5.90
1990	0.20	3.10	3.60	3.25	5.65	6.50
1991	-0.60	2.95	3.20	3.60	6.00	7.50
1992	-2.65	0.95	3.50	2.25	5.95	6.75
1993	0.45	3.90	3.90	2.00	5.85	8.20
1994	-0.25	2.65	2.75	2.35	6.40	4.90
1995	-0.45	4.90	2.75	4.30	6.50	6.60
1996	-1.90	-0.70	3.90	3.85	4.00	6.50
Mean	-0.61	2.37	2.69	3.01	6.03	6.25
Minimum	-2.65	-0.70	1.15	2.00	4.00	4.90
Maximum	1.05	4.90	3.90	4.70	8.35	8.20

Species Accounts

Figure 1 gives plots of the data and the preferred models for the six species. All of the models showed an association between juvenile proportions and a temperature variable or date of snowmelt. In no case was a bivariate model preferred. Outlying data points (indicated by squares in the figure) were not used in the calibration of the models because they are atypical of the rest of the data. Some of these outliers might look a bit surprising but are clearly justified. For example, the Ruddy Turnstone point with a juvenile proportion of zero is based on a sample of 109 adults. The probability of getting no adults in a sample this size with the juvenile proportion estimated by the model is 1 in 1,000. Whilst the linear models of Soloviev *et al*. (2005) would describe the Red-necked Stint and Ruddy Turnstone data almost equally well, they would clearly be unsuitable for the other species as they would indicate negative juvenile proportions at low temperatures.

Tables 5 to 10 present logit models for each of the six species. The models estimate a constant term and one or two weather parameters. The snowmelt variable used is the average number of days after 31 May estimated over the range over which breeding occurs (Table 1). The temperature variable used is either the average June or July temperature or their average. Too few data points are available for calibration of satisfactory models using more than one weather variable. All models are calibrated using iteratively reweighted least squares unless otherwise stated. Snowmelt models, although not preferred for four species, are included for completeness.

Red-necked Stint (Table 5)

This species was caught in the largest numbers with a minimum annual catch of 1,515 birds (Table 1) so it is a little surprising that the IRLS model is not significant.

Table 5. Red-necked Stint Models. The table gives: the number of years' data (N) on which the model is based; the estimate of the coefficient applying to each parameter and its asymptotic standard error (ASE); the probability that the coefficient estimate is zero (Prob = 0); and the square of the correlation coefficient (R^2) which represents the proportion of the variability in the data explained by the model. The comment column gives additional information relevant to the model (i.e. lists outliers not used in calibration and indicates if IRLS weighting was not used). The first model presented is the preferred one.

Parameters	N	Estimate	A.S.E.	Prob = 0	R^2	Comment
Constant	16	-3.846	1.151	< 0.0005	0.200	Unweighted
Average Temp.		0.465	0.250	0.032		
Constant	16	-2.974	1.061	0.003	0.082	
Average Temp.		0.262	0.233	0.130		
Constant	16	-1.972	0.286	< 0.0005	0.045	Unweighted
Snowmelt		0.022	0.028	0.213		

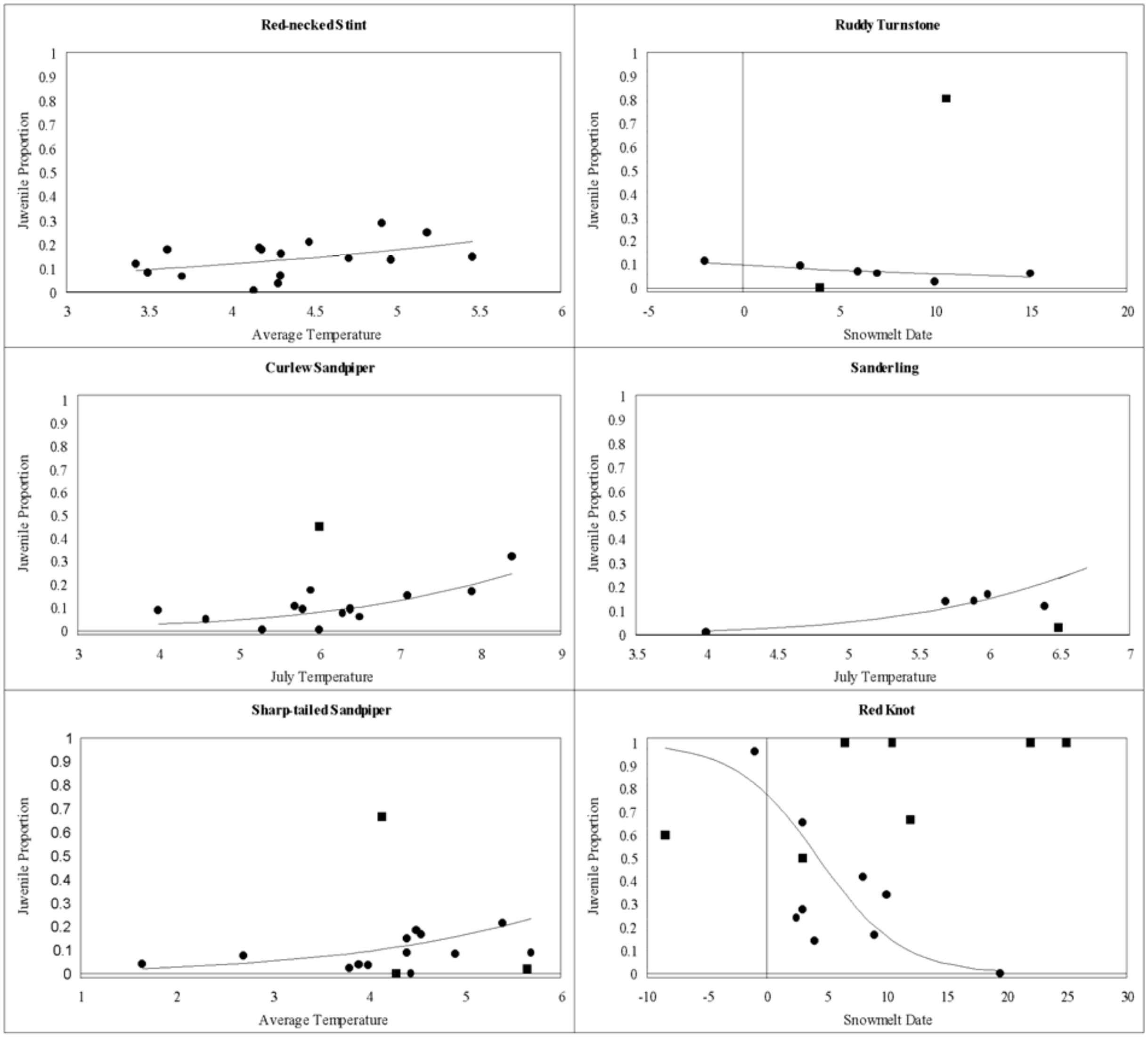


Figure 1. Data and model plots for the six species examined. Black circles are points included. Outliers are black squares.

Juvenile proportions were quite precisely estimated in all samples and the IRLS could be considered to be over-compensating for sample size in this circumstance. The improvement in the model after removal of the IRLS weighting is readily apparent. A model using snowmelt date as the independent variable is not significant. It also has the wrong sign as the expectation is that earlier snowmelt will be associated with higher breeding success.

Curlew Sandpiper (Table 6)
There is one very evident outlier with a juvenile proportion of nearly 0.5. The best model is based on the July temperatures. Average annual catches are about one third those for Red-necked Stint with the smallest catch being only 210 birds. Here, IRLS weighting clearly gave a better result than the non-significant unweighted model (not shown). Again snowmelt date does not give a significant model but the sign of the snowmelt coefficient is at least correct.

Sharp-tailed Sandpiper (Table 7)
There is an obvious outlier with a juvenile proportion of 0.67. No juveniles were captured in two years. One of these occurrences, based on 119 birds, is treated as an outlier; the other, based on 9 birds, is not. The modelled juvenile proportion is approximately 0.1 in both cases and it is quite likely that a sample of 9 birds will produce no juveniles (probability *c*. 1 in 2.5); with 119 birds it is near to impossible (probability *c*. 1 in 333,333). Similar considerations apply to the two points in the bottom right hand corner of the figure. Like the Curlew Sandpiper, snowmelt date does not give a significant model but the sign of the snowmelt coefficient is correct.

Table 6. Curlew Sandpiper Models

Parameters	N	Estimate	A.S.E.	Prob = 0	R^2	Comment
Constant	15	-5.726	1.100	< 0.0005	0.377	Outlier: 0.453 (437)
July Temp.		0.549	0.165	< 0.0005		
Constant	15	-1.857	0.431	< 0.0005	0.085	
Snowmelt		-0.041	0.037	0.136		

Table 7. Sharp-tailed Sandpiper Models

Parameters	N	Estimate	A.S.E.	Prob = 0	R^2	Comment
Constant	13	-4.538	0.707	< 0.0005	0.635	Outliers: 0.0 (119),
Average Temp.		0.588	0.151	< 0.0005		0.02 (101), 0.667 (66)
Constant	14	-4.195	0.773	< 0.0005	0.493	Outlier: 0.667 (66)
Average Temp.		0.498	0.165	0.001		
Constant	13	-2.153	0.629	< 0.0005	0.013	Outliers: 0.0 (119),
Snowmelt		0.015	0.045	0.373		0.02 (101), 0.667 (66)

Ruddy Turnstone (Table 8)
Although two years data of the eight available were excluded, both largish catch totals but one with no juveniles (in a sample of 109) and the other with 80% (in a sample of 152), the remaining data were well behaved with date of snowmelt showing by far the strongest association with Victorian juvenile proportions. The June temperature had a significant but lesser impact whereas that for July temperature was negligible.

Sanderling (Table 9)
There are data for only six years for this species. The data point for which only six juveniles were observed in a sample of 192 birds is a clear outlier. The remaining data are well behaved. The model using July temperatures gives the best fit.

Red Knot (Table 10)
It is immediately evident from Figure 1 that the data for Red Knot do not behave as do those for the other species. Juvenile proportions range from 0 to 1, even on large samples. The reason for this is that many of the juveniles occurring in Victoria are the progeny of adults which spend the non-breeding season in New Zealand (Riegen *et al*. 2005). Minton *et al*. (2005) state, "Furthermore in some years (years following poor breeding seasons) the species is almost totally absent from certain locations, especially ones where catches are more easily made". The adults in the samples are from the population of this species which occurs in Victoria. The data cannot, therefore, be treated on the same basis as the other species for which the Victorian samples are assumed to be representative of the breeding population. It is however possible that the Red Knot juvenile proportion, although essentially different from that of other species, does vary with Arctic weather conditions. On this basis, we have examined logistic models of these data. For model calibration the data for seven years were treated as outliers. Only one of these was substantial; in 1982 a sample of 49 birds contained no juveniles. The other outliers were of juvenile proportions based on six or fewer birds. (This was done more to make Figure 1 more informative; excluding them made very little difference to the model.) All the exclusions have juvenile proportions of 0.5 or larger. The results (Table 10) show that the association with date of snowmelt is stronger than that with the temperature variables. Figure 1 shows two extreme data points (Juv. Prop. = 0.96, n = 173; Juv. Prop. = 0, n = 100) If either one of these is excluded, a significant model is obtained; if both are, there is no suggestion of any relationship with date of snowmelt.

DISCUSSION

This study has used logistic regression to calibrate models relating the juvenile proportion of catches in Victoria to the timing of snowmelt and monthly temperatures in Arctic Siberia. Statistically significant relationships were found for the six species examined. Based on visual examination of data plots, this method would seem to be preferred to the linear correlation analysis of Soloviev *et al*. (2005). For two of the species, Red-necked Stint and Sharp-tailed Sandpiper, the relationship was with the average of the June and July temperatures. In both these cases, the models on the months considered individually were very similar. Interestingly, unweighted models for the Red-necked Stint performed better. The average July temperature was the best explanatory variable for Curlew Sandpiper and Sanderling, although June temperature was nearly as good for the latter. In not one case was the average June temperature the best explanatory variable. This might, at least in part, be explained by these temperatures being negatively correlated with snowmelt dates, significantly so for Yakut and Chukotsk. The results on all species considering only temperature effects are in broad agreement with those of Soloviev *et al*. (2005).

Table 8. Ruddy Turnstone Models

Parameters	N	Estimate	A.S.E.	Prob = 0	R^2	Comment
Constant	6	-2.232	0.169	< 0.0005	0.571	Outliers: 0 (149), 0.8 (152)
Snowmelt		-0.051	0.021	0.007		
Constant	6	-3.511	0.536	< 0.0005	0.464	Outliers: 0 (149), 0.8 (152)
June Temp.		0.345	0.181	0.028		
Constant	6	-3.945	2.249	0.040	0.091	Outliers: 0 (149), 0.8 (152)
July Temp.		0.234	0.376	0.267		

Table 9. Sanderling Models

Parameters	N	Estimate	A.S.E.	Prob = 0	R^2	Comment
Constant	5	-8.347	1.329	< 0.0005	0.921	Outlier: 0.031 (192)
July Temp.		1.105	0.233	< 0.0005		
Constant	5	-1.934	0.513	< 0.0005	0.361	Outlier: 0.031 (192)
Snowmelt		-0.092	0.068	0.089		

Table 10. Red Knot Models

Parameters	N	Estimate	A.S.E.	Prob = 0	R^2	Comment
Constant	9	1.244	0.583	0.016	0.889	Outliers: 1 (49,1,1,1),
Snowmelt		-0.289	0.107	0.003		0.667 (6), 0.6 (5), 0.5 (2)
Constant	9	-2.791	1.833	0.064	0.346	Outliers: 1 (49,1,1,1),
July Temp.		0.950	0.609	0.059		0.667 (6), 0.6 (5), 0.5 (2)
Constant	9	-14.453	8.203	0.039	0.422	Outliers: 1 (49,1,1,1),
July Temp.		2.280	1.294	0.039		0.667 (6), 0.6 (5), 0.5 (2)

The Ruddy Turnstone and Red Knot juvenile proportions were best explained by the timing of snowmelt. For the Ruddy Turnstone, the next best explanatory variable was the average June temperature, which is more likely to be related to the date of snowmelt than temperatures later in the season. The Red Knot model rests, as noted above, on the two extreme data points in the model; the data from the other 14 years have relatively little effect. Despite the statistical significance of the model, it does not provide convincing evidence for the dependence of breeding success on the timing of snow melt. On the other hand, the breeding habitats of Red Knot and Ruddy Turnstone share some characteristics (Table 1), possibly reflecting some common causality. The unusual structure of the Victorian Red Knot population and its sporadic occurrence in Victorian catching locations suggest that methods additional to cannon netting (e.g. ageing by telescope scans, relating juvenile catch sizes to trapping effort) could be needed to provide a fuller picture of annual breeding productivity.

The models in Tables 5 through 10 were achieved after excluding one or more year's data for all species but the Red-necked Stint. The identification and removal of outliers is standard statistical practice so there is nothing unusual in this. What is unusual is the relatively large number of exclusions of generally very high or very low juvenile proportions. Table 2 shows that these are not necessarily due to small samples. For example, there is a Red-necked Stint sample of 2,314 birds with only 0.7% juveniles and a Curlew Sandpiper sample of 437 birds with 45% juveniles. Weather is not the only factor effecting the survival of young birds in Arctic Siberia. There are many other well-known threats to young birds in Siberia; predation (e.g. by Arctic Foxes, wolves, Snowy Owls) is perhaps the main one but short periods of severe weather, although not necessarily detectable in the monthly averages used here, may also have a major impact. The young then have to survive their first migration, unaccompanied by adults, to the non-breeding grounds in, in our case, Victoria. Some years of high juvenile productivity are doubtless due to an absence of all or most of these pressures, other years of low productivity are no doubt due to several or all of them being present.

Very high juvenile proportions on large samples cannot, however, be attributed to a fortuitous combination of circumstances. A juvenile proportion of 0.67 converts to recruitment rate of two young for every adult or four young per breeding pair (Rogers *et al*. 2004). It would be amazing for all breeding pairs to raise successfully a maximum brood of four chicks and for them all to survive to Australia. A possible cause of these extreme values, and indeed other outliers, is the heterogeneous distribution of young birds within wader flocks on the non-breeding grounds. This has been suspected for some time (e.g. Harrington & Liddy 1982, Weston 1992) and has now been clearly demonstrated (Rogers *et al*. 2005, Battley 2005). A consequence of this is that the juvenile proportion of some of the flocks comprising a year's total catch may be biased overestimates of the population juvenile proportion; some others may be underestimates. Larger samples than are required by binomial theory are needed to ensure that an unbiased population estimate of the juvenile proportion is obtained. No work has yet been done to determine what minimum size samples are required.

It is something of a wonder that the signature of weather on the breeding grounds is still apparent six months later in Australia given the many greater and better known threats to survival of juvenile waders bred in the Siberian Arctic.

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DELAYED DISPERSION OF A JUVENILE HOODED PLOVER FROM ITS NATAL TERRITORY.

ANTHEA WHITELAW[1], JIM WHITELAW, [1] AND MICHAEL A. WESTON [2]

[1] *83 Bayview Ave, Inverloch, 3996 Vic. Australia.*
[2] *Birds Australia, 415 Riversdale Rd, Hawthorn East, 3123 Vic. Australia. m.weston@birdsaustralia.com.au*

Little is known about dispersion of young Hooded Plovers *Thinornis rubricollis* from their territories despite major studies of the breeding biology of this species (see Marchant and Higgins 1993, Weston 2000, Baird and Dann 2003). This is partly because the rarity of the species combined with its low reproductive success means that relatively few fledging events occur, making data collection necessarily opportunistic (see Weston 2003). Additionally, information on the timing of departure from the natal territory requires very frequent, and preferably daily checks of territories, and these are rarely available (exceptions include Newman and Park 1992, 1993).

Studies of colour-banded birds have revealed that Hooded Plover pairs routinely lay a number of clutches within a breeding season. Repeat clutches are laid following nest failure or after young have successfully fledged, i.e. are capable of flight (Weston 2000). In the case of successful fledging, the timing of the departure of young from the natal territory may have important implications. These might include:

- Breeding adults may not be able to concurrently associate with their young and initiate another breeding attempt, either because of constraints on the adults (e.g., time or energy reserves) or on the territory (e.g., available food).
- Juveniles which remain on their natal territory may potentially disrupt normal incubation or brooding activities.
- The risk of predation may be positively or negatively affected by the number of birds on a territory.
- The timing of departure from the natal territory may also have important implications for the dispersing juvenile. Timing of dispersal may potentially affect subsequent survival, pair and territory formation, and/or the age of first breeding.

The importance of the timing of departure from the natal territory is emphasised by observations of parental aggression towards their fledglings while on the natal territory (MAW and B. Dowling pers. obs. including on colour-banded parents and their young). The available evidence suggests that juvenile Hooded Plovers are generally either aggressively evicted from the natal territory by their parents before a subsequent breeding attempt is initiated, or if the end of the breeding season is approaching, the juveniles may be tolerated by their parents and join flocks without being aggressively evicted (Weston 2000, 2003). Here we report an instance when a juvenile remained on territory while its parents layed and began incubating a subsequent clutch.

OBSERVATIONS

The data presented here were collected as part of a program of intense management of one breeding territory at the Inverloch surf beach (38°35'53"S, 145°42'35"E), southern Victoria, Australia (Whitelaw and Whitelaw 2004). At this site, some wardening occurred and the pair's breeding territory has been fenced for every breeding season since 2000/2001 (for a description of the management at the site see Whitelaw and Whitelaw 2004). One of the two breeding adults at this site was colour banded as part of a broader study (Weston 2000).

During the 2003/2004 breeding season daily checking of the breeding area commenced on 7 September 2003. A nest was discovered on 18 October 2003; daily checking revealed that two chicks were present on 14 November 2003 (one egg had disappeared on or before 29 October). On 17 December the single surviving juvenile was noted flying along the beach with the two adults, including one individually colour-marked adult, and all returned to the fenced breeding area. Daily checks up to and including 31 December indicated that the two adults and the juvenile remained within the territory.

On 24 December the adults were seen copulating and digging false nest scrapes. However, during daily checks until and including 3 January 2004, no subsequent copulating or scrape-making was observed. On 3 January 2004, aggression from one adult towards the juvenile was noted. Several charges at the juvenile were made, although the juvenile remained in the area. On 4 January, no aggression was noted, but an adult appeared to be sitting on eggs (only 18 days after the juvenile was first noted flying). This was confirmed the following day when two eggs were discovered. No aggression was noted and the juvenile was in close proximity to the non-incubating parent. The juvenile could not be located on a territory check carried out on 6 January 2004. The second breeding attempt was also successful, with one egg hatched on 29 January, and one juvenile fledging on 28 February. The sequence of these observations is shown in Figure 1.

Given that second eggs in a clutch are laid no more than two days after the first egg (Weston 2000), the juvenile remained on territory for at least two, and probably at least three, days after the first egg of the subsequent clutch was laid. The reported durations of incubation (27-31 days; Marchant and Higgins 1993, Weston 2000) suggest that the first egg in the subsequent nest was laid between 29 December 2003 and 2 January 2004. If these dates are correct, then the juvenile remained on-territory between four and eight days after the first egg was laid respectively.

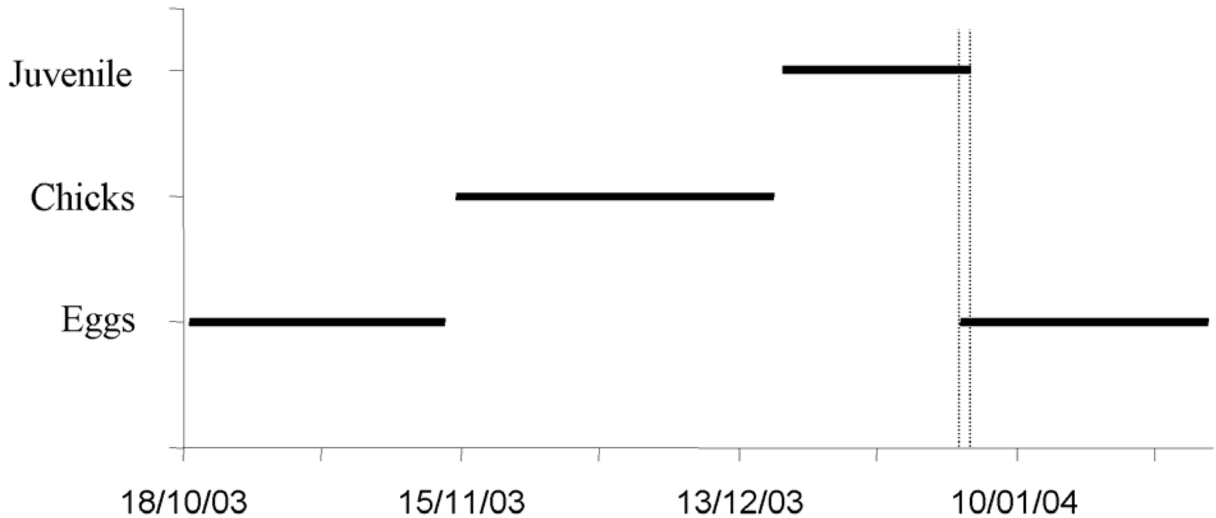

Figure 1. Visual representation of the sequence of events at the Inverloch Hooded Plover territory between 18 October 2003 and 29 January 2004. The solid lines indicate the presence of eggs, chicks and the juvenile. The dashed lines show the minimum overlap between occupation of the territory by the juvenile and the presence of eggs in a subsequent nest.

DISCUSSION

We know of no published reports of Hooded Plover juveniles remaining on their natal territory while their parents have laid another clutch. During the course of preparing this paper, we learned of two unpublished reports at Mornington Peninsula National Park, Victoria, where juveniles apparently remained in their natal territory while their parents re-nested (at Gunnamatta Beach in 1998 and at Franklin Road, Portsea, in 1997/1998; B. Dowling, Parks Victoria, pers. comm.).

Delayed juvenile dispersion – help or hindrance?

Delayed juvenile dispersion from a natal territory could either benefit, represent no significant benefit or cost, or represent a cost to the resident breeding adults (for example, see Komdeur 1994).

Co-operative breeding often involves young remaining with older birds to breed together (e.g., Bednarz and Ligon 1988). Benefits to the breeding adults would presumably be those realised by cooperatively breeding bird species, although assistance with feeding chicks (e.g., du Plessis 1994) is obviously not relevant for species with nidifugous young such as the Hooded Plover. Benefits of delayed dispersion might include improved defence, vigilance, incubation or brood-rearing (e.g., Innes and Johnston 1996, Komdeur 1994, McGowan and Woolfenden 1990). For example, Killdeer *Charadrius vociferous* sometimes lay multiple broods per year and it is not uncommon for early chicks to remain on territory and give distraction displays while their parents incubate (L. Oring, pers. comm.). Despite extensive studies, no instances of extra-pair involvement in defence, vigilance, incubation, or brood-rearing in the Hooded Plover are known to us. The short delay in departure of the juvenile reported here, the rarity of delayed dispersion, and the aggression exhibited by parents towards the juvenile, suggests few or no benefits to adult Hooded Plovers of retaining young on the breeding territory.

Potential costs to the adults of retaining young on territory centre around energetic stress and food depletion, and increased detectability of the territory and its inhabitants to predators (see Komdeur 1994). Average adult mass is lowest during the chick-rearing phase in Hooded Plovers suggesting this is a particularly energetically stressful period (Weston 2000). The retention of young on territory may extend this period of energetic stress among resident breeding adults, and so may interfere with egg-laying in subsequent nests (an energetically demanding time for females).

The risk of predation may be positively or negatively affected by the number of birds on a territory. More birds on a territory may attract predators and/or compromise the camouflage of nests. We know of an observation of a juvenile from a flock closely approaching an unattended but active nest (MAW pers. obs.). This approach could conceivably have compromised the camouflage of the nest. Alternatively, cooperative predator defence, such as that mentioned in the Killdeer example above, or improved vigilance, may reduce the risk of predation.

Juveniles might remain on territory when suitable habitat into which dispersion can occur is not available (e.g., Curry 1989, Walters *et al.* 1992). However, in the case reported here, many potentially suitable beaches existed nearby. At least some of these beaches were unoccupied by other Hooded Plovers (pers. obs.). Thus, this explanation seems unlikely in this case.

In the case reported here, the implications of delayed dispersion from the natal territory are unknown, although the breeding pair successfully fledged young from the subsequent nest despite the delayed departure of the juvenile from the territory. This suggests that any burden on the parents from the late departure of the juvenile was not insurmountable; indeed it could have been insignificant.

Management intervention

It should be noted that this pair was subject to intensive management that may have altered the course of normal reproduction (the other two pairs with delayed dispersal from Mornington Peninsula National Park were also subject to intense management; see Dowling and Weston 1999). In the 2003/2004 season the management of the Inverloch pair had been more intense than in previous seasons. This management involved manually moving the eggs to a safer position (twice), rescuing one chick by carrying it up the beach nearer its parents, the construction of a double fence around the breeding area, and intense community involvement and participation. It is possible that such intense management altered the normal course of events with regard to dispersal of the juvenile. Only a study of many pairs where management is less intrusive will be able to establish whether management alters aspects of breeding biology such as the timing of juvenile dispersal, or even whether such late dispersal is unusual or problematic.

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NORTHWARD SHOREBIRD MIGRATION SURVEYS IN 2005 AT FOUR NEW YELLOW SEA SITES IN JIANGSU AND LIAONING PROVINCES

MARK BARTER[1], KEN GOSBELL[2], LEI CAO[3] AND QIANG XU[4]

[1] 21 Chivalry Avenue, Glen Waverley, Vic 3150, Australia markbarter@optusnet.com.au; [2] 17 Banksia Court, Heathmont, Vic 3135, Australia; [3] School of Life Sciences, University of Science and Technology of China, 96 Jinzhai Road, Hefei 230026, Anhui Province, China; [4] Wetlands International - China, Grand Forest Hotel, 19A Bei Sanhuan Zhonglu Road, Beijing 100029, China

Shorebird surveys were conducted in late-April and early May focussing on four previously unsurveyed regions of intertidal areas, near-coastal salt works, and aquaculture ponds in southern Jiangsu and Liaoning. A total of 64,368 shorebirds was counted in southern Jiangsu, and 87,370 in Liaoning. The principal species in Jiangsu were Dunlin, Bar-tailed Godwit and Grey Plover, and in Liaoning were Bar-tailed Godwit, Whimbrel, Eurasian Curlew, Eastern Curlew, Great Knot and Dunlin, where the great majority of shorebirds occurred in the region closest to Yalu Jiang NNR. The main species present in salt works in north-eastern Liaodong Wan (i.e. Black-tailed Godwit, Spotted Redshank, Marsh Sandpiper and Curlew Sandpiper) were typical of those found in this habitat in the Yellow Sea region. Levels of human disturbance were extremely high, with those in southern Jiangsu being the highest seen yet during Yellow Sea shorebird surveys. Significant, and ongoing, reclamation of intertidal areas has occurred in recent years in both Jiangsu and Liaoning, with activity being particularly high in southern Jiangsu and west of Pulandian.

INTRODUCTION

Northward migration surveys have been conducted around the Chinese portion of the Yellow Sea since 1996 as part of a China-Australia cooperative programme of shorebird studies (Barter 2002; Barter *et al* 2003; Barter & Riegen 2004; Barter & Xu 2004). This paper describes the results of the most recent surveys of four new areas and includes information on the regions surveyed, survey methods used and conditions encountered.

METHODS

The shorebird surveys focused on the intertidal areas, near-coastal salt works, and aquaculture ponds in four regions located in southern Jiangsu, around the south and west coasts of the Dalian Peninsula, and in north-eastern Liaodong Wan (Figure 1).

Survey areas, counting techniques and coverage

Southern Jiangsu

The survey took place from 20-26 April along 170 km of coastline between the northern arm of the Yangtze River and the southern boundary of Yancheng National Nature Reserve. Access to the intertidal areas was generally good with a continuous sea wall along most of the coastline. Counts were made at 43 separate sites, with the aim of accessing the intertidal areas at about every 3-4 km along the coast. Most counting took place during the morning, with a cycle of rising tide heights culminating in a spring tide on 24 April at 11:30 am. Counts were mostly completed as birds collected on the mudflats as the tide rose. Weather was excellent throughout the survey period, with no rain and generally good visibility. Mudflats varied in width and were generally from 1-3 km wide. About 15 km of coastline in the southern part was sandy and had few shorebirds. It is estimated that in excess of 80% of the coastline was adequately surveyed.

Liaoning

Three areas were surveyed:

- 150 km of coastline, with large bays, along the south coast of the Dalian Peninsula to the west of the Yalu Jiang National Nature Reserve (NNR), from 29 April to 1 May, and on 7 and 11 May;
- 100 km of coastline and salt works on the Dalian Peninsula, to the west of Pulandian, on 2 May;
- 30 km of coastline in north-eastern Liaodong Wan on 4 to 5 May;
- the Erdao Salt Works in north-eastern Liaodong Wan on 3 and 5 May.

The southern coastline of the Dalian Peninsula consists of large bays normally separated by rocky headlands. Access to the coast was often time consuming and perhaps 60% of the intertidal areas and saltworks was covered. The counting problem was mitigated to some extent by the opportunity to view the mudflats from high points. Counts were made from 15 sites, mostly on a rising tide in the late morning and early afternoon. Due to accessibility problems we counted the extreme eastern part of the survey area (adjacent to Yalu Jiang NNR) on 7 and 11 May. The weather was generally good, but counting was seriously affected in Section B due to poor visibility. Mudflat widths were wider close to Yalu Jiang NNR (up to about 4 km) but much less in the western part (perhaps 2 km).

The survey of the region to the west of Pulandian, which consisted mainly of very extensive saltworks and aquaculture ponds, was mostly conducted from high vantage points. Counts were made from 11 sites, access was excellent, and the weather and visibility were good.

The coastline in north-eastern Liaodong Wan was surveyed from six sites to the west of the Liao He estuary and two to the east in front of the Erdao Salt Works. Access to the coast east of the Liao He was time consuming and we had to make long detours to reach the count positions. Time

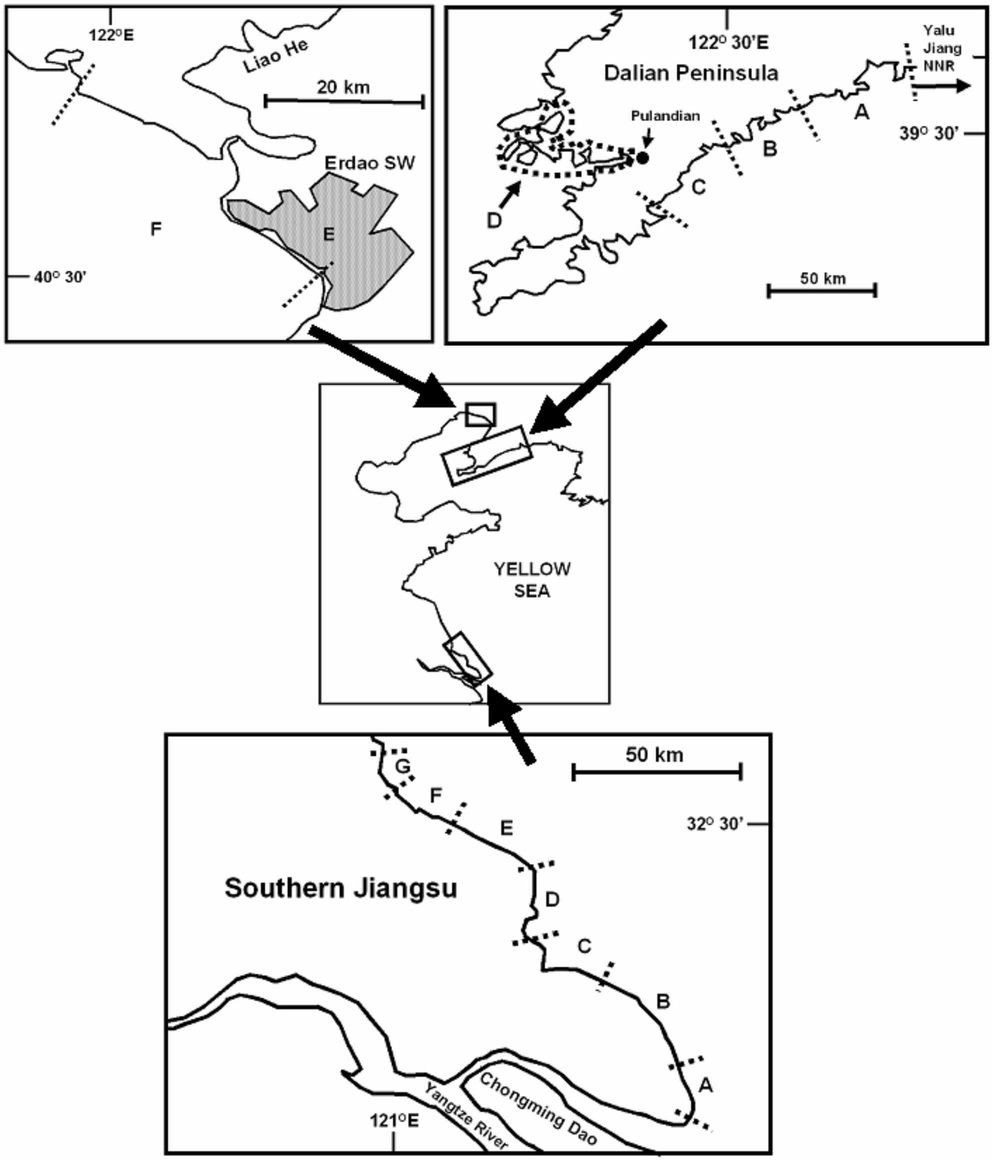

Figure 1. The locations of the three regions surveyed in 2004, with details of the count sites within each region.

limitations reduced coverage and it is estimated that about 80% of the intertidal areas in this area was covered. Only about 20% of the intertidal area in front of Erdao Salt Works was surveyed. Counts were conducted mostly on the incoming tide. Mud flat widths were about 3 km. The weather was mixed, being excellent on the first day but deteriorating to rain in the afternoon on the second day. The Erdao Salt Works was surveyed by driving along roads between the ponds; perhaps 50% of the potentially important shorebird habitat was covered. The weather was generally good.

Identification of internationally important concentrations

The 1% criterion from *Guidelines for the Nomination of Sites for the Shorebird Site Network* (Wetlands International 2003) was used to determine if a species was present in internationally important numbers.

RESULTS

Southern Jiangsu

A total of 64,368 shorebirds of 33 species was counted (Table 1). The dominant species were Dunlin, Bar-tailed Godwit and Grey Plover, which had a combined count amounting to almost 80% of the total count. Internationally important numbers of Bar-tailed Godwit, Whimbrel, Eastern Curlew, Terek Sandpiper, Red-necked Stint, Dunlin and Grey Plover were present. One Spoon-billed Sandpiper was recorded.

Table 1. The numbers of shorebirds counted in south Jiangsu from 20-26 April 2005. See Figure 1 for locations of Sections A – G. "Percentage of identified" is the species count as a percentage of the total number of birds identified.

	SECTION									
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**MISC.**	**TOTAL**	**Percentage of identified**
Snipe sp.								16	16	<0.1
Black-tailed Godwit *Limosa limosa*	4			1					5	<0.1
Bar-tailed Godwit *Limosa lapponica*	534	1 036	1 864	1 347	7 555	1 000	1		13 337	25.9
Whimbrel *Numenius phaeopus*	63	128	270	1 125	13	24	206		1 829	3.6
Eurasian Curlew *Numenius arquata*	1	5	1	20					27	<0.1
Eastern Curlew *Numenius madagascariensis*	38	50	13	500	6				607	1.2
Curlew sp.	95		8	2	19				124	0.2
Spotted Redshank *Tringa erythropus*	20	3	1	31					55	0.1
Common Redshank *Tringa totanus*	50	13	2	6		4	3		78	0.2
Marsh Sandpiper *Tringa stagnatilis*	4	2	2			19	3	6	36	<0.1
Common Greenshank *Tringa nebularia*	39	18	19	30	3	18	4		131	0.3
Wood Sandpiper *Tringa glareola*								24	24	<0.1
Terek Sandpiper *Xenus cinereus*	23	10	84	389	240	48			794	1.5
Common Sandpiper *Actites hypoleucos*	4				3			1	8	<0.1
Ruddy Turnstone *Arenaria interpres*		37	11	61	22				131	0.3
Asian Dowitcher *Limnodromus semipalmatus*						1			1	<0.1
Great Knot *Calidris tenuirostris*	400	343	1 035	8	14				1 800	3.5
Red Knot *Calidris canutus*		5		6					11	<0.1
Sanderling *Calidris alba*					2				2	<0.1
Red-necked Stint *Calidris ruficollis*		211	31		1 215	2 001			3 458	6.7
Long-toed Stint *Calidris subminuta*			1				2	6	9	<0.1
Sharp-tailed Sandpiper *Calidris acuminata*	3	1	1	1			60	39	105	0.2
Dunlin *Calidris alpina*	446	4 591	4 760	2 092	6 860	2 000			20 749	40.3
Curlew Sandpiper *Calidris ferruginea*	3	2						1	5	<0.1
Spoon-billed Sandpiper *Eurynorhynchus pygmaeus*					1				1	<0.1
Eurasian Oystercatcher *Haematopus ostralegus*					1	1	6		8	<0.1
Black-winged Stilt *Himantopus himantopus*	3	35				2		12	52	0.1
Pied Avocet *Recurvirostra avosetta*						5			5	<0.1
Grey-headed Lapwing *Vanellus cinereus*							5		5	<0.1
Pacific Golden Plover *Pluvialis fulva*	10	1							11	<0.1
Grey Plover *Pluvialis squatarola*	823	1 694	172	470	235	3 600	7		7 001	13.6
Kentish Plover *Charadrius alexandrinus*	20	32		7	10		1		70	0.1
Lesser Sand Plover *Charadrius mongolus*	2	7	9	47	145				210	0.4
Greater Sand Plover *Charadrius leschenaultii*	4	5	1	17	27				54	0.1
Sand Plover sp.	3		2	130		300			435	0.8
Unidentified shorebirds	1 033	3 601	4 020	1 530	1 450	1 200	340		12 854	
TOTALS	3 625	11 830	12 307	7 820	17 821	10 223	638	104	64 368	

Liaoning

South coast of Dalian Peninsula

A total of 64,310 shorebirds of 22 species was counted along the south coast (Table 2 – Sections A, B & C). The major species were Bar-tailed Godwit, Whimbrel, Eurasian Curlew, Eastern Curlew, Great Knot and Dunlin. The great majority of shorebirds occurred in the region closest to Yalu Jiang NNR; further to the west numbers declined significantly.

West of Pulandian

Few shorebirds (Table 2 – Section D) were encountered in the extensive region of salt works to the west of Pulandian.

North-eastern Liaodong Wan

A total of 4,182 shorebirds of 21 species were counted within the Erdao Salt Works (Table 2 – Section E) and 16,795 shorebirds of 21 species were counted along the coastline (Table 2 – Section F). The major species present in the salt works were Black-tailed Godwit, Spotted Redshank, Marsh Sandpiper and Curlew Sandpiper. The most numerous species counted on the coast were Great Knot and Dunlin which, in total, amounted to 82% of the total count. Internationally important numbers of Marsh Sandpiper were counted in the salt works and of Great Knot on the coast. One Spoon-billed Sandpiper was seen in the salt works.

DISCUSSION

The great importance for shorebirds of the intertidal areas lying to the west of the Yalu Jiang is evident from the maximum counts of 166,471 birds within the Yalu Jiang NNR, in late-April 2004, and the count in this survey of 60,231 birds over the 80 km immediately to the west of the Reserve. The species composition encountered in this survey was very similar to that encountered at Yalu Jiang (Barter and Riegen 2004) demonstrating that this stretch of coastline is of particular importance for Bar-Tailed Godwit, Whimbrel, Eurasian Curlew, Eastern Curlew, Great Knot and Dunlin.

The survey of the North-eastern Liaodong Wan coast confirmed the importance of this region for Great Knot and Dunlin as was shown in earlier counts of Shuangtaizehekou NNR in late-April and mid-May (Barter et al. 2000). The species present in the adjacent salt works were typical of those found in this habitat in the Yellow Sea region.

Despite the very large area of salt works to the west of Pulandian, very few birds were present. Interestingly, there was little human activity on the intertidal areas indicating that they probably had generally low benthic fauna productivity.

Levels of human disturbance were extremely high, with numerous activities being conducted on the mudflats, including shellfish harvesting, fishing and mariculture. Disturbance levels in southern Jiangsu were the highest seen yet during Yellow Sea shorebird surveys. The intertidal areas were covered with many lines of nets, especially in the northern part of the survey area. Significant, and ongoing, reclamation of intertidal areas has occurred in recent years in both Jiangsu and Liaoning, involving extension of the sea wall further out onto the mudflats, building mariculture and aquaculture ponds on the intertidal areas, and closing off estuaries. Reclamation activity was particularly high in southern Jiangsu and west of Pulandian.

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Table 2. The numbers of shorebirds counted in Liaoning from 29 April-5 May, and on 7 and 12 May 2005. See Figure 1 for locations of Sections A – F. "Percentage of identified" is the species count as a percentage of the total number of birds identified.

	SECTION							
Species	**A**	**B**	**C**	**D**	**E**	**F**	**TOTAL**	**Percentage of identified**
Snipe sp.				1		5	6	<0.1
Black-tailed Godwit *Limosa limosa*				2	223		225	0.3
Bar-tailed Godwit *Limosa lapponica*	7 700	2 890	2 195	45		534	13 364	17.7
Whimbrel *Numenius phaeopus*	2 658	219	121	132	2	159	3 291	4.4
Eurasian Curlew *Numenius arquata*	3 600	1		40		13	3 654	4.8
Eastern Curlew *Numenius madagascariensis*	940	141	150	55		158	1 444	1.9
Curlew sp.	500	300	160			206	1 166	1.5
Spotted Redshank *Tringa erythropus*		21	2	14	355		392	0.5
Common Redshank *Tringa totanus*	3	1			25	23	52	<0.1
Marsh Sandpiper *Tringa stagnatilis*		15		6	1 310	10	1341	1.8
Common Greenshank *Tringa nebularia*	14	81	1	120	43	29	288	0.4
Wood Sandpiper *Tringa glareola*	1			5	97	33	136	0.2
Terek Sandpiper *Xenus cinereus*	2	11			9	4	26	<0.1
Ruddy Turnstone *Arenaria interpres*	101	1			47		149	0.2
Great Knot *Calidris tenuirostris*	15 300	131				7 330	22 761	30.1
Red Knot *Calidris canutus*	1	1			20	260	282	0.4
Sanderling *Calidris alba*					64		64	<0.1
Red-necked Stint *Calidris ruficollis*	25	1 614			183		1 822	2.4
Temminck's Stint *Calidris temminckii*						1	1	<0.1
Sharp-tailed Sandpiper *Calidris acuminata*		12			106	20	138	0.2
Dunlin *Calidris alpina*	14 650	3 422	50		504	2 885	21 511	28.5
Curlew Sandpiper *Calidris ferruginea*					505		505	0.7
Spoon-billed Sandpiper *Eurynorhynchus pygmaeus*					1		1	<0.1
Broad-billed Sandpiper *Limicola falcinellus*					1		1	<0.1
Eurasian Oystercatcher *Haematopus ostralegus*	75	3				70	148	0.2
Black-winged Stilt *Himantopus himantopus*				3		42	45	<0.1
Pied Avocet *Recurvirostra avosetta*					1	3	4	<0.1
Little Ringed Plover *Charadrius dubius*		5					5	<0.1
Grey Plover *Pluvialis squatarola*	882	81	40	80	2	471	1 556	2.1
Kentish Plover *Charadrius alexandrinus*	50	13		732	64	60	919	1.2
Lesser Sand Plover *Charadrius mongolus*	90	1			24	127	242	0.3
Greater Sand Plover *Charadrius leschenaultii*	10						10	<0.1
Unidentified shorebirds	2 350	2 315	1 360	848	596	4 352	11 821	
TOTALS	48 952	11 279	4 079	2 083	4 182	16 795	87 370	

MECHANISMS BY WHICH JUVENILE BAR-TAILED GODWITS FORM SUBGROUPS

PHIL F. BATTLEY

Department of Mathematics and Statistics, University of Otago, PO Box 56, Dunedin, New Zealand.
philbattley@quicksilver.net.nz

The degree to which juvenile waders congregate, either in distinct flocks or in subgroups within flocks, is pertinent to the accuracy of productivity estimates (e.g. K. Rogers *et al*. 2005). While the potential for flocks to contain non-randomly distributed birds is not a new topic for discussion (e.g. Weston 1992), observations on how (or even whether) birds actually do 'bunch' in age-classes have been few (Harrington 2004, D. Rogers *et al*. 2005). The lack of detailed information on flocking behaviour may be due to difficulties distinguishing juveniles from adults in the field. Juvenile Bar-tailed Godwits (*Limosa lapponica*) are, however, readily identified in the field due to their distinctive plumage, and recent observations have shown clearly how juveniles can congregate within mixed-age roosting flocks.

On 8 September 2004, Martin Green (University of Lund, Sweden) and I were observing Bar-tailed Godwits at a high-tide roost near the Opagyarak River, on the Yukon-Kuskokwim Delta, Alaska, U.S.A. (60°05'N, 165°30'W). Initially, 80 birds (from an earlier flock of 101) were preening and roosting on the tidal flats in a flock that contained some juveniles. When this flock flew, only 35 birds landed close to us, of which 34 were juvenile. About half an hour later these birds were joined by a large flock that had flown in from several kilometres away. Counts showed that only 46 of the 2,410 birds were juveniles (so the age breakdown of the second flock was a maximum of 12 juveniles to 2,318 adults).

The newly formed flock was flighty, regularly lifting off and circling around, with waves of birds dropping out and settling back onto the sand flat. Almost every time this happened, the juveniles were the first birds to resettle, and they often had their bills tucked into their feathers in a sleeping pose before the second wave of birds had even landed. Successive waves of birds did not start to settle until they flew over the first birds in the flock, with the net result that most of the juveniles were grouped together at the rear end of the flock.

In the Firth of Thames, New Zealand (37°11'S, 175°19'E), I have seen birds distributed in a similar way. For example, on 29 October 2004, godwits flew into a northerly breeze to land on a shallow pond adjacent to the mudflats to roost. Of the 173 juveniles, most were at the southern end of the flock, having been apparently the first to land.

It is also clear in October/November (when juveniles are most obvious) in the Firth of Thames, that if some godwits are still feeding as the tide-line approaches the shore (while the majority is pre-roosting on the flats), the feeding group will contain a disproportionate number of juveniles. On 14 October 2004, at least 84 juveniles were present in a flock of over 2,000 birds; 40 of these were feeding together as the tide came in.

On a larger scale, it is clear that juveniles may not be randomly distributed between feeding or roosting sites. In Alaska, a sandbar only about 10 km from the Opagyarak roost held 870 godwits at high tide on 5 September 2004. Of 738 birds formally scanned for an age ratio, 606, or 82.1%, were juvenile; the corresponding figure for the Opagyarak roost was 1.95%.

These observations illustrate two mechanisms which can lead to a non-random distribution of juveniles in roosting flocks: the settling before adults of juveniles at a roost and a tendency for juveniles to make up a disproportionate part of 'late-feeding' birds and presumably later to group together within a roosting flock. The mechanisms have been observed in Bar-tailed Godwits and presumably also occur in other species of wader. Only in species such as the Bar-tailed Godwit in which juveniles are readily distinguishable can the mechanisms be observed. Why juveniles distribute themselves non-randomly over larger scales is a much larger research question, but the fact that they do stresses the importance of sampling widely when assessing age ratios, either by cannon-net catches or visual sampling.

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AN INITIAL ASSESSMENT OF THE MIGRATORY WADER COMMUNITY FOUND ON BATAM ISLAND, RIAU ARCHIPELAGO, WESTERN INDONESIA

ANDREW C. CROSSLAND[1] AND SULE ARIESTOND SINAMBELA[2]

[1]34 Chichester Street, Woolston, Christchurch 8006, New Zealand. Andrew.Crossland@ccc.govt.nz; [2]Jalan Mual Nauli IV, No.16 Siopat Suhu, Pemantang Siantar, Sumatera Utara 21115, Indonesia

INTRODUCTION

The 13,600 islands of Indonesia comprise the world's largest archipelago and form a 5,000 km wide barrier between South East Asia and Australasia. Although vast numbers of migratory waders are assumed to overfly or transit through Indonesia on migration (Lane 1987), many thousands more spend the northern winter on the archipelago's shores (Silvius 1988; Verheught *et al*. 1993; McKinnon & Phillips 1993; Strange 2001). To date only a relatively small length of coastline has been surveyed by ornithologists and much further work is needed before a comprehensive account of the true size and distribution of wader populations in Indonesia can emerge. In this paper we attempt to plug a small gap by providing an initial assessment of the migratory wader community found on Batam Island (1º15'N, 103º55'E) in western Indonesia.

STUDY AREA AND METHODS

Batam (466 sq km) is the second largest island in the Riau Archipelago located near the eastern entrance to the Straits of Malacca between the Malay Peninsula and Sumatra. Up until the late 1970s the island was largely undeveloped and sparsely populated with small fishing communities dotted around the coastline and minimal settlement in the heavily forested interior. However, since the 1980s Batam has undergone rapid economic growth with industrial, urban and tourist developments springing up all over the island. Substantial immigration of workers from other parts of Indonesia saw the island's population increase from 2,000 residents in 1968 to over 600,000 today. Consequently, much of the island has now been cleared of forest and a substantial part of the coastline is characterised by remnant pockets of mangroves and inter-tidal mudflats interspersed between port facilities, industrial sites, new town development, and clusters of holiday resorts.

Despite close proximity to Singapore and its relatively large birdwatcher community, we have been unable to find reference to any previous dedicated research on waders or coastal birds on Batam. The most comprehensive account of the island's avifauna was provided by Rajathurai (1996), who published an annotated checklist to the birds of Batam and other islands in the Riau Archipelago. His paper drew on his own observations, findings of field surveys carried out by the Nature Society (Singapore) in 1989 and 1991, and a review of recent records by birdwatchers and the earlier published work of pioneer ornithologists K.W. Dammerman (1926) and C.A. Gibson-Hill (1952).

Rajathurai (1996) increased the recorded avifauna for Batam from 64 to 119 bird species, including five migratory waders reported during the 1980s and 1990s - Whimbrel (*Numenius phaeopus)*, Common Sandpiper (*Actitis hypoleucos*), Grey Plover (*Pluvialis squatarola*), Pacific Golden Plover (*Pluvialis fulva)* and Greater Sand Plover (*Charadrius leschenaultii*). In addition, he included Little Ringed Plover (*Charadrius dubius*) on the strength of a record by Gibson-Hill (1952), and cited a very old record of Pintail Snipe (*Gallinago stenura*) by Dammerman (1926, after Schot 1882) but added a cautionary note that the validity of this record had been questioned by Gibson-Hill (1952).

Gan & Ramakrishnan (2005) gave an account of birdlife at an important coastal wetland in Singapore and speculated that the wader species present there might provide a clue as to what species are likely to occur on the hundreds of ornithologically unexplored islands in nearby. Certainly, the list of seven migratory waders recorded from Batam as listed by Rajathurai (1996) is depauperate compared to that of nearby Singapore (30+ species), an island of approximately similar size but with much less extensive inter-tidal habitat (Lim & Gardner 1997). To obtain more comprehensive information on the status of waders on Batam we made visits to one site on the north coast in December 2001, and to three sites on the north and west coasts in September 2002.

The sample sites were the head of Teluk Senimba (Senimba Bay), a mangrove-lined embayment with mudflats exposed around the margins at low tide; Tanjung Riau (Cape Riau), a mangrove-lined stretch of shoreline with marginal mudflats and mud banks; and Sungai Jodoh (Jodoh River Estuary), a small tidal estuary with inter-tidal mudflats, cut-over mangrove remnants and largely urbanised margins. Each site was fully covered on foot or by canoe by two observers, each with 10x50 binoculars. All waders and coastal birds present were identified to species and included in the count. Wader totals are given in Table 1.

RESULTS AND DISCUSSION

Although overall bird numbers were small, we found a total of 10 migratory wader species at the 3 sampled sites including 5 new species records for Batam Island – Common Greenshank (*Tringa nebularia*), Common Redshank (*Tringa totanus*), Terek Sandpiper, (*Xenus cinereus*), Curlew Sandpiper (*Calidris ferruginea*) and Lesser Sand Plover (*Charadrius mongolus*).

The most abundant wader recorded was Pacific Golden Plover, comprising 43% of all birds counted between the 3 sites on 6 September 2002. This species is probably a common migratory wader throughout Batam and the Riau Archipelago, reflecting its abundance in nearby Singapore where congregations of up to 1,000 birds occur (Gan &

Table 1. Wader counts at 3 coastal sites on Batam Island, Indonesia

Species	Head of Tk. Senimba	Tg. Riau	Sg. Jodoh	Sg. Jodoh
	6-Sep-02	6-Sep-02	28-Dec-01	6-Sep-02
Whimbrel	-	1	13	-
Common Greenshank	4	1	-	2
Common Redshank	-	2	12	6
Terek Sandpiper	-	4	-	-
Common Sandpiper	4	3	31	41
Curlew Sandpiper	-	2	-	-
Grey Plover	-	1	-	-
Pacific Golden Plover	8	74	-	28
Lesser Sand Plover	-	38	4	34
Little Ringed Plover	-	2	8	-
Total	16	128	68	111

Ramakrishnan 2005). The absence of Pacific Golden Plover at Sungai Jodoh in December but their presence there as well as at the other two sites in September may indicate a similar pattern of seasonal abundance to that observed in Singapore - highest numbers during southward migration, lower numbers in the northern winter and during northward migration (Gan & Ramakrishnan 2005).

The next most numerous species was Lesser Sand Plover (28% of birds counted on 6 September), which again reflects the abundance of this species in Singapore (Lim & Gardener 1997; Crossland 2002; Gan & Ramakrishnan 2005), as well as on the Malay peninsula (Wells 1999), and in southern (Verheught *et al.* 1993) and eastern Sumatra (Silvius 1988, Crossland in prep.). The higher numbers of Lesser Sand Plover counted at Sungai Jodoh in September (34 birds) as compared to December (4 birds) may indicate that like Singapore and peninsular Malaysia, highest numbers occur during the southward migration period (Wells 1999; Crossland 2002; Gan & Ramakrishnan 2005).

The third, fourth and fifth ranked species were Common Sandpiper, Common Redshank and Whimbrel. All three are among the most abundant waders found in Singapore, peninsular Malaysia and mainland Sumatra (Wells 1999; Silvius 1988; Strange 2001) and they are likely to occur in good numbers elsewhere on other islands in the Riau Archipelago.

Of the five remaining species (Common Greenshank, Terek Sandpiper, Curlew Sandpiper, Grey Plover and Little Ringed Plover), all occur as relatively common migrants to nearby Singapore (Lim & Gardner 1997; Gan & Ramakrishnan 2005) and there are no surprises amongst them. Species not yet recorded on Batam, but which should be looked for as they have been observed on other islands in the Riau Archipelago, include Eurasian Curlew (*Numenius arquata*), Eastern Curlew (*Numenius madagascariensis*), Bar-tailed Godwit (*Limosa lapponica*), Ruddy Turnstone (*Arenaria interpres*) and Red-necked Stint (*Calidris ruficollis*) (Rajathurai 1996; Lim Kim Seng 1997). Several additional species are also likely to occur as they are regular migrants to Singapore. These include Swinhoe's Snipe (*Gallinago megala*), Common Snipe (*Gallinago gallinago*), Marsh Sandpiper (*Tringa stagnatilis*), Sanderling (*Calidris alba*), Temminck's Stint (*Calidris temminckii*), Long-toed Stint (*Calidris subminuta*) and Kentish Plover (*Charadrius alexandrinus*) (Lim & Gardener 1997; Wells 1999). An absence of records from the Riau Archipelago, combined with relative scarcity in Singapore, suggests that this area is outside the main wintering and passage zones for several waders that are quite numerous on the shores of mainland Sumatra. Such species include Black-tailed Godwit (*Limosa limosa*), Asian Dowitcher (*Limnodromus semipalmatus*), Great Knot (*Calidris tenuirostris*), Red Knot (*Calidris canutus*), Broad-billed Sandpiper (*Limicola falcinellus*) and Wood Sandpiper (*Tringa glareola*).

Observations from aeroplanes and a study of topographical maps indicate that considerable inter-tidal habitat exists around the shorelines of islands in the Riau Archipelago and on other island groups located between the Malay peninsula and Sumatra. Collectively these islands are likely to support many thousands of migratory waders, with concentrations likely at large sites like Bintan Bay on Bintan Island and the eastern shorelines of Singkep and Lingga islands. To date very little, if any, surveying of wader and wetland bird populations has taken place in this area. Tremendous opportunity therefore exists for Indonesian or Singapore/Malaysian-based ornithologists, as well as holidaying overseas birders, to visit ornithologically unexplored islands and to contribute useful observations of migratory waders and other birdlife.

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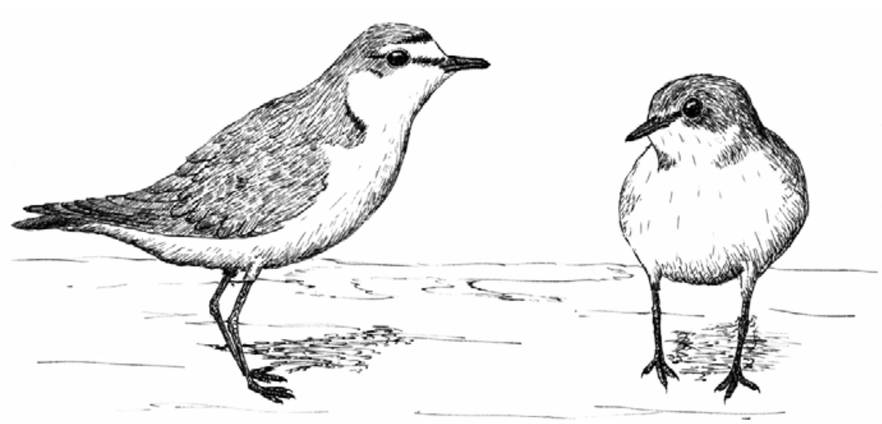

WADER AGEING SERIES. METHODS AND TERMINOLOGY

D. I. ROGERS[1,2], K.G. ROGERS[2], & C.D.T. MINTON[3]

[1]*Charles Sturt University; drogers@melbpc.org.au.* [2]*Ninks Road, St Andrews, Vic 3761, Australia.* [3]*165 Dalgetty Rd, Beaumaris, Vic. 3193, Australia*

INTRODUCTION

Wader banding studies have been a substantial part of the wader scene in Australia for the last twenty-five years and more. The value of these studies is greatly enhanced when all birds are aged accurately. A substantial body of knowledge has been built up for many species on the progression of moults and plumages and their relationship to the ages of birds. This knowledge has not been described particularly fully in the literature. Marchant & Higgins (1993) and Higgins & Davies (1996) provide valuable summaries of the plumage succession and moult strategies of all Australasian wader species, but these books are not easily taken into the field and are now out of date for some species. Prater *et al*. (1977) describe wader ageing in the northern hemisphere but no accessible guide to ageing waders in the hand is available for Australia or the East Asian-Australasian Flyway. The paper on Red-necked Stints in this issue of Stilt (Bamford *et al*. 2005) is the first of a Wader Ageing Series that we hope can be developed into the comprehensive guide that the Flyway needs.

This paper describes the general approach used to age waders in Australia, the terminology and conventions to be used in the wader ageing series, and outlines the basic structure of the ageing series papers. The paper does not go into finer details (e.g. colours of bare parts) that are helpful in ageing of a small number of species.

THE WADER YEAR

Waders that breed in the Holarctic (northern Asia and the far north of North America) are subject to strict seasonal patterns. Adults breed during a very short period in the northern hemisphere summer (usually June and July) and migrate south from mid-July through to October, with the adults usually migrating before the juveniles. They spend the boreal winter (i.e. the austral summer) on non-breeding grounds where they carry out most of their moult and pre-migratory fattening. They then migrate north, usually starting in March or April. Some species exhibit 'delayed maturity'. In this, young birds make their first northward migration at the end of their second year (when about 20-22 months old), having foregone their first opportunity at about nine months. A few species do not carry out their first northwards migration until their third or fourth year.

This paper refers generally to shorebird species that breed in the northern hemisphere and migrate to Australia. By convention in Australia, the first of August is taken as the birthday for all migratory waders, even though in practice the young of the year will have often have fledged a few weeks before this date. Similar principles of moult and ageing are also helpful in ageing southern hemisphere breeders, although the seasons are reversed. In south-eastern Australia and New Zealand, wader researches have yet not established a southern "birthday" for studying southern species with reasonably predictable annual cycles (e.g. Pied Oystercatcher, Wrybill, Double-banded Plover). We suggest that 1 January would be an appropriate date to use for these species. Note, however, that this simplification cannot be applied easily to shorebird species in which the time of breeding varies enormously from region to region (e.g. Black-winged Stilt, Red-capped Plover) and from year to year (e.g. Banded Stilt, Red-kneed Dotterel).

AGE CODES

A huge variety of different age codes are used by different researchers and banding schemes around the world. In part the variety of age codes is driven by the differing annual cycles that birds go through in different regions. Historical accident has also played a large role in the development of different codes. In this ageing series, we use the age codes required by the Australian Bird and Bat Banding Schemes (ABBBS). At present more shorebirds are banded in Australia than anywhere else in the flyway, and the ABBBS age codes are reasonably easily understood.

Age can only be measured relative to a starting point or birthday. By convention in Australia, the first of August is taken as the birthday for all migratory waders and the first of January can be taken as the birthday for many resident wader species (see above). Given a birthday, the age codes following can be applied to all birds.

Age Code J - a bird in its first year, still in the juvenile plumage in which it fledged;
Age Code 1 - a bird in its first year that has replaced some or all of its juvenile plumage;
Age Code 2 - a bird in its second year;
Age Code 3 - a bird in its third year;
… and so on.

Note that these age codes are not equivalent to 'human' age nomenclature. Trainee banders are sometimes confused by this point and hence make the mistake of assuming that (e.g.) age code 1 applies to a one year old bird. This would be incorrect; if a bird has passed its first 'human' birthday, the correct age code is 2.

The age codes can be extended by adding a '+' symbol; this signifies 'or older'. So, an Age 3+ bird is in its third year or older. "Age 3+" does NOT mean that the bird is more than three years old. Use of higher age codes is usually impossible in the field. In theory recaptures can be aged with more precision: e.g. the age code for a bird banded as a 3+ and recaptured eleven years later is 14+. However, it is best to leave this kind of age assignation to the analyst. In the field, and when entering the data, it is important to record the age assigned in the field on the basis of plumage or moult characters.

The age code "1+" – i.e. a bird in its first year or older – needs to be used carefully. A bird may be aged as 1+ if the bander is unable to age it (a circumstance most likely to occur in very large catches where it is necessary to "ring and fling"). The age code 1+ is also appropriate for a bird that looks like an adult if the age at which the species in question loses its last subadult characters is unknown. On Australian banding sheets these two meanings of "1+" can be distinguished by using the "How aged" column, with the code "U" (for unknown) indicating that the age of the bird could not be assessed.

Age codes can be inconvenient in text and birds are often referred to as first-year birds (for age codes J and 1), second-year birds (for age code 2), and adults (for age code 2+ or 3+, i.e. birds which have passed through all the identifiable young bird stages). The age at which birds can be referred to as adults is species specific.

MOULT PROGRESSION

Waders, like all birds, have to replace their plumage at regular intervals and most species replace their body plumage twice, and their flight feathers once, in the course of a year. Events such as moult are highly synchronous within migratory species. This is because such waders have a tightly scheduled annual cycle, driven by the need to be on the far northern breeding grounds in peak condition during the few weeks when conditions there will be suitable for nesting. Migration has to be carried out on a tight schedule in order to be at the breeding grounds at the right times, and this in turn constrains the time available for vital non-breeding activities. Adult migratory waders only have a few months, from their arrival in Australia to their departure, to recover from the demands of the southward migration, replace their flight feathers and then lay down fat reserves in preparation for the northward migration. Migratory waders can generally be aged to a high degree of accuracy through an understanding of age-related plumage characteristics and the timing of moult, especially the timing and pattern of primary replacement.

Plumage succession and moult strategies of migratory waders are summarised below. Plumages are described in normal print, moults in italics. In boldface we use names of moults and plumages often used in Australia. While these terms will be familiar to most readers, they are rather imprecise and in some cases not strictly accurate. Accordingly, we also give the formal plumage and moult names (in parentheses) according to the moult and plumage nomenclatural scheme of Humphrey and Parkes (1959), with the modifications suggested by Howell *et al*. (2003). This nomenclatural scheme is unambiguous, is thoroughly explained in the literature, and it enables moult workers to apply a terminology that is consistent across species.

Adults

Post-breeding moult *(Definitive prebasic moult). A moult of all body and flight feathers. Body feathers usually start to moult while staging on southwards migration, or soon after arrival at the non-breeding destination; flight feather moult typically starts after arrival at the non-breeding destination and is more prolonged, with birds moulting primaries through much of the austral summer. In a few species post-breeding moult can begin while still on the breeding grounds.*

Adult non-breeding (Definitive basic). Non-breeding body plumage is held for most of the non-breeding period – varies from species to species, but usually dull grey or brown above, pale below.

Pre-breeding moult *(Definitive prealternate moult). A partial moult, involving most or all body feathers, but not the flight feathers. Usually occurs just before beginning northwards migration; may be completed while staging on migration.*

Adult breeding (Definitive alternate). Held during nesting attempts on the breeding grounds; usually more brightly coloured than non-breeding plumages. There are a few species in which breeding and non-breeding plumages look similar (e.g. *Gallinago* snipes) but even in these species, the body plumage is replaced twice each year.

For the sake of completeness we also provide definitions of another moult and plumage, which only occurs in a few species and is not of direct ageing relevance:

Pre-supplemental *(Definitive pre-supplemental moult). A partial moult of some body feathers. Only known from staging areas while on northwards migration; involves replacement of recently grown definitive alternate feathers. Only described in three wader species so far: Ruff (Jukema and Piersma 2000), Bar-tailed Godwit (Piersma & Jukema 1993) and Great Knot (Battley et al. in press).*

Supplemental (Definitive supplemental). A third plumage, held on the breeding grounds and more brightly coloured than alternate plumage. So far only known from Ruff, Bar-tailed Godwit and Great Knot, but this plumage may have been overlooked in a few other species.

Young birds (in order of increasing age)

Juvenile (Juvenal). The plumage in which young waders fledge. Body feathers are slightly smaller than in subsequent plumages, and as all grow at the same time, they are uniform in wear, giving juveniles a characteristically neat appearance when fresh. In many wader species the patterning of juvenile plumage is similar to adult breeding on the upperparts, and to adult non-breeding on the underparts. Juvenile plumage in most species also has some distinctive attributes not seen in other plumages, but there is much variation between species.

It fades with wear, becoming superficially similar to the first non-breeding plumage.

Post-juvenile moult *(Pre-formative moult). Body moult usually occurs on the non-breeding grounds, about September to November, but may begin earlier while staging on the first southwards migration. Post-juvenile moult involves replacement of body feathers in all species, and in some, there is also some replacement of flight feathers. Primary moult strategy is very important in ageing. It varies from species to species. Some species, especially those that breed when in their first year, moult all primaries, some moult a varying number of outer primaries, some moult a varying number of inner primaries, and some do not moult primaries at all. In species with delayed maturity, moult strategies are especially varied, and often one wing will be at a somewhat different moult stage to the other.*

First non-breeding (Formative). Similar to adult non-breeding and held through the first austral summer. In many species, it can be separated from adult non-breeding because juvenile flight-feathers and some juvenile inner median coverts are retained. The pattern of these inner coverts differs from that of adults in many species, with juvenile coverts often having white or buff tips, with or without dark subterminal bands.

First pre-breeding *(Pre-alternate 1). A variable partial moult of body feathers only, occurring at about the same time as adult pre-breeding moult or, especially in species with delayed maturity, a month or two afterwards. The resultant plumage is held until about August of the second year. Although it is common practice to call this a "pre-breeding" moult, in many species this moult is not followed by a breeding attempt.*

First breeding plumage (Alternate 1). Very variable. In some species, especially those that first breed when a year old, it is similar to, or indistinguishable from, adult breeding. In many others, especially those with delayed maturity, this plumage is superficially similar to adult non-breeding plumage, though often with broader dark centres to upperparts feathers, or with traces of more brightly coloured breeding plumage. Although it is common practice to call this a "breeding" plumage, in many species this plumage is held by birds that are not attempting to breed.

Second year moult *(Pre-basic 2). A complete moult of body and flight feathers, occurring when just over a year old, taking place at the same time of year or slightly earlier than adult prebasic moult. In most species, the resultant plumage is effectively indistinguishable from that of older birds i.e. the bird has become adult.*

RECORDING PRIMARY MOULT

The method for recording primary moult is summarised below. With experience primary moult can be recorded quickly and systematically with a bird in the hand.

All waders have ten functional primaries. It is conventional to call the innermost feather (adjacent to the secondaries) primary 1, and the outermost primary 10. The opposite convention, of numbering primaries from the outside in, can result in errors in the recording of moult scores (Rogers & Rogers 1998). For correctness and consistency with other workers in the East-Asia Pacific flyway, it is best to stick to the practice of recording primary moult from the inside, working outwards. Primaries are either fully grown or growing. The (Australian) conventions for describing these feather conditions are given below and illustrated in Figure 1.

Growing feathers

These are at one of four growth stages, scored 1 to 4 (Marchant & Higgins 1993) as follows:

1. Feather missing (i.e. a gap in the feather tract) or in

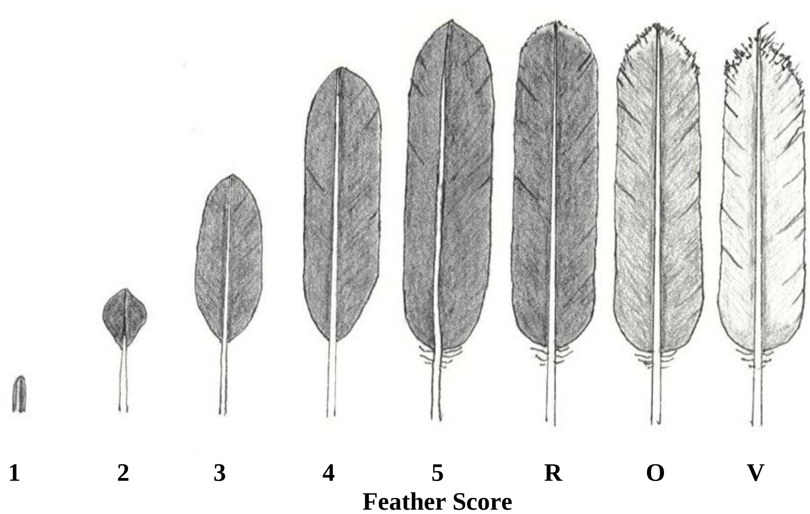

Figure 1. Stages of feather growth and feather wear. Artist: Annie Rogers.

pin (i.e. the waxy sheath surrounding the feather vane is unbroken).

2. Some of the feather vane is showing and the feather is less than one-third of its expected full grown length.
3. The feather is between one-third and two-thirds of its expected full grown length.
4. The feather is more than two-thirds of its expected full grown length and still growing (growing feathers still have blood in the shaft, and a trace of waxy sheath at the base).

Fully grown feathers

In most birds in active primary moult, there will usually only be two ages of fully grown primary, new inner primaries which are scored as "5" and old outer primaries which are scored as "O". In some cases, particularly with young birds, other feather "generations" may also be distinguishable (see Rogers 1990). The relative age of these different generations is an important clue to bird ageing. The codes used in Australian wader studies are summarised below. Further notes are then given on particular restrictions applied to ensure the data collected are unambiguous:

5 – New. New primaries of waders are dark (black in most species), with smooth black edges.

O – Old. Old primaries fade to a browner colour (especially on those regions near the tip that are exposed to direct sunlight when the wing is folded), and show abrasion at the edges and tips.

V – Very worn. In Australia it is conventional to only apply this term to primaries from juvenal birds which were not replaced in their first year. They are typically faded to brown, with feather vane much degraded and brittle, particularly at the tip which often has no feather vane, with just a the shaft (or a remaining fragment of the shaft) projecting.

R – "Replacement". Used to describe feathers with slight wear in birds at the start of their second year. These are feathers that have replaced the original juvenile primaries. They are clearly newer than the very worn retained juvenile primaries found in some young shorebirds at the same time of year, and distinctly less fresh than the newly grown feathers developing as part of the early stages of pre-basic ("post-breeding") primary moults of adults and second-year birds.

6 – Very new primaries, obviously a newer generation than other primaries in the same wing that are scored as "5".

Wear of flight feathers is a gradual process and in some individuals primaries deteriorate faster than in others. Such variations can lead to incorrect ageing if they result in feathers of the same generation being given different codes in different individuals. To avoid potential problems of this kind, Australian wader banders have adopted several additional conventions for classifying primary wear:

1. In adults, primaries are treated as making the transition from new (5) to old (O) on the breeding grounds. Accordingly, primaries of adults that have recently returned from the breeding grounds are always classified as "O", even if they do not show very strong wear.
2. Primaries (usually outer primaries) attained during the first austral summer or autumn in a post-juvenile moult are initially classified as "5". The "birthday" for these primaries is treated as 1 August; after this date, these primaries are classified as "R". This prevents analysts confusing them with the newly grown primaries of recently returned adults or second-year birds.
3. Juvenile primaries, which are fresh on arrival in Australia, are recorded as "5" until the end of November. They are treated as making the transition to old "O" on 1 December. This arbitrary date has been selected to avoid any potential confusion between the very different looking wings of juveniles (yet to begin moult) with: (a) wings of adults that have just completed primary moult (this can happen in a few individuals as early as the end of December); (b) primaries of first-year birds that have started primary moult (in a few species this can begin as early as December).
4. Worn juvenile primaries are classified as "V" if they are over a year old. The birthday on which they are regarded as making the transition from "O" to "V" occurs on 1 August. Using this convention prevents confusion with the old "O" primaries of returning adults.
5. The codes "R" and "V" are not usually used after 31 October, because by November it can be difficult to distinguish primaries of second-year birds from the primaries of moulting adults. However, the codes "R" and "V" can be used in rare cases after 31 October when the bander is very confident about the age of the feather.

Moult Formula

In the field, where large numbers of birds often have to be processed quickly, it is conventional to summarise these data with a primary moult formula, in which the primary moult is recorded from inside to outside, and the number of adjacent primaries at the same stage of growth is given as a superscript; the superscripts should add up to 10. Examples of the application of this shorthand are presented in Table 1. Further details on the recording of moult can be found in Marchant & Higgins (1993), and Ginn and Melville (1983).

WADER SEXING

Many species of wader have sexual differences in the breeding plumages, so sexing may be possible on birds before departure on northward migration or on birds newly-returned from breeding (with some retained breeding plumage) or before departure on northward migration. However, in only a few species are the plumage differences

Table 1. Examples of primary moult formulae

Primary feather score p1	p2	p3	p4	p5	p6	p7	p8	p9	p10	Primary moult formula	Examples found in Red-necked Stints
O	O	O	O	O	O	O	O	O	O	O^{10}	Newly arrived adult, Sept, yet to begin primary moult.
5	5	4	2	O	O	O	O	O	O	$5^2 4^1 2^1 O^6$	Adult, early Oct., starting primary moult.
5	5	5	5	5	5	5	5	4	1	$5^8 4^1 1^1$	Adult, Jan., in late stages of primary moult.
5	5	5	5	5	5	5	5	5	5	5^{10}	Adult, Mar., with completed primary moult.
O	O	O	O	O	O	O	O	4	1	$O^8 4^1 1^1$	First year, Feb., carrying out partial moult of outer primaries.
O	O	O	O	O	O	O	O	5	5	$O^8 5^2$	Same first year bird, May, after partial moult of outer primaries.
V	V	V	V	V	V	V	V	R	R	$V^8 R^2$	Same bird, after 1st Aug. "birthday" and thus now classified as Age 2.
5	5	5	3	1	V	V	V	R	R	$5^3 3^1 1^1 V^3 R^2$	Same bird, Sept., in early stages of second prebasic primary moult.

large enough to allow accurate sex allocation for all individuals.

Sex should only be assigned on a field sheet, or entered in the data, if sexing was based on plumage characters. In most species there is sexual size dimorphism (i.e. the sexes differ in size), so it may be possible to determine the sex from measurements. However sexing of this kind should be done by the analyst, as it is complicated by size variation between individuals, and often size overlap between the sexes. In several species, the size difference is sufficiently large to allow sex to be confidently assigned to individual birds. For these species the measurement most useful for sexing should be taken whenever possible. If possible, a second measurement should be recorded; this allows better sexing criteria to be developed (see, for example, Rogers 1995a, 1995b).

In most species there are no differences in the non-breeding plumage of males and females. Sex can, if desired, be determined genetically from blood or feather samples, but these techniques are expensive, need special training and licences, and are generally not an option for most banding teams.

CONCLUSION

The basic format of papers in this series (see Bamford *et al*. 2005 in this issue) is as follows:

1. A free-format detailed account of plumages and moults (and any other helpful ageing characters) in the identifiable age classes for the species. This will cover both flight feather and contour feather moults, and can have figures and tables where appropriate. Sexing characters should also be described, if known.
2. A one-page table, which summarises the key ageing features by time of year and age of the bird. This page, if photocopied (and laminated) would be suitable for use by banders in the field.

We would like to encourage other authors to contribute articles for this series. Ideally the moult and ageing terminology outlined in this paper should be followed, so that the series will be as standardised as possible. We also encourage authors to provide representative photographs of important plumages and moult stages.

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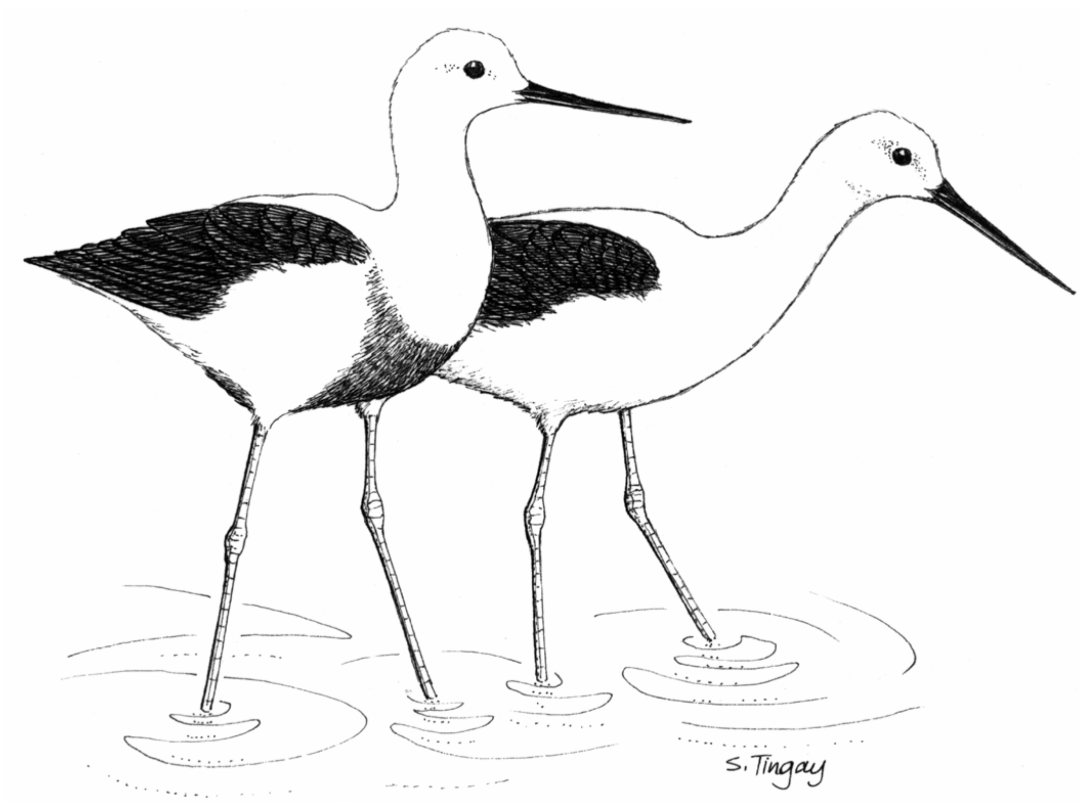


WADER AGEING SERIES NO. 1 - RED-NECKED STINT

M.J. BAMFORD[1], J. TALBOT[1], D.I. ROGERS[2,3], C.D.T. MINTON[4,] & K.G. ROGERS[3]

[1] WA Wader Study Group, c./ 23 Plover Way, Kingsley, WA, 6026, Australia; [2] Charles Sturt University; drogers@melbpc.org.au. [3]340 Nink's Rd, St Andrews, Vic. 3761, Australia. [4]165 Dalgetty Rd, Beaumaris, Vic. 3193, Australia.

INTRODUCTION

The Red-necked Stint *Calidris ruficollis* has a life-history and moult strategy that is typical of many shorebird species that spend the non-breeding season in Australia. It breeds in the Siberian tundra from the Taimyr Peninsula to the Chukotsk Peninsula and migrates to spend the non-breeding season (August to April) in Australia and other sites in the Australasian region. Young birds delay their first northward migration to near the end of their second year.

This paper describes methods for ageing Red-necked Stints in the hand. We also describe the changes in body plumage that occur over time, and give notes on ageing methods that are useful in field views. The sections on body plumage can be skipped by those readers who only need to age Red-necked Stints in banding studies; a look at the outstretched wing is all that is needed to age this species accurately in the hand. The paper is based mostly on banding studies in south-western Australia (WA Wader Study Group), Victoria (VWSG) and north-western Australia (AWSG), and on field observations made in Victoria (Rogers *et al*. 2005a). The terminology and methods applied here are described in Rogers *et al*. (2005b).

Female Red-necked Stints are slightly larger than males (Higgins & Davies 1996), but there is too much overlap in size for measurements to be of any value in assigning sex with confidence.

FIRST-YEAR BIRDS (Age Codes J or 1)

Body plumage

First-year Red-necked Stints fledge in a distinctive juvenile plumage. When fresh, the upperparts are usually boldly streaked black and cinnamon-rufous (Fig. 1), superficially resembling the upperparts of breeding adults; unlike breeding adults, they lack red markings on the throat and neck. Complete, fresh, juvenile plumage develops on the breeding grounds and is held through most or all of southwards migration; it is still very apparent in some first-year birds in Australia until early October (Fig. 2). Most first-year Red-necked Stints do not arrive in southern Australia before October.

The juvenile plumage of Red-necked Stints fades and wears over time. By about mid to late October, the fringes of the scapulars and mantle feathers have lost their cinnamon-rufous tinge, becoming narrower and greyish brown. This results in a superficial similarity to the upperparts plumage of non-breeding adults. However, the retained juvenile upperpart feathers differ from those of non-breeding adults in having broad, dusky-brown to black centres (Figs 3, 4). The juvenile plumage consists of feathers grown at the same time, so the wear of the body plumage typically appears uniform; in addition, juvenile feathers are slightly smaller than those developed in subsequent plumages. The combination of these features gives the juvenile plumage a characteristic neat appearance, readily observed through a telescope. This attribute, while subtle, can be detected reliably with experience. The same principle can be used to age many other wader species (Rogers *et al*. 2005a).

First-year Red-necked Stints begin, continue or resume post-juvenile body moult after they have arrived in Australia, moulting into a body plumage (the "first non-breeding" or "formative" plumage) that looks like that of adult non-breeding. Most Victorian birds start to moult juvenile body plumage in October, but some individuals with near-complete (though worn) juvenile body plumage can be seen well into November. Post-juvenile body moult takes a few weeks, but by early December most Victorian individuals have moulted all identifiably juvenile body feathers. Post-juvenile body moult is thought to occur slightly earlier in north-western Australia.

From about the start of December, body plumage looks nearly identical to adult non-breeding, and examination in the hand is required to age birds on primary condition (see below) and on the presence of one or more retained juvenile inner median coverts. In the austral autumn (about April), first-year birds replace much of their first non-breeding plumage. The resultant plumage (properly termed first alternate) usually looks similar to adult non-breeding. The dark centres of the upperparts feathers are slightly broader than in adult non-breeding, but this is of little practical use in ageing. A few individuals develop a little rufous plumage (at most 25%) on the face, neck, and (less commonly) upperparts in first alternate plumage, but not until April or May.

Primary condition and moult; upperwing coverts

First-year Red-necked Stints arrive in Australia with new primaries that are sooty black and sharp-edged (Fig. 6). In September, these feathers are only about 2 months old and have completed only one migratory flight from the breeding grounds. They gradually fade over the non-breeding season, becoming much paler greyish brown, especially in north-western Australia. The margins, especially of the outermost primaries, show their first traces of wear by November (especially in the tropics) and wear is quite clear by January. A few first-year Red-necked Stints undergo a partial primary moult (Figs. 8, 9), typically replacing the outermost 1-2 primaries in Victoria, the outermost 1-4 primaries in north-western Australia, the outermost 3-6 primaries in south-western Australia. In south-western Australia in the 1982/1983 season, 10 of 102 first-year birds underwent such a partial primary moult and replaced the outermost 3 to 6 feathers in both wings. In Victoria, fewer than 10% of first-year birds undergo this moult. In north-western Australia, a partial primary moult is undertaken by 81% of birds (data from 676 records between May and August). This partial primary moult tends to occur in January to April, later than the complete primary moult displayed by older birds (Fig. 10).

For experienced observers, the condition of primary wear or moult can be used reliably to pick out first year Red-necked Stints in the hand. Confirmation of the ages assigned on the basis of primary condition can be obtained by looking at the wing coverts. In fresh juvenile plumage, most of the inner upperwing coverts have buff fringes and the fringes of the innermost median coverts are more richly coloured cinnamon-rufous (Fig 1). (Note that among wader specialists, the fringes of the inner median coverts are often referred to as buff, but the colour is richer than this and the use of the word “buff” has simply become the convention.) Some juvenile inner median coverts are retained through the first austral summer, autumn, and often winter; their buff to cinnamon fringes (which are usually shielded from direct sunlight by overlying scapulars and tertials) usually remain warmly coloured throughout this period (Fig. 7). In contrast, adults lack buff fringes to these coverts.

SECOND-YEAR BIRDS (Age Code 2)

In Australia, the first day of August is designated as the “birthday” of all migrant waders from the northern hemisphere, including Red-necked Stints. A first-year bird is treated as Age category 1 on 31 July, but on the next day the same individual is treated as Age category 2. This convention helps to keep collected data tidy and unambiguous. Age 2 birds become increasingly difficult to distinguish from adults during the austral spring and can only be reliably aged from August to October.

Body Plumage

Second-year Red-necked Stints remain on the non-breeding grounds, having skipped their first opportunity for northwards migration. Most still have first alternate plumage (described above) at the time of their first “birthday” - superficially similar to adult non-breeding (definitive basic), but with slightly broader dark centres to the feathers of the upperparts, and some birds have some rufous feathering. In their second austral spring (about September, when around 14 months old) second-year Red-necked Stints begin moult into a second non-breeding plumage, identical to that of adult non-breeding and only separable (sometimes) on primary wear (see below). At the end of their second austral summer, Red-necked Stints are essentially adult; they moult into breeding plumage, cannot be distinguished from older birds and migrate northwards with them.

Primary condition and moult

Second-year birds can be recognised early in the season (August-October) on the basis of primary moult. Primaries of birds which have retained all their juvenile primaries will be very old (V). In birds which have undergone a partial primary moult the previous summer, the outermost primaries will be younger, darker and sharper-edged than the inner, older primaries (Figs 6, 7). In Australia it is conventional to classify these newer primaries as “R” (for “replaced”). This then allows analysts to distinguish them from the old (O) primaries of arriving adults and from the new (5) primaries of adults that have arrived and started primary moult.

Second-year Red-necked Stints undergo a complete primary moult at about the same time as older birds, usually beginning in September (sometimes in late August in north-western Australia) and completed in the mid or late austral summer (see notes on 3+ birds below). In practice, second-year birds become indistinguishable from 3+ birds before this primary moult is completed. In those individuals that did not replace any juvenile outer primaries in the first year, the very worn outer primaries are about 6 months older and hence noticeably more worn, than those of adults. However, the wear of the outer primaries of shorebirds seems to accelerate as the feathers get older, and in both adults and second year birds, the outer primaries of birds in active primary moult can look very untidy (Fig. 10). This often makes it difficult to distinguish the very worn primaries of second-year birds from the worn primaries of adult birds after October.

In those individuals that have replaced some juvenile outer primaries in their first year, the resultant “R” primaries are 2-4 months younger than the “O” primaries of adults and hence appear fresher. This distinction is especially obvious in Age 2 birds while they still also retain some very worn juvenile primaries – a typical example would be a second-year bird with three new primaries, a primary still growing, two very old (V) primaries and 4 replacement primaries. The moult formula of this bird would read: $5^3\ 3^1\ V^2\ R^4$. However, after the remaining two “V” primaries are shed, this individual would have a moult formula of (e.g.) $5^4 3^1 1^1 R^4$, the only distinction from adults being a rather subjective assessment that the outer primaries are fresher than those of adults.

In Victoria, detection of Age 2 birds becomes increasingly difficult in the austral spring. A few Age 2 birds, especially those that replaced some outer primaries in their first year, may be picked out through November and even into December. However this is often impossible, and retraps have shown that detection of Age 2 birds becomes unreliable after October.

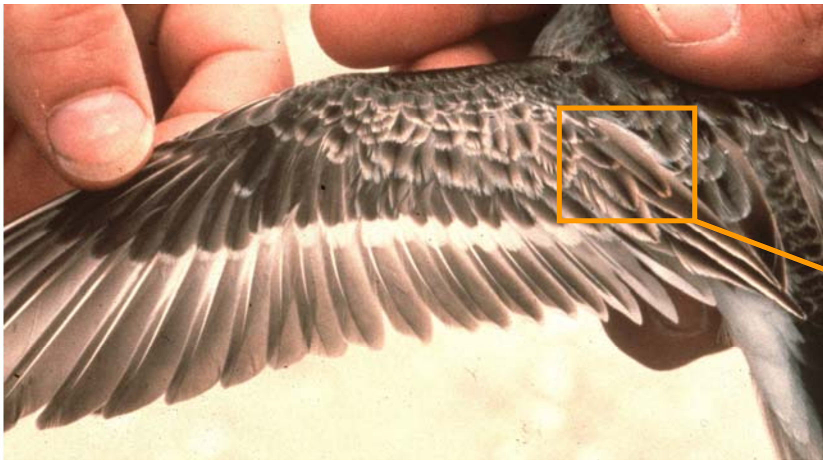
Fig. 1. Fresh juvenile Red-necked Stint. Captured on breeding grounds. Can initially be very brightly coloured on upperparts with cinnamon-rufous tips to most inner wing coverts. Photo: Weiting Lui.

Fig. 2. Fresh juvenile Red-necked Stint. Western Treatment Plant, Victoria, 3 October 2003. Rufous edges and white tips of scapulars are reduced but still visible; also note small size and dark centres of upperparts feathers. Photo: D.I. Rogers.

Fig. 3. Worn juvenile Red-necked Stint. Broome Sewage Farm, north-western Australia, November 2004. Rufous fringes of scapulars have worn away, but small size of scapulars and wing coverts is still clear, as are dark centres to scapulars. Photo: C.D.T. Minton.

Fig. 4. Adult non-breeding Red-necked Stint. Victoria, November 2004. Larger scapulars than juvenile (drooping over wing coverts) and upperparts feathers have black shaft streaks instead of dark black centres. Photo: C.D.T. Minton.

Fig. 5. Adult breeding Red-necked Stint. Roebuck Bay, north-western Australia, May 1999. This individual had apparently missed northwards migration and had developed complete, slightly worn breeding plumage. Photo: H. Gibbs.



Figs 6 and 7. Juvenile Red-necked Stint wing. Tasmania, December 1980. Primaries slightly worn; close-up shows inner median coverts. Photo: C.D.T. Minton.

Figs 8 and 9. Immature Red-necked Stint wing. Roebuck Bay, north-western Australia, May 1999. Partial primary moult completed. Close-up shows wing tip. Moult formula $O^8 5^2$. Photo: H. Gibbs.

Fig. 10. Adult Red-necked Stint wing. Tasmania, December 1980. Active primary moult. Moult formula $5^7 3^1 1^1 O^1$. Photo: C.D.T. Minton.

Fig. 11. Adult Red-necked Stint. Victoria, March. Fresh breeding plumage. Moult formula 5^{10}. Photo: C.D.T. Minton.

ADULTS (Age Code 3+ from August to October, 2+ in other months)

Body Plumage

Adult Red-necked Stints begin to moult from breeding (alternate) plumage to non-breeding (basic) plumage while on southwards migration, but may retain traces to lots of rufous on the face and chest, and sometimes some dark and rufous feathers on the upperparts when they arrive (August-September). Moult into non-breeding plumage continues or resumes on arrival in Australia and birds are in complete non-breeding plumage (Fig. 4) from about October to January. Adults moult back to breeding plumage between February and April, and it is common to see adult Red-necked Stints in March with appreciable rufous on the face, neck and upperparts (Figs 5, 11). Note that second-year birds will also develop breeding colour at this time. When fresh in the austral autumn, the rufous feathers of the face and neck have white tips. These are lost with wear during the breeding season, and the rufous regions fade a little, losing their original brick-red tinge and becoming more orange. As a result of these changes caused by wear and fading, the breeding plumage appears most brightly coloured when the birds are on the breeding grounds.

Primary condition and moult

By their third year, Red-necked Stints have settled into a moult pattern where they replace all their primaries annually, mainly within the period October to January (starting a little earlier, often in September, in north-western Australia). Before this moult is well advanced, birds can be confidently aged as 3+ because both first- and second-year birds will be distinct. However, once second-year birds progress into their first full primary moult, they become indistinguishable from older birds. The time at which this occurs varies between individuals, but many second year birds look identical to adults by November. Therefore, we recommend that the age code 3+ can only be used until the end of October, with 2+ being used subsequently.

SUMMARY TABLE

Table 1 summarises the key ageing characters, the relevant age codes, and the periods when they apply. Read across the columns to find the age mix in any period and down the columns to find how plumages change with time for an age group. (The symbol 1º is shorthand for 'primary'.)

ACKNOWLEDGEMENTS

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Table 1. Summary of plumage succession and ageing features in Red-necked Stints in the hand. The appropriate ABBBS ageing codes are given in boldface in each cell.

Period	First Year (Ages J and 1)	Second Year (Age 2)	Third Year and Older (Adults)
Aug.-Sep.	**Age J** On S migration or non-breeding areas: – Retain all juvenile primaries – Typical 1° moult: 5^{10} – Inner wing coverts (i.e. inner median and greater secondary coverts) have rufous-cinnamon or buff tips and outer edges – Body plumage: juvenile	**Age 2** In non-breeding areas: – Outer primaries either all retained from juvenile plumage and therefore very worn, or with fresher (R) outermost primaries previously attained in partial moult – Typical 1° moult: V^{10}, V^6R^4, $5^23^1V^4R^3$. – Body plumage: Non-breeding, some with remnants of very limited breeding plumage (<25%)	**Age 3+** On S migration or non-breeding areas: – Primaries all old, or starting complete primary moult – Typical 1° moults: O^{10}, $5^13^12^1O^7$ – No buff-tipped wing coverts – Body plumage: Moulting from breeding to non-breeding
Oct.-Dec.	**Age 1** In non-breeding areas: – Juvenile primaries starting to show slight wear – No active 1° moult. Primaries classified as 5^{10} before Dec, as O^{10} after Dec. 1. – Still have some "buff-tipped" inner wing coverts – Body plumage: worn juvenile moulting to non-breeding	**Age 2** In non-breeding areas: – Not reliably distinguishable from adult non-breeding (age 2+) after end of October. Most can be picked out in Oct. on 1° moult, with very worn retained juvenile outer 1°s or fresher retained feathers from partial moult of outer 1°s. – Typical 1° moults: $5^23^1V^4R^3$, $5^64^1R^3$, $5^23^1V^6$	**Age 2+ (3+ until end of October)** In non-breeding areas: – Carrying out or just about to begin a complete 1° moult – Typical 1° moults: $5^23^12^1O^6$, $5^64^1O^3$, O^{10} – No buff-tipped wing coverts – Body plumage: non-breeding
Jan.-Apr.	**Age 1** In non-breeding areas: – Retain juvenile flight feathers, now more worn than new primaries of adults; some start to replace a few outermost primaries. – Typical 1° moults: O^{10}, $O^84^1O^1$ – Still have some "buff-tipped" inner wing coverts – Body plumage: non-breeding	See Third Year and Older	**Age 2+** In non-breeding areas or starting N migration (departures start late Mar. in s. Aust to mid Apr. in NWA): – Completing or just finished primary moult – Typical 1° moults: $5^84^11^1$, 5^{10} – Body plumage: moulting from non-breeding to breeding
May-July	**Age 1** In non-breeding areas: – Typical 1° moults: O^{10}, O^75^3 – Still retain at least 1 "buff-tipped" inner wing covert – Body plumage: Non-breeding, or with traces of incomplete breeding plumage (especially on face and neck)	See Third Year and Older	**Age 2+** Completing N migration or breeding: – No active primary moult, 1°s fresh – Typical 1° moult: 5^{10} – Body plumage: Full breeding

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SHOREBIRD ABUNDANCE IN THE WESTERN PART OF CHAR BAHAUDDIN DURING NORTHWARD MIGRATION

M. SAZEDUL ISLAM[1] AND M. ANISUZZAMAN KHAN[2]

[1] *Marinelife Alliance, Sayeman Road, Baharchara, Cox's Bazar 4700: sazed_marine@yahoo.com.* [2]*Environment Department, P.O. Box. 67, Dubai, UAE.*

A comprehensive shorebird survey was conducted on 29 February 2004, almost at the end of the non-breeding season, of the western side of Char Bahauddin, an island off the central coast of Ganges Delta in Bangladesh. A total of 3,130 shorebirds of 31 species including 400 unidentified birds was recorded. The five most abundant species were Pacific Golden Plover, Black-tailed Godwit, Whimbrel, and Bar-tailed Godwit; 165 Black-headed Ibis were also counted. The count of 1,033 individuals of Pacific Golden Plover and two Spoon-billed Sandpipers were the significant findings.

INTRODUCTION

The Bangladesh coastal region can be considered to be situated at the interface of the two rings of a figure-of-eight (Rahman, 1988). The northern ring represents the Himalayas and its river system including Nepal, Bhutan, and parts of India and China. It has enormous water discharge throughout the year which reaches its peak in the monsoon season and causes regular flooding in Bangladesh. Thus the Bangladesh coastal region works as a funnel for the Himalayan water. The southern ring of this figure-of-eight is the Bay of Bengal, which again funnels into the Bangladesh coast.

The coastal area has been broadly categorized into three regions based on their physiographic characteristics (Hossain 1989) as:

– Eastern Region. Known as the 'Pacific type', the most settled of the three regions. A narrow strip with a long sandy beach interfaces with the sea on the western side and the hill forests of Cox's Bazar on the east. Only a few rivers, Karnafuli, Matamuhuri, Sangu and Naf, traverse this strip.
– Central Region. This is the most active area of the delta where the massive sediment load of the Ganges-Brahmaputra-Meghna river systems falls into the Bay of Bengal through the Meghna estuary. Land erosion and accretion is a continuous process and newly accreted land is often quickly occupied. There is a series of offshore islands formed by sediments.
– Western Region. Termed the 'Atlantic type'; many criss-crossing distributors characterize this region, which has a relatively stable landmass, covered by the largest mangrove forest in the world, the Sundarban. The offshore area, known as the Swatch of No Ground, sucks in the relatively small sediment load carried by the smaller but deeper rivers and limits erosion and accretion.

The central coast runs from the Tetulia River in the east to the big Feni River estuary in the west and includes the mouth of the Meghna River. This region is characterized by heavy sediment input, the formation of chars (new land) and bank erosion. This region is the most dynamic and most of the accretion and erosion occurs here. The coastline is highly broken and consists of a series of islands formed by sediment deposits. The funnel-shaped apex of the Bay of Bengal in this region is relatively shallow and the rivers and channels emptying into the bay change their courses rapidly. The general flow of water in this part of the Bay is westward, heading towards the Swatch of No Ground. As a result, the islands in this region are generally subject to erosion on their eastern sides and sedimentation on the western sides. Over the years, this effect has resulted in the appearance of larger islands in the area, e.g. Hatiya, Monpura, Shahbajpur, tending to "bend" westward. In the north-eastern part of the bay, the water in the Hatiya and Swandweep channels flows directly south-east during outgoing tides. As a result, the erosion/sedimentation pattern for the islands in this area is different. In this area, erosion occurs on the northern sides of the islands, while sediments are deposited along their southern edges. Sites of considerable activity include the northern and southern tips of Hatiya and Swandweep islands. Much of the dynamic nature of this region is due to the fact that the three major rivers, the Ganges, Brahmaputra and Meghna, have joined to form this estuary.

There has been little study of migratory shorebirds in this region and few surveys have been carried out. Information on the population abundance of migratory shorebirds in the southern coastal region, including comments on their importance, have been presented in Islam, 2001b; Islam and Islam, 2002; Khan, 1997 and Wetlands International, 1997. Some other important documents related to shorebirds study are Rashid 1989 and Sarker and Sarker 1988. These studies are largely based on surveys in migration periods when large numbers of birds pass through the area. This is the first survey undertaken in the non-breeding season to be documented in the literature.

MATERIALS AND METHODS

Char Bahauddin is an island located in south central coastal zone of Bangladesh. It lies to the south-east of Hatiya Island in the estuary of the Shahbajpur River (Figure 1). There are several islands in the area which are separated by a complex

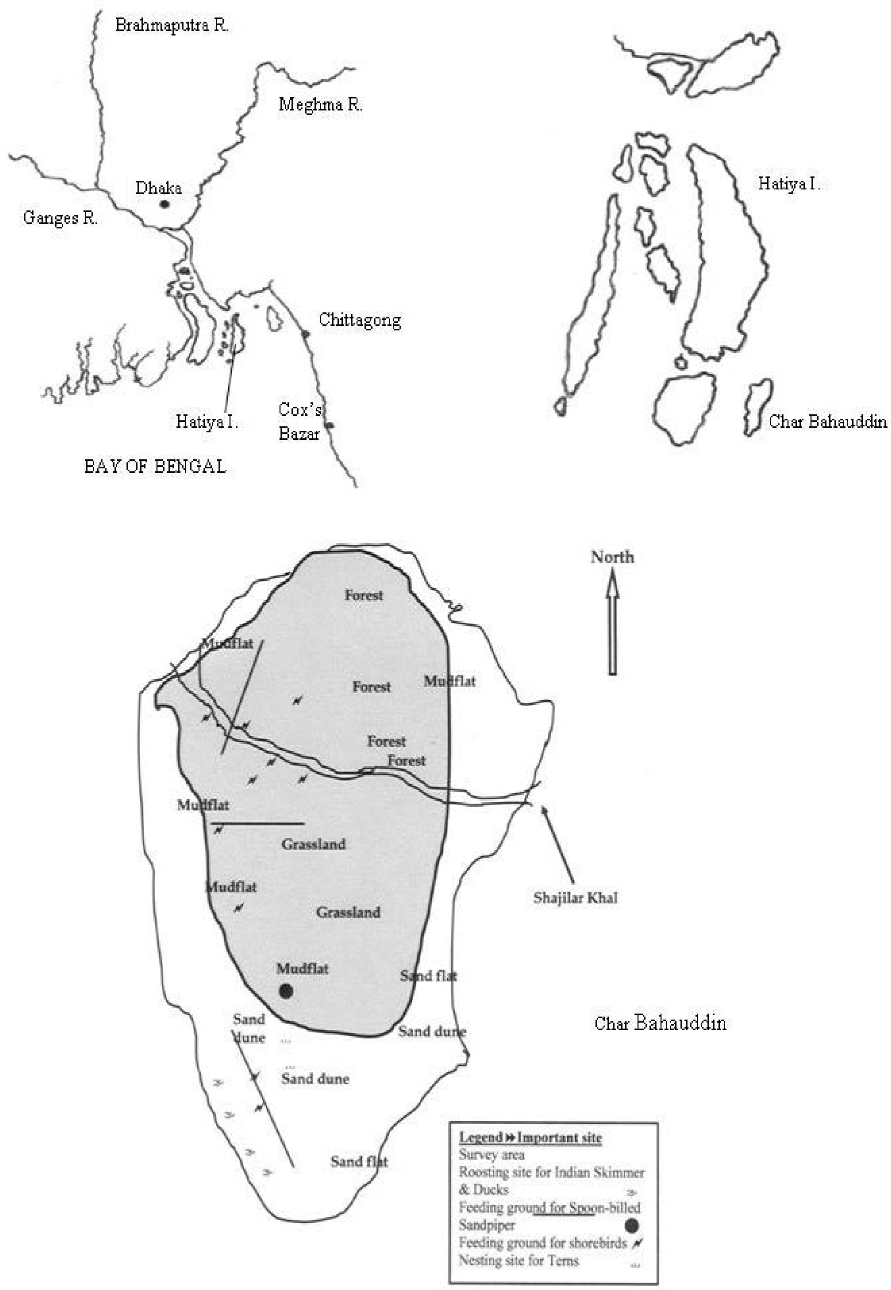

Figure 1. Bay of Bengal and Char Bahauddin

of rivers, channels and canals. This survey was of the western part of Char Bahauddin (91º3.15'E, 22º3.51'N).

The survey was conducted at the end of the non-breeding season on 29 February 2004; indeed, some birds which spent this period here may already have left the study area on northward migration. The survey was conducted over the period of a neap high tide when much of the intertidal mudflats is uncovered. Counting started in the late morning and extended to evening. The counting technique involved walking just inland of the tide edge and counting roosting and feeding birds. This meant that the counters walked quite long distances. Some parts of the survey were conducted from the seaward side from a fishing boat. Although there was light rain in the early morning, weather conditions throughout the count period were generally favorable.

RESULTS AND DISCUSSION

A total of 2,895 birds of 31 species were counted with an additional 400 birds which could not be identified to species (Table 1). Over 100 individuals were counted for six species:

Table 1. Species Counts

English Name	Scientific Name	Number	Percent
Black-headed Ibis	*Threskiornis melanocephalus*	165	5.0%
Greater Painted Snipe	*Rostratula benghalensis*	3	0.1%
Small Pratincole	*Glareola lactea*	17	0.5%
Grey-headed Lapwing	*Vanellus cinereus*	3	0.1%
Red-wattled Lapwing	*Vanellus indicus*	5	0.2%
Pacific Golden Plover	*Pluvialis fulva*	1033	31.4%
Grey Plover	*Pluvialis squatarola*	3	0.1%
Little Ringed Plover	*Charadrius dubius*	16	0.5%
Kentish Plover	*Charadrius alexandrinus*	26	0.8%
Lesser Sand Plover	*Charadrius mongolus*	1	0.0%
Greater Sand Plover	*Charadrius leschenaultii*	3	0.1%
Pintail Snipe	*Gallinago stenura*	4	0.1%
Common Snipe	*Gallinago gallinago*	4	0.1%
Asian Dowitcher	*Limnodromus semipalmatus*	11	0.3%
Black-tailed Godwit	*Limosa limosa*	600	18.2%
Bar-tailed Godwit	*Limosa lapponica*	162	4.9%
Whimbrel	*Numenius phaeopus*	263	8.0%
Eurasian Curlew	*Numenius arquata*	83	2.5%
Common Redshank	*Tringa totanus*	85	2.6%
Marsh Sandpiper	*Tringa stagnatilis*	128	3.9%
Common Greenshank	*Tringa nebularia*	43	1.3%
Wood Sandpiper	*Tringa glareola*	37	1.1%
Terek Sandpiper	*Xenus cinereus*	5	0.2%
Common Sandpiper	*Actitis hypoleucos*	87	2.6%
Great Knot	*Calidris tenuirostris*	5	0.2%
Little Stint	*Calidris minuta*	20	0.6%
Temminck's Stint	*Calidris temminckii*	5	0.2%
Curlew Sandpiper	*Calidris ferruginea*	20	0.6%
Spoon-billed Sandpiper	*Calidris pygmea*	2	0.1%
Broad-billed Sandpiper	*Limicola falcinellus*	12	0.4%
Ruff	*Philomachus pugnax*	44	1.3%
Unidentified waders		400	12.1%
Total		3295	

Pacific Golden Plover, Black-tailed Godwit, Whimbrel, Black-headed Ibis, Bar-tailed Godwit, and Marsh Sandpiper. These numbers are not enormous but two of them, those for Black-headed Ibis and Pacific Golden Plover exceed the 1% thresholds for use in Ramsar Convention Criterion 6 and are about half the threshold value for Black-tailed Godwit and Whimbrel (Wetlands International 2002). Somwhat surprisingly, Bar-tailed Godwit is not listed in that publication as occurring in Bangladesh. Given that this count was of part of one island only and counted in a day, it would not be surprising if the region as a whole were to contain numbers of birds exceeding the 1% threshold for several species.

Seven sandpiper species were counted: Curlew Sandpiper, Terek Sandpiper, Spoon-billed Sandpiper, Broad-billed Sandpiper, Marsh Sandpiper, Wood Sandpiper, and Common Sandpiper. This group of 271 birds comprised 8.8% of the total count. By contrast, in an October 2000 count (Islam 2001a), the island totals for Common Sandpiper, Broadbilled Sandpiper, Marsh Sandpiper, Wood Sandpiper, Terek Sandpiper and Curlew Sandpiper were 5,547, 454, 900, 1,483, 2,570 and 201 individuals respectively.

Six plover species were counted: Grey Plover, Pacific Golden Plover, Lesser Sand Plover, Little Ringed Plover, Kentish Plover and Greater Sand Plover. Species counts for this group ranged ranged from a single Lesser Sand Plover to 1,033 Pacific Golden Plovers. This group comprised 32.8% of the total count. These small numbers contrast with the early winter shorebird counts of 2002 (Islam 2001a) in which the large numbers of Kentish Plover showed that the extensive mudflats are very important feeding sites for migratory shorebirds during both southward and northward migration periods. The largest recorded flock size for this species was 45,000 in south eastern part of the survey area and the total for the area was 79,500. The next most common species was Little Ringed Plover with 20,400 individuals counted. In that survey the regional totals of Kentish Plover, Little Ringed Plover, Lesser Sand Plover, Greater Sand Plover and Pacific Golden Plover were 105,688, 43,248, 2,981, 1,835 and 2,173 individuals respectively (Islam 2001b).

Of the other common species, Black-tailed Godwit has previously been counted in good numbers, 1,560 in Char Bahauddin and 2,503 in Bandar Tila, the island immediately to the west, on the south central coast during an early winter shorebird count in 2000 (Islam 2001a).

Bangladesh is at the crossroads of two major shorebird migration flyways in the Asia-Pacific region. The country has been considered to be on the western edge of the East-Asian Australasian Flyway and at the eastern edge of the Central Asian Flyway. Important Bird Areas (IBA) in the coastal zone are: Urir Char, Boyer Char, Dhal Char, Char Bahauddin, Nijhum Dwip, Sonar Char, Kalkiny Dwip, East

Dhal Char, Char Dhigal and Char Jamir. All these areas are important staging grounds and stop-overs for long distance migratory birds and lie in the East Asian-Australasian Flyways (Khan 1997).

Some of the rare species of birds which visit the area regularly are: Bar-headed Goose *Anser indicus*, Greylag Goose *Anser anser*, Eurasian Spoonbill *Platalea leucorodia*, Goliath Heron *Ardea goliath*, Asian Dowitcher *Limnodromus semipulmatus*, Spotted Redshank *Tringa erythropus*, Spoon-billed Sandpiper *Calidris pygmeus* and Indian Skimmer *Rynchops albicollis*. These birds start visiting the site from October and return in April. The early migrants are Common Sandpiper *Actitis hypoleucos*, Wagtails, Lesser Sand Plover *Charadrius mongolus* and Brown-headed Gull *Larus brunnicephalus*. Char Bahauddin acts as the best habitat for another globally threatened bird, the Indian Skimmer. A recent study (Islam and Khan 2005) recorded a flock of 1,503 Indian Skimmer. Small Pratincole *Glareola lactea* and River Tern *Sterna aurantia* use the southern sand dunes as nesting ground. Observation of their nesting behavior has found during the present ornithological survey.

The globally threatened (BirdLife International 2000) Spoon-billed Sandpiper uses the habitat in Char Bahauddin regularly. They feed on detritus, polycheats and algae in the intertidal mudflat. The habitat is tiny wave like mud mixed with sand, usually covered with green algae. The accompanying species are Little Stint, Broad billed Sandpiper and Lesser Sand Plover; they are normally seen together in flocks. Other important sites for this species are East Dhal Char, and Patar Char. The habitats of this species are changed with the change in the mudflats. The habitats in Ghasiar Char, Dhal Char, Char Pia and Char Nurul Islam where the species used to occur are no longer suitable for them. All the Chars are changed into high raised grassland. There is no regular inundation and the mudflats are no longer there. Char Nurul Islam habitat has eroded. The area is also under substantial pressure from land grabbers and shrimp larvae collectors. This is unfortunate given the area is known to be a staging ground for such a globally threatened species.

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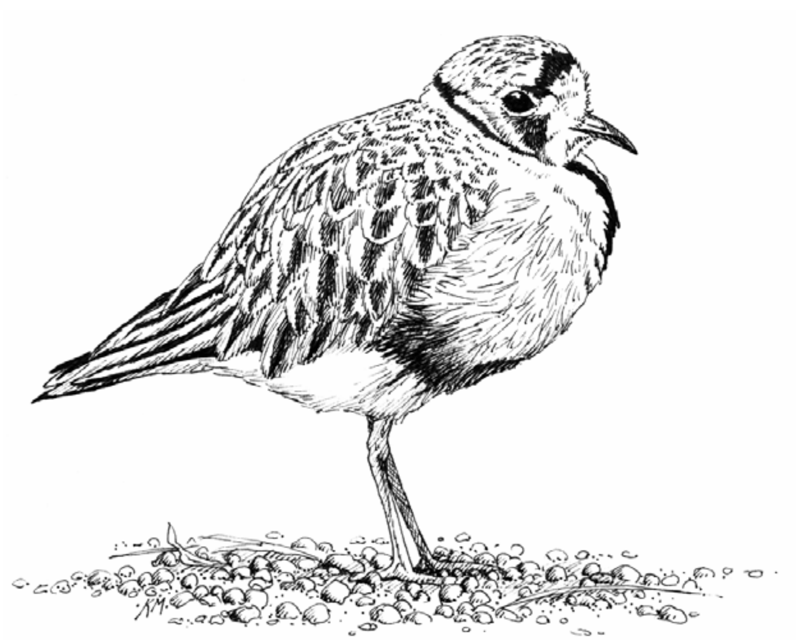

NOTES ON SHOREBIRD NUMBERS IN SUNGEI BULOH WETLAND RESERVE, SINGAPORE IN 2000 AND 2001

J.T.W.M.GAN[1] AND R.K.RAMAKRISHNAN[2]

[1]*National Parks Board, Sungei Buloh Wetland Reserve, 301 Neo Tiew Crescent, 718925, Singapore; James_GAN@nparks.gov.sg.* [2]*Ramakrishnan_Kolandavelu@nparks.gov.sg*

Shorebirds from the Scolopacidae and Charadriidae were counted regularly on a monthly basis in Sungei Buloh Wetland Reserve, Singapore between January 2000 and December 2001. A total of 17 species was recorded during the census sessions. Total shorebird numbers peaked in December for both years. Pacific Golden Plover *Pluvialis fulva* had counts exceeding 1,000 during both southward and northward migrations. The counts have revealed information on the mix of shorebird species, and their general movements and numbers over the two years.

INTRODUCTION

Singapore is an island republic of 699 sq km located at the southern end of the Malay Peninsula. Although densely populated, it has many nature reserves and parks. A key nature area conserved for its mangrove ecosystem is the Sungei Buloh Wetland Reserve (SBWR). To date, 212 species of birds, comprising about 60% of Singapore's total, have been recorded in the reserve. Twenty-four species are from the Scolopacidae and six from the Charadriidae. The site is located within the East Asian-Australasian Flyway, approximately half way between northern Australia and southern China. Shorebirds in the thousands pass through the site during the southward migration every year. The northward migration tends to see fewer shorebirds passing through.

This paper summarises shorebird count data obtained from monthly wader censuses conducted at SBWR. It is hoped that this information will also give an indication of shorebird species and numbers that might be expected in similar sites in the vicinity of the reserve and on scores of as yet ornithologically unsurveyed islands immediately south of Singapore.

METHODS

Study Area

Sungei Buloh Wetland Reserve (1º26'80"N, 103º43'30"E) is a 130-hectare coastal wetland located on the northwest sector of Singapore. Two short mangrove lined rivers, the Sungei Buloh Besar and the Sungei Buloh Kechil run through the reserve. The area has intertidal mudflats, mangrove forest and a complex of abandoned shrimp ponds. At the mouth of the Sungei Buloh Besar estuary is Pulau Buloh, an island of mature mangroves surrounded by mudflats.

Shorebird Survey

Shorebirds were counted over a two-year period from January 2000 and December 2001. Only shorebirds within the complex of disused shrimp ponds were counted. These ponds are connected to the sea by sluice channels. Installed across the sluice channels are sluice gates. These gates can be raised or lowered and the water levels within the ponds can be carefully regulated to expose mudflats when required. During high tide, shorebirds which feed along much of the north-western coast tend to congregate on exposed mudflats within the network of ponds to feed and roost. At least one pond has lowered water levels and exposed mudflats at any one time. Counts were made at least once a month except for May and June 2000 when no census was conducted because of the low numbers (less than 20) of shorebirds. The shorebird census for 2001 included counts for May and June as it was thought that the data would be more complete for analysis. All counts were conducted during daylight hours. Each session lasted two hours and was conducted within two hours of the maximum high tide. During a typical session, an observer and a recorder walk along a predetermined trail to lookout points or hides facing the mudflats and ponds on a randomly scheduled day within the month. Binoculars and telescopes are used to aid the identification and counting of the shorebirds. Censuses may be taken as frequently as four sessions on separate days within the month.

RESULTS

A total of 17 species was recorded during the census sessions. Seven of the 17 species dominated with counts of at least 100 birds at any one session during the study period. Count data for these 7 species for the period Jan 2000 to Dec 2001 are listed in Table 1. Note that the totals as given in the tables refer to the highest count for a given month and are not average counts. For both years, maximum shorebird counts were in December. For that month, the peak counts of shorebirds for each session did not exceed 2,500 birds. Only the Pacific Golden Plover had counts exceeding 1,000. This occurred in April and November 2001. The only other shorebird with numbers exceeding a thousand was the Lesser Sand Plover *Charadrius mongolus* (1,003 in January 2000). Common Redshank *Tringa totanus* and Whimbrel *Numenius phaeopus* were the only two species noted in the boreal summer of 2001 but only in very low numbers.

To generalise, the species with the highest numbers recorded during the southward migration (September to November) relative to their numbers throughout the year were Common Redshank and Curlew Sandpiper. Species with the highest numbers recorded during the northward migration (March and April) were Pacific Golden Plover and Whimbrel. Species with the highest numbers in the northern winter (December and January) were Common Greenshank, Marsh Sandpiper and Lesser Sand Plover.

Table 1. Maximum monthly counts for the seven most common shorebird species

	Common Greenshank	Common Redshank	Curlew Sandpiper	Marsh Sandpiper	Lesser Sand Plover	Pacific Golden Plover	Whimbrel	No. of Census Sessions	Max Daily Shorebirds Count
Year 2000									
Jan	191	48	105	357	1003	488	41	2	1998
Feb	148	131	103	380	878	220	201	3	1772
Mar	96	24	73	170	20	662	89	3	1079
Apr	54	2	1	37	60	171	41	1	367
May	-	-	-	-	-	-	-	0	-
Jun	-	-	-	-	-	-	-	0	-
Jul	0	20	0	0	0	0	0	1	21
Aug	15	433	12	0	0	0	11	1	478
Sep	28	683	84	31	367	455	149	2	1607
Oct	55	399	275	122	189	334	139	2	1448
Nov	36	51	185	232	555	393	143	1	1605
Dec	115	310	238	347	603	311	139	1	2078
Year 2001									
Jan	220	115	67	376	786	348	139	2	1738
Feb	118	44	0	372	213	450	186	1	1391
Mar	58	7	0	129	104	327	118	1	755
Apr	124	116	0	223	112	1081	219	4	1622
May	5	17	0	3	10	0	10	3	45
Jun	0	7	0	0	0	0	13	3	20
Jul	1	32	0	0	0	0	14	3	32
Aug	12	154	50	3	183	220	20	4	407
Sep	41	305	133	84	675	545	113	4	1787
Oct	111	190	302	314	555	624	176	4	1968
Nov	118	221	248	134	440	1022	157	2	2213
Dec	189	152	288	486	606	940	198	3	2470

A comparison was made of the seven most common shorebird species at the reserve with the maximum counts recorded by the Asian Waterfowl Census (AWC) for Singapore between 1991 and 1996 (Perennou and Mundkur 1991, 1992; Mundkur and Taylor 1993; Lopez and Mundkur 1997; Li and Mundkur 2004). Direct comparison is possible for counts taken in January since the AWC counts are consistently conducted in that month. The percentage of each species of shorebird that can be found in the reserve against the Singapore population is at best a rough estimate but still an indicator of the relative importance of the reserve with respect to other sites in Singapore. The relevant data are given in Table 2.

Species Accounts

Common Greenshank *Tringa nebularia*. The maximum count at the reserve was 220. It seems likely that almost half the Greenshanks in Singapore can be found at the reserve especially as the peak count was recorded in January, the month when the AWC are conducted.

Common Redshank *Tringa totanus*. The maximum count was 683. The peaks in September and the 60% to 70% drop the following month provide some indication of turnover rates for Redshanks passing through the reserve.

Curlew Sandpiper *Calidris ferruginea*. The maximum count was 302. The 1991-96 counts for Singapore ranged from 5 to 781. First migrants were recorded in August. No birds were counted between February and July 2001. Only one census session was conducted in each of February and March but three further high tide wader counts (6 and 11 March, 3 April) at the reserve by an independent observer also did not find any Curlew Sandpiper (A. Crossland pers. comm.). This result could be explained by the possibility that, in this year, Curlew Sandpipers took a northward migration route that bypassed, or used other wetlands in, Singapore. Such an alternative route could possibly be along the eastern coast of Sumatra before crossing over to Malaysia and/or Thailand. Large numbers of Curlew Sandpiper occur along the east coast of Sumatra at this time (A. Crossland pers. comm.). Wader counts at suitable sites in Indonesia and the Malay Peninsula would help to clarify the actual route taken. The peak counts in October indicate a strong southward passage in that month with another lower peak in December before falling sharply in January and subsequent months for the northward migration.

Marsh Sandpiper *Tringa stagnatilis*. The maximum count was 486. Counts for Singapore ranged from 526 to 1,294. Birds arrive at the reserve in appreciable numbers only in October. The data collected are consistent with the

Table 2. Summary and comparison of Singapore's totals of selected species of shorebirds counted during the Asian Waterbird Census (1991-2001) and shorebirds counted in Sungei Buloh Wetland Reserve (2000-2001).

	Common Green-shank	Common Redshank	Curlew Sandpiper	Marsh Sandpiper	Lesser Sand Plover	Pacific Golden Plover	Whimbrel	No. of sites counted
Asian Waterbird Census 1991-2001								
1991	180	712	114	709	173	908	88	10
1992	472	267	781	989	178	1952	247	13
1993	265	459	429	1294	773	2154	315	13
1994	326	530	411	1261	724	1609	224	15
1995	294	668	28	526	86	1697	341	15
1996	386	1004	5	696	351	2416	217	13
1997	664	333	3	722	1000	1195	329	10
1998	299	778	180	901	591	1428	149	6
1999	439	898	207	480	811	2424	321	11
2000	137	292	50	391	715	1217	71	10
2001	290	205	25	682	617	1306	112	10
Singapore's January Maximum 1991-2001								
	664	1004	781	1294	1000	2424	341	
Sungei Buloh Wetland Reserve Maximum. All months								
Number	220	683	302	486	1003	1081	219	
% Jan. Max.	33.1%	68.0%	38.7%	37.6%	100.3%	44.6%	64.2%	

observations in the Malay Peninsular where Marsh Sandpipers arrive late and depart relatively early with a further peak in the boreal spring (Wells, 1999). This surge was noted in early April 2001 but not in 2000. It may, however, have happened between count dates and so been unrecorded.

Lesser Sand Plover *Charadrius mongolus*. The maximum count of 1,003 birds was recorded on 26 January 2000; 15 days later the count was 878. AWC counts for Singapore have recorded 724. Observations in the Malay Peninsula have generally noted decreases in Lesser Sand Plover numbers from December to March (Wells 1999). These observations are consistent with the pattern of counts recorded for 2000 and 2001 when counts are highest in December and decrease as the northward migration progresses. This may indicate a boreal spring exodus without significant augmentation by passage migrants. It seems likely that, like the Curlew Sandpiper, the main northward migration route of Lesser Sand Plovers bypasses Sungei Buloh.

Pacific Golden Plover *Pluvialis fulva*. Counts twice exceeded 1,000 birds. AWC counts for Singapore range from 908 to 2,416. The count of 1,081 birds in April 2001 suggests staging during northward migration.

Whimbrel *Numenius phaeopus*. A maximum count of 219 was obtained. This count was taken in early April and might indicate staging. The high counts of Whimbrel in early April quickly slumped to 10 in early May. Some Whimbrel may have spent the breeding season in Singapore in 2001 as small numbers were present throughout May, June and July. First arrivals were noted in August and a large influx of birds was noted in September in both years.

DISCUSSION

This study has shown that counts between September and April of over 1,000 shorebirds may be expected at SBWR over the high tide period. From May to July, only a few species of shorebirds can be found, usually Common Redshank and Whimbrel with fewer than 30 individuals counted. From the census data for 2000 and 2001, the shorebird community at the reserve is composed of seven main species and ten other species which occur in lesser numbers. The latter, in descending order of abundance, are: Terek Sandpiper *Tringa cinerea*, Common Sandpiper *Tringa hypoleucos*, Ruddy Turnstone *Arenaria interpres*, Broad-billed Sandpiper *Limicola falcinellus*, Grey-tailed Tattler *Tringa brevipes*, Red-necked Stint *Calidris ruficollis*, Little Ringed Plover *Charadrius dubius*, Eurasian Curlew *Numenius arquata*, Bar-tailed Godwit *Limosa lapponica*, and Black-tailed Godwit *Limosa limosa*. Other shorebird species, for example Asian Dowitcher *Limnodromus semipalmatus* and Greater Sand Plover *Charadrius leschenaultii*, were detected at the reserve in 2000/2001 in mist netting operations (Gan 2001, 2002) and through other observations but were not recorded during the actual census sessions.

Preliminary data obtained through counts and observations suggest that the reserve is favoured by perhaps half the Singapore population of Whimbrel, Common Redshank, Pacific Golden Plover and Lesser Sand Plover. Further studies would be required to confirm this. More frequent counts over a longer period would help to establish patterns of seasonal abundance, distribution, and movements of shorebirds in Singapore. A limitation of the data obtained during the study period is that a substantial influx of passage waders might last only a few days and might be missed through slipping between counts that are spaced at wider intervals. Closer-spaced counts during migration periods would refine our knowledge of the exact magnitude and timing of passage peaks. The data presented, though limited by resource constraints, are however sufficient to give an indicative picture of seasonal abundance of shorebirds at Sungei Buloh. It is clear that the Sungei Buloh wetland area is an important site for these shorebirds. Similar sites in and around Singapore may reveal a similar picture of species mix and monthly abundance.

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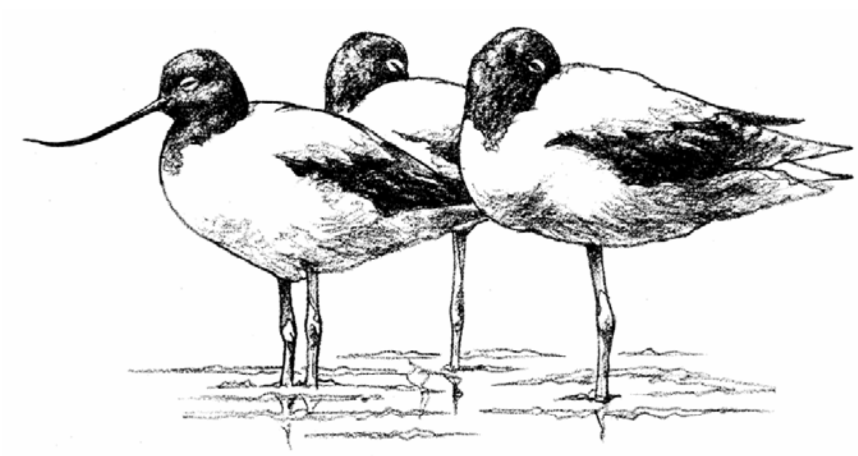


SIGHTING OF WADERS LEG FLAGGED IN VICTORIA: REPORT NUMBER 12

CLIVE MINTON[1], ROZ JESSOP, PETER COLLINS, ALICE EWING, AND HEATHER GIBBS

[1]*Clive Minton, 165 Dalgetty Rd, Beaumaris, Victoria 3193, Australia. mintons@ozemail.com.au*

INTRODUCTION

Each year we report sightings of waders which were colour leg-flagged in Victoria. This enables members of the Victorian Wader Study Group (VWSG) and those who have searched for and reported leg-flags to see the results of their efforts. Comments under each species highlight interesting records and put the sightings into the context of what was previously known about the species movements. Summary tables are included at the end of the listing. Table 1 shows the number of flag sightings, by species and country, reported during the last year; Table 2 shows the cumulative sightings reported since leg flagging started in Victoria in 1990; and Table 3 shows how the number of leg flag sightings made each year has grown over this 15 year period.

To the end of December 2004, 69,349 waders from 32 species have been orange-flagged in Victoria. A record number of flag sightings were reported in the past twelve months. Overseas sightings of 932 birds added 30% to the number of overseas flag sightings. A further 264 birds were seen in Australia away from the Victorian coastal flagging sites. Red Knot and Bar-tailed Godwit again topped the lists mainly because of the huge sighting efforts in New Zealand where many of the Victorian birds move to. But the list also contains, for the second year running, a good number of Sharp-tailed Sandpiper sightings – a reflection of the high population levels and numbers flagged during the last two summers. A welcome addition to the list was our first overseas sighting of a flagged Greenshank.

There have now been 3,695 overseas sightings of 17 wader species flagged in Victoria. The 1,666 total flag sightings within Australia include a further eight species. New Zealand still leads the way as the country in which most Victorian flagged birds are seen (2,109 sightings). Each year a collated list of flag sightings are received for the Mai Po Marshes in Hong Kong (China) and the total reports from there over the years have now reached 590. There have been big increases in recent years in the numbers of our birds seen in mainland China and in Taiwan (China). An amazing 183 Bar-tailed Godwit sightings have now been reported in Alaska. The number of flag sightings in Indonesia and Mongolia, although small in total number, also grew markedly in the last year.

The pattern of the build up of flag sighting reports over the years is influenced by the increasing numbers of birds leg flagged in Victoria (in the early years only a proportion of the birds caught were flagged). But it is also a reflection of the growing awareness of flagging throughout the Flyway and the greater search effort which now takes place. Although Table 3 suggests some levelling out of the number of flag sighting reports is now occurring it may well be that we shall reach 1000 for the first time in 2005.

Table 1. All sightings of Victorian-flagged waders processed into the AWSG leg-flag database between 27 Jun 2004 and 31 July 2005 by species and country of sighting

Species	China (Hong Kong)	China (Mainland)	China (Taiwan)	Indonesia	Japan	Korea	New Zealand	Russia	Total Overseas	Total Australia
Red Knot	-	8	8	-	4	1	356	2	379	42
Bar-tailed Godwit	-	9	-	-	5	29	225	-	322	24
Red-necked Stint	40	57	21	11	8	1	1	1	149	105
Curlew Sandpiper	16	4	8	3	-	-	-	-	31	48
Sanderling	2	2	-	-	9	1	-	-	14	15
Ruddy Turnstone	-	-	4	-	1	3	3	-	11	4
Sharp-tailed Sandpiper	-	4	7	-	-	-	-	-	11	4
Great Knot	3	3	-	-	-	1	-	-	7	7
Eastern Curlew	-	2	-	-	1	-	-	-	3	5
Double-banded Plover	-	-	-	-	-	-	3	-	3	
Common Greenshank	-	-	1	-	-	-	-	-	1	
Terek Sandpiper	-	1	-	-	-	-	-	-	1	
Total	61	90	49	14	28	36	588	3	932	254

Notes 1. Row totals include : Bar-tailed Godwit: US (54); Red-necked Stint: Mongolia (7), Malaysia (2)

2. The following species were sighted only in Australia. Frequency in brackets. Lesser Sand Plover (3), Banded Stilt (2), Red-necked Avocet (2), Black-tailed Godwit (1), Pied Oystercatcher (1), Greater Sand Plover (1)

Table 2. All sightings of Victorian-flagged waders in the AWSG leg-flag database on 31 July 2005 by species and country of sighting

Species	China (Hong Kong)	China (Mainland)	China (Taiwan)	Indonesia	Japan	Korea	Malaysia	New Zealand	Russia	Vietnam	Total Overseas	Total Australia
Red Knot	4	13	16	-	4	2	-	1531	2	-	1572	232
Bar-tailed Godwit	-	66	-	-	48	72	-	533	-	-	902	130
Red-necked Stint	192	73	87	17	43	9	4	30	30	2	514	605
Curlew Sandpiper	364	11	39	3	1	-	1	-	2	1	422	300
Sanderling	12	5	4	1	99	3	-	-	2	-	126	167
Ruddy Turnstone	1	1	15	-	4	5	-	8	-	-	34	31
Eastern Curlew	-	4	3	-	16	4	-	-	-	-	27	38
Sharp-tailed Sandpiper	2	5	11	1	-	7	-	-	-	-	26	39
Great Knot	4	5	5	-	1	8	1	-	-	-	24	68
Grey Plover	-	1	-	-	18	1	-	-	-	-	20	1
Greater Sand Plover	9	-	1	-	-	-	-	-	-	1	11	14
Double-banded Plover	-	-	-	-	-	-	-	7	-	-	7	1
Terek Sandpiper	1	1	-	-	-	3	-	-	-	-	5	1
Black-tailed Godwit	-	1	-	-	-	1	-	-	-	-	2	3
Lesser Sand Plover	1	-	-	-	-	-	-	-	-	-	1	14
Common Greenshank	-	-	1	-	-	-	-	-	-	-	1	1
Broad-billed Sandpiper	-	-	1	-	-	-	-	-	-	-	1	1
Total	590	186	183	22	234	115	6	2109	36	4	3695	1646

Notes 1. Row totals include : Bar-tailed Godwit: USA (183); Red-necked Stint: Brunei (1); Mongolia (25); Thailand (1)

2. The following species were sighted only in Australia. Frequency in brackets. Red-necked Avocet (9), Grey-tailed Tattler (4), Banded Stilt (2), Latham's Snipe (1), Pectoral Sandpiper (1), Pied Oystercatcher (1), Pacific Golden Plover (1), Red-capped Plover (1)

Table 3. Number of sightings each calendar year of waders flagged in Victoria as of 31 July 2005. Sightings comprise overseas sightings and significant movements within Australia.

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Sightings	5	30	79	171	126	75	110	153	304	335	377	498	686	943	805	664	5361

SPECIES ACCOUNTS

All flag sighting reports received since those in Minton *et al*. (2004) are summarised below. The layout of these tables differs from that of previous reports. Column 1 gives, in alphabetical order, the state for Australian sightings and the country for overseas sightings. Mainland China is considered in two parts, north and south of Shanghai; New Zealand is considered in three parts, North and South Islands and Other (e.g. Chatham Islands). The second column gives the number of sightings in this report. The third column gives the number of sightings (not the date!) in each month and year (late reporting is not unusual). The fourth column lists the names of individuals, and in some cases organisations, and the number of sightings they have been involved in. Further information on these sightings is available from the VWSG.

BLACK-TAILED GODWIT, *Limosa limosa*

AUSTRALIA

NEW SOUTH WALES	1	**2004:** Dec 1	Jenny Spencer (1)

This species has been the most productive of all those flagged by the VWSG. Four flag sightings, two from overseas and two from north-west Australia, came from the first two Black-tailed Godwits flagged in 1996 and 1997. The above sighting almost certainly relates to a third Black-tailed Godwit flagged at Swan Island, Queenscliff in January 2003. This bird follows the same pattern as some of the earlier ones of a bird reverting to spending its non-breeding season in a more conventional Black-tailed Godwit area in Australia. Victoria is on the fringe of the normal distribution of this species and clearly some birds which occur here may subsequently change their non-breeding location.

BAR-TAILED GODWIT, *Limosa lapponica*

OVERSEAS

CHINA (Mainland) – North	9	**2005:** Apr 4; May 5	Cao Lei (8), Ken Gosbell (3), Mark Barter (3), Bai Qing Quan (1), Wang Tao (5), Xu Qiang (3), Zhang Kejia (3)
JAPAN	5	**2002:** Apr 2; May 1 **2003:** Apr 1	Hitoshi Suginome (1), Masataka Hanada (1), Tatsuya Kobayashi (1), Torigai Hisahiro (1)

		2004: Apr 1	
KOREA	29	**2004:** May 1 **2005:** Apr 24; May 4	Chungrok Park (1), In-sook Ji (3), Jake Maclennan (2), Jo Jung-jang (3), John Roberts (1), Kim Hyun-tae (7), Kim Shin-hwan (2), Ko Kyeng-nam (1), Lee Hae-soon (3), Lee Ki-hak (3), Lee Koang-koo (1), Nial Moores (2), Park Suk-kyoo (2), Peter Nebel (2)
NEW ZEALAND – North I.	69	**2003:** Jul 1; Sep 1; Nov 1 **2004:** May 1; Jun 1; Sep 4; Oct 9; Nov 6; Dec 6 **2005:** Jan 11; Feb 3; Mar 11; Apr 9; May 3; Jun 3	Adrian Riegen (4), B. Groom (1), B. Keeley (1), Bill Plunket (1), Chris Matthews (1), David Lawrie (3), G. Eller (3), Gillian Vaughan (8), Gordon Gorbey (3), Gwen Pulham (7), Ian Southey (2), J. Groom (1), K. Bond (5), M. Foreham (1), N. Fitzgerald (1), Nigel Milius (4), Pam Agnew (2), Phil Battley (1), R. Clough (4), Ray Pierce (2), Rob Schuckard (2), Roger Slack (1), Sav Saville (3), T. Barnard (1), Ted Wnorowski (9), Tim Barnard (2), Tony Habraken (14), Tony Wilson (1)
NEW ZEALAND – South I.	155	**2003:** Nov 3 **2004:** Mar 1; Jun 1; Sep 2; Oct 11; Nov 19; Dec 9 **2005:** Jan 34; Feb 29; Mar 41; Apr 3; May 1	Andrew Crossland (4), Bev Alexander (3), Chris Petyt (4), Colin Miskelly (1), Colin Reid (1), David Melville (38), Derek Onley (9), Dick Veitch (1), Don Cooper (2), Filipe Moniz (1), Gillian Vaughan (1), Henk Heinekamp (4), Ian Southey (2), Jan Walker (4), Julia Melville (1), Peter Field (57), Phil Battley (4), Richard Schofield (1), Rob Schuckard (23), Sheila Patch (3), Steve Wood (2), Sue Moore (4), Tony Crocker (1), Tony Habraken (1), Willie Cook (8)
NEW ZEALAND - Other	1	**2004:** Dec 1	Colin Miskelly (1)
USA	54	**2004:** Jun 1; Aug 21; Sep 31 **O5:** May 15	Gavin Bieber (1), Heather Swensen (31), Martin Green (3), Phil Battley (3), Sarah Connors (25)

AUSTRALIA

NEW SOUTH WALES	6	**2004:** Oct 4 **2005:** Jan 2	Barbara Jones/Far S. Coast Birdwatchers (1), Jenny Spencer (5), Hunter BOC (2)
QUEENSLAND	14	**2004:** Sep 5; Oct 8 **2005:** Mar 1	Ivell White (1), Jim White (1), John Knight (4), Des Wells (6), David Edwards (1), David Milton (1), Dave Houghton (2), Martin Waugh (1)
TASMANIA	1	**2004:** Dec 1	Richard Ashby (1), Mark Brakey (1)
WESTERN AUSTRALIA	1	**2004:** Nov 1	Chris Hassell (1), Adrian Boyle (1)

A massive 322 overseas sightings and 24 sightings in Australia were reported in the past year. The overseas records were again dominated by the large number of birds which had moved to New Zealand (225). Another 54 were reported from Alaska, most of these being in southwest Alaska in late August and early September 2004 as birds gathered prior to their 11,000 km trans-Pacific non-stop migration to the northern coast of Australia and New Zealand. One sighting also occurred of a bird on northward migration to Alaska which had stopped off at the Pribilof Islands in mid-May. Most exciting of all was the sighting of a Bar-tailed Godwit on its nesting territory close to the north coast of Alaska near Deadhorse, Prudhoe Bay. This is far further east in Alaska, at a longitude of 149ºW, than any previous report of a Bar-tailed Godwit from Australia. At 13,032 km north-east of Victoria, this is the second greatest distance moved by any marked wader from Victoria (the record is 13,069 km north-west for a Curlew Sandpiper).

There was also an increased number of reports of flagged Bar-tailed Godwits in Korea, mostly obtained from two excellent websites maintained by a Korean photographer and a Korean ornithologist. These records further emphasize the extreme importance of the west coast of Korea, part of the Yellow Sea, as a migratory stopover for waders between Australia and their arctic breeding grounds. If the threatened closure of the sea wall at Saemangeum goes ahead then there are likely to be serious adverse affects on waders that visit Australia.

Bar-tailed Godwit sightings within Australia partly reflect arrivals on southward migration in Queensland and passage down the east cost of the continent towards Victoria. However the list also contains some birds which appear to have moved their non-breeding area from Victoria to Queensland, NSW, Tasmania and even the north coast of Western Australia.

EASTERN CURLEW, *Numenius madagascariensis*

OVERSEAS

CHINA (Mainland) - North	2	**2005:** Apr 1; May 1	Bai Qing Quan (1), Wang Tao (1)
JAPAN	1	**02:** Mar 1	Masafumi Takeshita (1)

AUSTRALIA

NEW SOUTH WALES	1	**2004:** Oct 1	Jenny Spencer (1)
QUEENSLAND	4	**2004:** Jul 3; Oct 1	Ivell White (1), Jim White (1), John Knight (2), David Edwards (1), David Milton (1), Sandra Harding (1)

Fewer Eastern Curlew have been flagged in recent years than in the early to mid-1990s when particular emphasis was given to this species. A total of 524 have been flagged over the years, and with such a long-lived species, it may not be surprising therefore that flag sightings continue to be reported, including three from overseas. These came from western Japan and the Chinese part of the Yellow Sea, in the relatively narrow migration corridor used by the Eastern Curlew moving between Australia and their breeding grounds in south-eastern Siberia.

The five records in Queensland and New South Wales illustrate the typical coastal migration route used by Eastern Curlew on their southward return journey to Victoria. Two of the sightings, in different parts of Moreton Bay, occurred in late

July. These could well have been early birds returning from the breeding grounds as the first of these usually reach Victoria before the end of July.

COMMON GREENSHANK *Tringa nebularia*

OVERSEAS

CHINA (TAIWAN)	1	**2005:** Apr 1	Chung-Yu Chiang (1)

This is the first flag sighting of a Greenshank reported away from the flagging areas. This is amazing considering that 419 have been flagged and that the average flag sighting rate for Victorian waders is about 2%. It is also surprising because a Greenshank, when wading around in the water, is fairly obvious and its tibia, on which the flag is placed, is usually visible. The low reporting rate may be a consequence of the habitats in Asia through which Greenshank migrate not being well visited by ornithologists and birdwatchers.

TEREK SANDPIPER, *Xenus cinereus*

OVERSEAS

CHINA (Mainland) - North	1	**2005:** May 1	Wang Tao (1), Yuan Xiao (1)

This is the first sighting of this species from mainland China. Previous overseas sightings are one from Hong Kong (China) and three from Korea.

RUDDY TURNSTONE, *Arenaria interpres*

OVERSEAS

CHINA (TAIWAN)	4	**2004:** Aug 1 **2005:** Apr 1; May 2	Chung-Yu Chiang (2, Kun-Hsien Hsu (1), Yueh-Ying Shih (1)
JAPAN	1	**2003:** Aug 1	Tadashi Kasai (1)
KOREA	3	**2004:** Aug 2 **2005:** Apr 1	Thomas Heinicke (2), Jurgen Steudtner (2), Kyeng-sook Kwan (1), Nial Moores (2)
NEW ZEALAND – North I.	1	**2005:** Feb 1	Tony Habraken (1)
NEW ZEALAND – South I.	2	**2005:** Mar 2	Nick Allen (1), Rob Schuckard (1)

AUSTRALIA

NEW SOUTH WALES	2	**2004:** Sep 1 **2005:** Mar 1	Mike Newman (1), Rod Gardner (1)
SOUTH AUSTRALIA	1	**2005:** Apr 1	Maureen Christie (1), Lorraine Moore (1)
WESTERN AUSTRALIA	1	**2005:** Jul 1	Stuart Young (1)

This is another nice crop of flag sightings; all are from areas where there have been previous records of Victorian flagged birds. Taiwan is clearly an important migratory stopover area and sightings from there are helped by the birds roosting on a concrete wall in fish ponds where their flags can be readily observed. The now well-established "southward migration" of some Turnstones through Victoria on their way to non-breeding areas in New Zealand is illustrated by three further sightings there.

One of the New South Wales reports is the third from Lord Howe Island. The timing of the reports is such that all could have been birds on migration to or from Victoria, but it is also possible that a Victorian flagged bird has changed its non-breeding area to Lord Howe Island.

GREAT KNOT, *Calidris tenuirostris*

OVERSEAS

CHINA (HONG KONG)	3	**2004:** Apr 3	Geoff Carey (2), Paul Leader (1)
CHINA (Mainland) - North	3	**2005:** May 3	Cao Lei (3), Wang Tao (3)
KOREA	1	**2005:** Apr 1	In-sook Ji (1)

AUSTRALIA

NEW SOUTH WALES	1	**2004:** Nov 1	Tom Clarke
NORTHERN TERRITORY	2	**2005:** Jan 1; Feb 1	Arthur Keates (2), Sheryl Keates (2), Stephen Garnett (1)
QUEENSLAND	3	**2004:** Sep 1; Oct 1; Nov 1	David Edwards (1), Des Wells (1), Judy Caughley (1), Barb Dickson (1)
WESTERN AUSTRALIA	1	**2003:** Jul 1	Chris Hassell (1), Adrian Boyle (1)

Although only 310 Great Knot have been flagged in Victoria there have been an amazing 24 overseas sightings reported and 68 elsewhere in Australia. This corresponds to a "resighting rate" of close to 30%. It is not clear why this species should produce such a large number of flag reports. The overseas reports came from the usual areas of Hong Kong and mainland China, and Korea, the same areas most frequented by Great Knots from north-western Australia. The sightings within Australia mostly relate to birds which have probably changed their non-breeding location away from Victoria. Most surprising of these was one which was seen at 80 Mile Beach in north-western Australia on 12 July. However since the timing indicates this would have been an immature bird it could possibly have been a bird which had moved north from Victoria for its “winter holidays”, and was intending to return again afterwards.

RED KNOT *Calidris canutus*

OVERSEAS

CHINA (Mainland) - North	8	**2004:** May 7 **2005:** Apr 1	Adrian Boyle (1), Paul Holt (1), Yang Hong Yan (6)
CHINA (TAIWAN)	8	**2004:** Apr 1 **2005:** Apr 7	Chia-Yang Tsai (1), Chih-Wei Yeh (1), Chung-Yu Chiang (1), Taiwan Wader Study Group (5)
JAPAN	4	**2002:** Apr 4	Hiroshi Tanaka (1), Kazuhisa Oue (1), Masataka Hanada (1)
KOREA	1	**2004:** Aug 1	Jurgen Steudtner (1), Nial Moores (1), Thomas Heinicke (1)
NEW ZEALAND – North I.	262	**1997:** Feb 1 **2003:** Jul 1; Oct 1; Dec 1 **2004:** Sep 12; Oct 21; Nov 31; Dec 16 **2005:** Jan 42; Feb 44; Mar 62; Apr 16; May 12; Jun 2	Adrian Riegen (4), Bruce Keeley (2), Chris Matthews (5), David Lawrie (15), G. Pulham (10), Gavin Grant (4), Gillian Vaughan (31), Gordon Gorbey (9), Gwen Pulham (33), Ian Saville (11), Ian Southey (10), John Geale (4), John Simmons (12), K. Bond (24), Mike Wilcox (3), Pam Agnew (1), Phil Battley (5), R. Clough (13), Ray Pierce (6), Rob Schuckar (4), Roger McNeill (1), , Sav Saville (9), Simon Chamberlin (15), T. Barnard (2), T. Moore (2), Ted Wnorowski (13), Tim Barnard (3), Tony Habraken (109), Tony Wilson (1), Will Perry (4)
NEW ZEALAND – South I.	1	**2004:** Oct 1; Nov 28; Dec 1 **2005:** Jan 11; Feb 21; Mar 31	Colin Miskelly (1), David Melville (21), Don Cooper (9), Julia Melville (3), Phil Battley (2), Rob Schuckard (43), Steve Wood (10), Sue Moore (2), Willie Cook (42)
NEW ZEALAND - Other	1	**2004:** Dec 1	Colin Miskelly (1)
RUSSIA	2	**2004:** Aug 2	John Geale (1), Ken Gosbell (1), Steve Kendall (1), Yuri Gerasimov (1)

AUSTRALIA

NEW SOUTH WALES	30	**2003:** Oct 1 **2004:** Sep 7; Oct 20; Nov 2	Allan Richardson (2), Ann Lindsey (6), Graham Barwell (1), Hunter Bird Observers Club (2), Jenny Spencer (16), John Liney (1), Mark Whittaker (1), Mike Crowley (2), Phil Straw (1), Rod Gardner (2), Tun-Pin Ong (2)
NORTHERN TERRITORY	2	**2005:** Jan 1; Feb 1	Arthur Keates (1), Catherine McFadden (1), Sheryl Keates (1)
QUEENSLAND	1	**2004:** Sep 1	John Knight (1)
TASMANIA	5	**2004:** Dec 5	C. Donaghey (3), F. Spruzen (3), Mark Brakey (2), P. Porteus (3), R. Donaghey (3), Richard Ashby (2)
WESTERN AUSTRALIA	4	**2004:** Nov 2; Dec 2	Adrian Boyle (2), Chris Hassell (3), Les George (1)

With 379 overseas flag-sighting reports and another 42 coming from within Australia, the Red Knot is the most commonly sighted species in the past year. The flag reports are dominated, even more than those for Bar-tailed Godwit, by sightings in New Zealand. The massive total of 356 there reflects in part the success the VWSG has had in recent years in catching Red Knot, particularly immatures in the winter months; these are the birds which move to New Zealand in later years and make it their permanent non-breeding area. The high number of sightings is also the result of the highly skilled and enthusiastic team of wader watchers and flag sighters in New Zealand.

Other overseas sightings were also important with the eight in mainland China, eight in Taiwan (China), and one in Korea; this doubles the previous totals of flagged Red Knot in these countries. The four reported from Japan were the first for that country. Even more pleasing were the sightings in Kamchatka in eastern Siberia. Ken Gosbell, the VWSG secretary and treasurer, was a member of the expedition which sighted these birds. They are the strongest indication yet from banding and flagging that the *rogersi* subspecies of the Red Knot, which forms the main population in eastern Australia and New Zealand, probably comes from the breeding areas in Chukotka, to the north of Kamchatka.

The wide range of sightings of flagged Red Knot within Australia – all states except South Australia and the Australian Capital Territory – indicates how flexible the movements of this species can be. As in most other species a number of flag sightings indicate birds which have probably changed their non-breeding area away from Victoria. Others however indicate migration routes within Australia of birds on passage to or from Victoria. Perhaps the most surprising of all of these was the sighting of a bird on 15 November at Carnarvon in the far north-west of WA.

SANDERLING *Calidris alba*

OVERSEAS

CHINA (HONG KONG)	2	**2005:** Apr 1; May 1	Cheung Mok Jose Alberto (1), Yu Yat Tung (1)
CHINA (Mainland) – North	2	**2004:** Apr 1 **2005:** May 1	Yang Hong Yan (1), Cao Lei (1)
JAPAN	9	**2002:** Aug 6 **2004:** Aug 3	Kazuyuki Kuwabara (1), Toshikazu Saito (1), Shinroku Shibuya (1), Kenzo Tomiya (1), kenichiro Fujita (2), Masamichi Ito (1), Tsutomu Nakata (2)
KOREA	1	**2004:** Sep 1	Chungrok Park (1)

AUSTRALIA

NEW SOUTH WALES	1	**2005:** Feb 1	Martin Schultz (1)

SOUTH AUSTRALIA	8	**2005:** Mar 6; Apr 1; May 1	Clive Minton (4), Lorraine Moore (2), Maureen Christie (4)
TASMANIA	1	**2004:** Dec 1	R. Donaghey (1), C. Donaghey (1) , F. Spruzen (1), and P. Porteus(1)
VICTORIA	5	**2004:** Dec 4 **2005:** Feb 1	Martin Schulz (5)

Japan, as usual, is the dominant location from which most overseas sightings of Sanderling were reported. Most of these relate to southward migration. The fact that the two sightings in Hong Kong and two in mainland China were birds on northward migration suggests that the northward migration route may be rather further to the west than that used on southward migration.

The sightings within Australia mostly relate to birds which have changed their non-breeding location. Sanderling have been found to move between different regions of the coast more frequently than any other migratory wader species which visits Australia.

RED-NECKED STINT *Calidris ruficollis*

OVERSEAS

CHINA (HONG KONG)	40	**2004:** Apr 4 **2005:** Apr 7; May 28; Jun 1	Adrian Boyle (3), Cheung Mok Jose Alberto (3), John Allcock (2), Neil Fifer (4), Paul Leader (3), Yu Yat Tung (11)
CHINA (Mainland) - North	55	**2002:** Aug 12 **2004:** May 2; Sep 36 **2005:** May 5	Cao Lei (2), Ken Gosbell (1), Paul Holt (51), Yang Hong Yan (1)
CHINA (Mainland) – South	2	**2005:** May 2	Xi-Min Wang (2), Zhu-ying Wang (2)
CHINA (TAIWAN)	21	**2004:** Apr 1; Aug 7; Sep 3 **2005:** Apr 1; May 9	Chao-Chuo Huang (1), Cheer (1), Chien-Ming Chu (1), Chung-Yu Chiang (1), Hsin-Hsuen Li (1), Hsiu-li Lin (1), Kun-Hsien Hsu (1), Kuo-Wei Wu (1), Li-Chao Chou (1), Ming-Tsai Hsu (1), Taiwan Wader Study Group (4), Wen-Yin Huang (1), Yu-Kun Wang (1)
INDONESIA	11	**2005:** Apr 9; May 2	Anak Burung (2), Iwan Londo (6)
JAPAN	8	**2002:** Jul 1; Aug 1 **2003:** Aug 1 **2004:** May 1; Jul 2; Aug 2	Hideo Itami (1), Hiroshi Yukawa (1), Kazuhiro Oodate (1), Morio Shinohara (1), Naoyuki Takeo (1), Satoru Matsumoto (1), Sei Akutsu (1), Takashi Hayakawa (1)
KOREA	1	**2004:** Aug 1	Jurgen Steudtner (1), Thomas Heinicke (1)
MALAYSIA	2	**2004:** May 1 **2005:** May 1	Mizutani Akira (2)
MONGOLIA	7	**2004:** Jul 5; Aug 2	Mark Thomas (6)
NEW ZEALAND – South I.	1	**2005:** Jan 1	Ian Southley (1)
RUSSIA	1	**2004:** Jun 1	Eugeny Syroechovski Jr (1)

AUSTRALIA

NEW SOUTH WALES	4	**2004:** Sep 2; Oct 1 **2005:** Jan 1	Chris Brandis (1), Graham Barwell (2), Joy Pegler (1)
NORTHERN TERRITORY	6	**2004:** Sep 1 **2005:** Mar 1, May 5	Arthur Keates (1), Roger Potts (5), Sheryl Keates (1)
QUEENSLAND	5	**2004:** Sep 3 **2005:** Jan 2	Barry Morgan (1), Christopher Timewell (1), Colin Reid (1), Dave Houghton (1), David Milton (1), Joanna Morgan (1), Lorelle Black (1), Robert Black (1), Sandra Harding (1)
SOUTH AUSTRALIA	48	**2004:** Mar 1; May 3; Jun 4; Jul 2; Sep 5; Oct 5 **2005:** Feb 11; Mar 6; Apr 8; May 1	Alice Ewing (1), Birgita Hansen (3), Chris Hassell (1), David Close (1), David Dadd (3), Ian Mitchener (2), Inka Veltheim (1), John Seymour (2), Ken Gosbell (4), Lorraine Moore (5), Margaret Dadd (5), Margie Tiller (2), Maureen Christie (29), Nhill Bird Observers Club (1), Peter Collins (2), Roz Jessop (4), Sue Black (2)
TASMANIA	5	**2004:** Jul 1; Oct 2; Dec 1 **2005:** Feb 1	Alastair Richardson (1), Doug Watkins (1), Hazel Britton (2), Jim Hunter (1), John Hunter (1), Naoko Takeuchi (1), Peter Atkinson (1), Peter Britton (2)
VICTORIA	4	**2005:** Mar 4	Chris Doughty (4)
WESTERN AUSTRALIA	33	**2004:** Sep 2; Nov 1; Dec 3 **2005:** Apr 16; May 10; Jun 1	Adrian Boyle (3), Alan Collins (3), Belinda Forbes (1), Bill Russell (3), Chris Drysdale (1), Chris Hassell (10), Chris Sanderson (3), Eyre Bird Observatory (4), Helen Macarthur (2), Lisa Collins (2), Mark Swann (4), Ricki Coughlan (1), Sam Bibby (2), Tim Gale (2)

Another massive list of wonderful leg flag sightings with 149 overseas and 105 in Australia. There was a big boost this year in the number of sightings in mainland China (57 compared with 16 in total from all previous years). Many of these were reported by Paul Holt, who leads bird tours to China each year. He saw flagged birds in May and even more during late August and early September. In most species, more flagged birds are sighted during northward migration than southward migration. Eleven sightings were reported from Indonesia, a substantial increase on the previous total of only six. The sighting in Russia, on the breeding grounds in Chukotka in the very far north east of Siberia, was the most valuable Red-necked Stint report received during the year. With a previous Red-necked Stint flag sighting on a breeding area in the eastern Taimyr this indicates that the Red-necked Stints which visit Victoria may come from throughout their Arctic breeding range, a massive spread of some 70 degrees of longitude between 110°E and 180°E. Other valuable overseas sightings of flagged Red-necked stints reported during the year came from Malaysia, Mongolia, Japan (mainly on southward migration), Taiwan (on both northward and southward migration), Hong Kong (northward migration only) and New Zealand (an almost annual occurrence).

Within Australia flag sightings showed the very wide spread of migration routes used by Red-necked Stints, particularly on their northward migration over the period March to May. Three reports (on one occasion involving three flagged birds together) came from the Tanami Mine, a new location some 650 km north-west of Alice Springs. The extremely enthusiastic observer was even able to read the metal band number on one bird. It had been banded in Corner Inlet only a few weeks previously. Other flag sightings from within Australia indicate that some birds had changed their non-breeding areas. Other sightings illustrate the greater mobility of birds which occurs in the austral winter when the first year birds remain behind after the adults have left for their Siberian breeding grounds.

SHARP-TAILED SANDPIPER *Claidris acuminata*

OVERSEAS

CHINA (Mainland) – North	4	**2002:** Feb 1 **2005:** Mar 3	Cao Lei (1), Paul Holt (1), Wang Hui (1), Wang Tao (1)
CHINA (TAIWAN)	7	**2005:** Apr 1; May 6	Chu Guozhong (1), Ching-Ming (1), Chia-Yang Tsai (1), Chien-Ming Chu (1), Chung-Yu Chiang (3), Hsing-Jen Chou (1)

AUSTRALIA

SOUTH AUSTRALIA	4	**2005:** Feb 2; Mar 3	John Seymour (3), Roz Jessop (1), Peter Collins (1)

This was another good year for Sharp-tailed Sandpiper flag sighting reports with 11 from overseas (only 15 previously). This is a reflection of the relatively large numbers caught and flagged during the last two summers in Victoria when populations have been high due to extremely good breeding success. However, the overall flag sighting rate for Sharp-tailed Sandpipers remains low compared with other small to medium sandpipers. Only 26 have been reported overseas from 3,794 flagged – a rate of 0.7%. The corresponding rate for Curlew Sandpipers is 4.5% and for Red-necked Stints is 1.1%.

CURLEW SANDPIPER *Calidris ferruginea*

OVERSEAS

CHINA (HONG KONG)	16	**2004:** Apr 5 **2005:** Apr 7; May 4	Adrian Boyle (4), Geoff Carey (4), John Allcock (2), Paul Leader (3), Yu Yat Tung (3)
CHINA (Mainland) - North	4	**2004:** May 3 **2005:** May 1	Cao Lei (1), Paul Holt (1), Yang Hong Yan (2)
CHINA (TAIWAN)	8	**2004:** Aug 1 **2005:** Apr 4; May 3	Chung-Yu Chiang (4), Taiwan Wader Study Group (4)
INDONESIA	3	**2004:** Nov 2; Dec 1	D. Permana Putri (1), Iwan Londo (2), R. Anjarsari (1), V. Mahartriasa (1)

AUSTRALIA

NEW SOUTH WALES	11	**2004:** Sep 2; Oct 3; Nov 1; Dec 3 **2005:** Feb 2	Ann Lindsey (2), Graham Buchan (1). Jenny Spencer (6), Ken Gilmore (1), Mark Husk (1), Rod Gardner (1), Tun-Pin Ong (1)
QUEENSLAND	3	**2004:** Sep 1; Oct 1; Nov 1	Andrew Geering (1), Barry Morgan (1), Bob Forsyth (1), David Milton (1), Joanna Morgan (1), Sandra Harding (1)
SOUTH AUSTRALIA	7	**2004:** Sep 2; Dec 1 **2005:** Feb 3; Mar 1	Clive Minton (1), David Close (1). Dean Cutten (3), Inka Veltheim (1), Maureen Christie (2)
TASMANIA	1	**2005:** Jan 1	Hazel Britton (1)
WESTERN AUSTRALIA	26	**2004:** Aug 1; Sep 2; Oct 1; Nov 10; Dec 1 **2005:** Mar 1; May 6; Jun 1; Jul 3	Adrian Boyle (2), Belinda Forbes (1), Chris Hassell (12), Chris Sanderson (5), Helen Macarthur (2), Josh Engel (1), Les George (8), Michael Tesch (1), Sam Bibby (2), Stuart Young (1), Tony Kirby (5)

The total number of Curlew Sandpiper flag sightings reported during the year was relatively low compared with some earlier years. This is a reflection of the current low population of this species and the relatively small number flagged in recent years in Victoria. Most sightings came from the usual areas in Hong Kong, Taiwan and mainland China. But the three sightings in Indonesia were the first from that country for this species. They seem to indicate that a bird has changed its non-breeding area from Victoria to Surabaya, a surprising occurrence.

Quite a few of the sightings within Australia also indicate individual birds which had changed their non-breeding areas away from Victoria. One was as far away as Carnarvon in Western Australia. The sightings also show that some immature birds moved north for the winter, including to Broome, Western Australia (as occurs in most years).

PIED OYSTERCATCHER *Haematopus longirostris*

AUSTRALIA

NEW SOUTH WALES	1	**2004:** Jun 1	via Australian Bird Banding Scheme

This is one of eight Pied Oystercatchers which were experimentally leg-flagged at Stockyard Point on 16 July 2000. Several others have been seen or recaptured locally since then. This movement into southern New South Wales is typical for Oystercatchers marked in flocks in Victoria. It is not clear why proportionately more of these have been marked originally at Stockyard Point than at any of the other catching locations.

BANDED STILT ***Cladorhynchus leucocephalus***

			AUSTRALIA
SOUTH AUSTRALIA	2	**2005:** Feb 2	Birgita Hansen (2), Alice Ewing (2)

These are the first sightings from the 151 Banded Stilt flagged in a catch at Werribee Sewage Farm in late December 2000. It is not surprising that they should be found in the Coorong, the main non-breeding habitat used by the Banded Stilt population in central and south-eastern Australia.

RED-NECKED AVOCET ***Recurvirostra novaehollandiae***

			AUSTRALIA
NEW SOUTH WALES	1	**2003:** Dec 1	T. Clarke (1)
VICTORIA	1	**2004:** Apr 1	Roger Standen (1)

The two sightings this year bring to nine the total number of records of Red-necked Avocet which have been reported away from their flagging areas in Port Phillip Bay and Westernport. Most have dispersed inland to northern Victoria and into New South Wales. The movement to the Hunter estuary near Newcastle in New South Wales is the furthest movement reported so far.

DOUBLE-BANDED PLOVER ***Charadrius bicinctus***

			OVERSEAS
NEW ZEALAND – South I.	3	**2003:** Dec 1 **2005:** Feb 1; Mar 1	Nick Allen (1), Phil Battley (1), Richard Schofield (1), Sue Moore (1)

Three more movements into the usual breeding areas in the South Island of New Zealand.

LESSER SAND PLOVER ***Charadrius mongolus***

			AUSTRALIA
QUEENSLAND	3	**2004:** Oct 1 **2005:** Feb 2	David Edwards (2), Ralph Reeger (1)

These records appear to relate to birds which have changed their non-breeding area away from Victoria.

GREATER SAND PLOVER ***Charadrius leschenaultii***

			AUSTRALIA
QUEENSLAND	1	**2005:** Jan 1	Peter Rothlisberg (1)

Another example of a bird changing its non-breeding area. This seems to happen particularly in species for which Victoria is on the fringe of the main non-breeding area. A proportion of birds which have visited Victoria in one year seem to revert to the main non-breeding area in future years.

ACKNOWLEDGEMENTS

The Department of Environment and Heritage Australia have again kindly provided funding, through AWSG, during the past year for the processing of leg flag sightings into a National Database. This involves two to three days work per week on average throughout the year. It enables all flag sighting data to be captured and put on permanent record and for prompt responses to those who have seen flagged birds and also those who put the flags on. The task grew beyond the capability of being handled by volunteer effort several years ago and DEH is greatly thanked for enabling flag data collection and management to now be dealt with efficiently. During the past year the leg flag database work has been handled by Alice Ewing and Heather Gibbs.

REFERENCE

Minton, C., R. Jessop, P. Collins, & I. Veltheim. 2004. Sightings in 2003-04 of waders leg-flagged in Victoria: report number 11. The Stilt 46: 65-77.

SIGHTINGS IN 2004-2005 OF WADERS LEG-FLAGGED IN SOUTH AUSTRALIA: REPORT NUMBER 4

CLIVE MINTON[1], ROS JESSOP, PETER COLLINS, MAUREN CHRISTIE, IAIN STEWERT, ALICE EWING AND HEATHER GIBBS.

[1]*Clive Minton, 165 Dalgetty Rd, Beaumaris, Victoria 3193, Australia. mintons@ozemail.com.au*

INTRODUCTION

Leg-flagging with the orange/yellow flag combination started in South Australia in April 1999. Since the previous list was published (Minton *et al*. 2004), there have been 86 overseas sightings and 69 elsewhere in Australia away from the flagging locations on the south-eastern coasts of South Australia (Table 1); these increase the previous total by 48%. In total, 184 sightings have been reported overseas and 295 within Australia (Table 2). There has been a steady build-up in flag sighting reports over the six years (Table 3) in which 3,655 waders of 15 different species have been leg-flagged in South Australia. Three species received 89% of the leg-flags placed: Sanderling (1,205), Red-necked Stint (1,108) and Ruddy Turnstone (940).

Catching is undertaken by short (5 day) visits once a year by a team from Victoria, and by Maureen Christie, who lives at Carpenter Rocks in the centre of the South Australian study area. Her banding activities, which take place throughout the year, have been most successful in making our South Australian data set more comprehensive. Only the months from October to April have been covered by the annual visits of a team from Victoria. Her achievements are especially noteworthy given that she often has a cannon-netting team of only two people.

The layout of these tables differs from that of previous reports. Column 1 gives, in alphabetical order, the state for Australian sightings and the country for overseas sightings. Mainland China is considered in two parts, north and south of Shanghai; New Zealand is considered in three parts, North and South Islands and Other (e.g. Chatham Islands). The second

Table 1. All sightings of South Australian-flagged waders processed into the AWSG leg-flag database between 27 June 2004 and 31 July 2005 by species and country of sighting

Species	China (Hong Kong)	China (mainland)	China (Taiwan)	Indonesia	Japan	Korea	New Zealand	Thailand	Total Overseas	Total Australia
Sanderling	6	-	2	-	14	3	-	-	25	53
Bar-tailed Godwit	-	-	-	-	-	-	33	-	33	1
Ruddy Turnstone	5	-	5	-	1	1	4	-	16	4
Red-necked Stint	-	2	2	1	-	-	-	-	5	5
Curlew Sandpiper	3	-	-	1	-	-	-	1	5	5
Sharp-tailed Sandpiper	-	-	2	-	-	-	-	-	2	1
Total	14	2	11	2	15	4	37	1	86	69

Table 2. All sightings of South Australian-flagged waders processed into the AWSG leg-flag database as of 31 July 2005 by species and country of sighting

Species	China (Hong Kong)	China (Mainland)	China (Taiwan)	Indonesia	Japan	Korea	New Zealand	Russia	Thailand	Total Overseas	Total Australia
Sanderling	6	-	3	-	61	7	-	2	-	79	193
Red-necked Stint	3	2	3	2	2	2	-	3	-	17	46
Ruddy Turnstone	6	-	8	-	5	1	13	-	-	33	26
Curlew Sandpiper	14	-	3	1	-	-	-	-	1	19	28
Bar-tailed Godwit	-	-	-	-	-	-	33	-	-	33	1
Sharp-tailed Sandpiper	-	-	3	-	-	-	-	-	-	3	1
Total	29	2	20	3	68	10	46	5	1	184	295

Table 3. Number of sightings each year of waders flagged in South Australia as of 31 July 2005

1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
3	6	0	38	27	46	52	64	63	117	63	479.

Note. These totals include both overseas sightings and significant movements within Australia. They also include sightings of Sanderling and Ruddy Turnstone (only) flagged before 1999 with an orange flag (only) on the tarsus. Where the flag position was reported, these sightings could be distinguished from those of birds flagged in Victoria, where the orange flag was placed on the tibia.

column gives the number of sightings in this report. The third column gives the number of sightings (not the date!) in each month and year (late reporting is not unusual). The fourth column lists the names of individuals, and in some cases organisations, and the number of sightings they have been involved in. Further information on these sightings is available from the VWSG.

BAR-TAILED GODWIT *Limosa lapponica*

OVERSEAS

NEW ZEALAND - North	3	**2005:** Mar 2; Apr 1	G. Goreby (1), B. Groom (1), J. Groom (1), T. Barnard (1)
NEW ZEALAND – South	30	**2003:** Dec 1 **2004:** Oct 1; Dec 3 **2005:** Jan 3; Feb 6; Mar 10; Apr 2; May 3; Jun 1	Andrew Crossland (7), Bev Alexander (2), Blue Booth (3), Brent Stephenson (3), Colin Reid (1), David Melville (1), Don Cooper (1), Filipe Moniz (1), Gillian Vaughan (2), Ian Southey (3), Jan Walker (6), Paul Scofield (3), Peter Field (2), Phil Battley (1), Rob Schuckard (2), Scott Butcher (2), Sheila Petch (3), Sue Moore (1), Willie Cook (1)

AUSTRALIA

TASMANIA	1	**2004:** Dec 1	C. Donaghey (1), R. Donaghey (1), F. Spruzen (1), and P. Porteus (1)

All the sightings above have come from three birds flagged on 21 October 2002, and eight juveniles flagged on 23 November 2004. Clearly all these birds were on passage when banded. Most were on their way to New Zealand, but one went to Tasmania.

RUDDY TURNSTONE *Arenaria interpres*

OVERSEAS

CHINA (HONG KONG)	5	**2005:** May 5	Adrian Boyle (3); Yu Yat Tung (2)
JAPAN	1	**2003:** Aug 1	d.k.
CHINA (TAIWAN)	5	**2004:** Apr 1; Aug 3; Sep 1	Chia-Yang Tsai (1), Chung-Yu Chiang (1), Kun-Hsien Hsu (1), Taiwan Wader Study Group (2)
KOREA	1	**2005:** May 1	Park Jong-gil (1)
NEW ZEALAND – North	2	**2004:** Nov 1 **2005:** Mar 1	Phil Battley (1), Tony Habraken (1)
NEW ZEALAND – South	2	**2005:** Feb 1; Mar 1	Phil Battley (1), Sue Moore (1), Rob Schuckard (1)

AUSTRALIA

SOUTH AUSTRALIA	1	**2004:** Sep 1	John Hatch (1), John Summers (1), Jeremy Robertson (1)
TASMANIA	1	**2005:** Mar 1	Mavis Burgess (1)
WESTERN AUSTRALIA	2	**2004:** Oct 2	Adrian Boyle (1), Tim Gale (1)

This year's sightings follow the same pattern as those from previous years. Sightings on northward migration were mainly from Hong Kong (China) and on southward migration mainly from Taiwan (China). There was also a sighting on northward migration in Korea and on southward migration in Japan. Four more sightings in New Zealand reinforce previous information indicating a significant passage of turnstones through south-eastern Australia on southward migration to non-breeding areas in both the North and South Islands of New Zealand. There is also additional evidence that some birds migrating to South Australia use the area of Roebuck Bay, Broome, in north-west Australia as a stopover location.

SANDERLING *Calidris alba*

OVERSEAS

CHINA (HONG KONG)	6	**2005:** Apr 1; May 5	Adrian Boyle (4), John Allcock (1), Yu Yat Tung (1)
CHINA (TAIWAN)	2	**2003:** Aug 1 **2005:** May 1	Chuan-Cheng Wang (1), Kuo-Wei Wu (1)
JAPAN	14	**2002:** Aug 1 **2004:** Aug 11; Sep 2	Atsuyuki Genma (1), Jun Hosoya(1), Kenji Ito (1), Kenji Nakajima (1), Kenzo Tomiya(1), Kouichi Tada (1), Masamichi Ito (1), Nobuo Ando (1), Osamu Saeki (2), Seiji Takashima (2), Toshiko Ohno (1), Zenji Konno (1)
KOREA	3	**2003:** Aug 1; Sep 1 **2004:** Aug 1	Chungrok Park (3)

AUSTRALIA

SOUTH AUSTRALIA	7	**2005:** Jan 3; Feb 4	David Hulett (3), Dean Cutten (3), Ken Gosbell (3), Peter Collins (1), Roz Jessop (1)
VICTORIA	45	**2004:** Nov 1; Dec 44	Martin Schulz (42), Peter Fuller (1)
WESTERN AUSTRALIA	1	**2004:** Oct 1	Adrian Boyle (1)

This excellent crop of 25 overseas sightings of Sanderling brings to 79 the total number of overseas sightings of this species. Japan continues to dominate the list with 61 sightings, almost all of which were birds on southward migration. The three sightings in Korea were also all during southward migration. In contrast, the six sightings at Mai Po marshes in Hong Kong, and one of the sightings in Taiwan, were of birds on northward migration. This is further evidence that the northward and southward migration routes are different for this species.

The majority of the sightings of birds within Australia relate to birds which had dispersed along the coast westwards or eastwards from the banding area. A total of 42 individuals were located on 12 December 2004 when the intrepid Martin Schultz walked the full length of Discovery Bay. There is yet another record from near Broome in north-west Australia. This indicates that, as for many other small-medium sized waders coming to non-breeding areas in south-eastern Australia, that area is used for migratory stopovers.

RED-NECKED STINT *Calidris ruficollis*

OVERSEAS

INDONESIA	1	**2005:** May 1	Iwan Londo (1), Anak Burung (1)
CHINA (Mainland) - North	2	**2002:** Aug 1 **2004:** Sep 1	Paul Holt (2)
CHINA (TAIWAN)	2	**2005:** Jan 1; May 1	Chien-Ming Chu (1), Tung-Hui Kuo (1)

AUSTRALIA

SOUTH AUSTRALIA	3	**2003:** Nov 1 **2004:** Mar 2	Dean Cutten (1), Terry Dennis (2)
VICTORIA	1	**2004:** Dec 1	Bernice Cohen (1)
WESTERN AUSTRALIA	1	**2005:** May 1	Chris Hassell (1)

A rather small list of flag-sightings for this species, considering the numbers flagged. Records include birds on northward migration through Indonesia and Taiwan (China) and two birds on southward migration on the western side of the Yellow Sea in northern China. The apparent sighting of a South Australian flagged bird in January is difficult to explain, but the record seems to be genuine. Records within Australia indicate dispersal of a few birds to other locations on the South Australian coast and yet another example of a bird using Roebuck Bay, Broome, in north-west Australia as a stopover location.

SHARP-TAILED SANDPIPER *Calidris acuminata*

OVERSEAS

CHINA (TAIWAN)	2	**2004:** May 2	Taiwan Wader Study Group (1), Wen-Yin Hu (1)

AUSTRALIA

VICTORIA	1	**2004:** Feb 1	Adrian Boyle (1)

The two sightings in Taiwan (which may relate to the same bird) in early May add to our relatively meagre data on this species' migration route. The irregular movements of this species between different habitats and locations in Australia is illustrated by the movement of one bird into Western Victoria.

CURLEW SANDPIPER *Calidris ferruginea*

OVERSEAS

CHINA (HONG KONG)	3	**2005:** Apr 2; May 1	Geoff Carey (1), Yu Yat Tung (2)
INDONESIA	1	**2004:** Nov 1	Iwan Londo (1)
THAILAND	1	**2005:** Apr 1	Pornthep Katsura (1)

AUSTRALIA

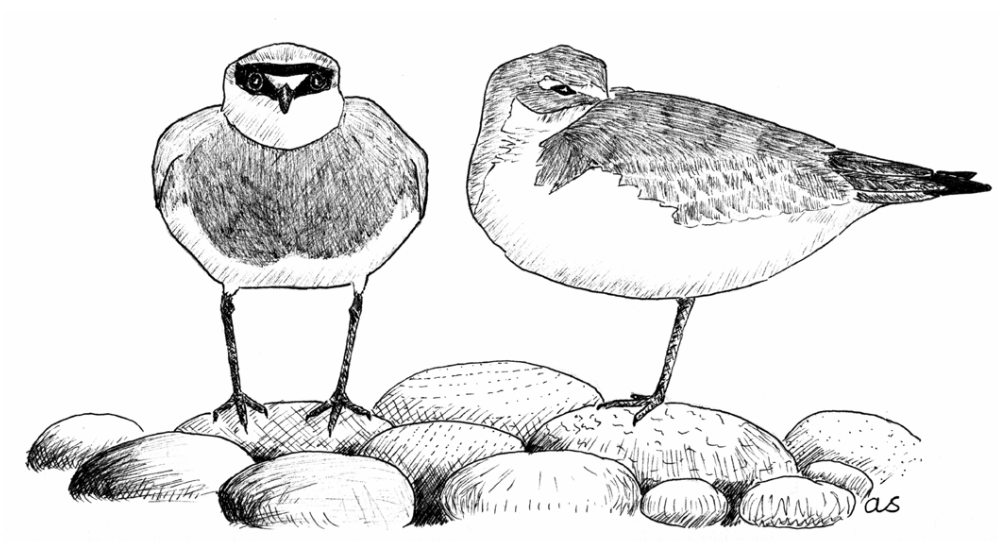
SOUTH AUSTRALIA	1	**2004:** Feb 1	Inka Veltheim (1), David Close (1)
VICTORIA	2	**2004:** Nov 1 **2005:** Jun 1	Pete Collins (1), Peter Fuller (1)
WESTERN AUSTRALIA	2	**2004:** Aug 1 **2005:** May 1	Chris Hassell (1), Broome Bird Observatory (1)

A nice collection of flag sightings for this species, which has only been caught and flagged in modest numbers in recent years. The sightings in Thailand and Indonesia are firsts for those countries for this species. The late date, 16 November, of the sighting in Indonesia may be of a bird which was still on migration, but could also indicate a surprisingly large change in non-breeding area. It is also noteworthy that the sighting in Thailand was on the relatively early date of 2 April. The three sightings in Hong Kong fit the previously established pattern of a major movement of this species through there in the second half of April and the first part of May.

The sightings in Australia portray a range of different types of movement. The bird seen at Roebuck Bay in August was probably a returning adult on southward migration. The one there on 16 May and the one at Werribee Sewage Farm in Victoria on 1 June were both first year birds in non-breeding plumage carrying out their usual, generally northward, winter wanderings. The other two records indicate birds which seem to have changed their non-breeding location.

REFERENCE

Minton, C., R. Jessop, P. Collins, M. Christie, I. Stewart & I. Veltheim. 2004. Sightings in 2003-04 of waders leg-flagged in South Australia: report number 3. The Stilt 46: 51-53.



REPORT ON POPULATION MONITORING COUNTS, 2004

JENNY SKEWES

13 Waterloo Street, Heathmont, Vic 3135, Australia

The summer and winter Population Monitoring Program (PMP) counts for 2004 are published here in the attached tables. There was very good coverage of sites at both times, particularly in the summer. The collection of these data is entirely dependent on the goodwill, fortitude and organisational skills of the great team of volunteers all over the country. This ongoing effort is greatly appreciated as it is producing a long-term data set of immense value for research and planning.

Together with the many other shorebird counts carried out at various intervals and locations, the PMP counts are entered into the AWSG Count Database. This is currently managed by Andrew Silcocks at Birds Australia. The backlog of counts which was held in paper form has now been entered into the database, and all counts sent in are added to it. More work needs to be done to identify and liaise with holders of historical and current shorebird count data which has been collected for purposes other than the PMP. The quality and usefulness of the database depends on it having the most comprehensive data set possible. At present the AWSG Count Database is being used in a project investigating the criteria for identifying nationally important shorebird sites.

I would again like to thank all the count co-ordinators and their many loyal counters who are prepared to turn out in all weathers to contribute to this very valuable long-term record. I am now handing over the job of collating these counts to Prue Wright, who will prepare the 2005 data for publication. Please send PMP counts to Prue in future. She can be contacted on email at prue27@bigpond.com. If you have any other counts which can be added to the AWSG Database, please send them to Andrew Silcocks at a.silcocks@birdsaustralia.com.au.

SUMMER 2004	QUEENSLAND					NEW SOUTH WALES						
	Cairns	Townsville	Mackay	Moreton Bay	Bowen	Tweed	Richmond	Clarence	Hunter	Parramatta R	Botany Bay	Shoalhaven
Date	11/7	11/7		11/7	11/7							
Latham's Snipe	-	-		-	-	2	-	-	-	-	-	-
Black-tailed Godwit	-	4	N	607	-	-	-	182	250		-	-
Bar-tailed Godwit	-	64	O	5743	2	-	74	276	1200	214	441	300
Little Curlew	-	-	T	-		-	-	-	-	-	-	-
Whimbrel	2	18		626	11	-	13	6	5	-	86	-
Eastern Curlew	-	33	C	1104	1	-	23	79	475	-	201	109
Marsh Sandpiper	-	8	O	82	-	-	-	-	89	-	-	-
Common Greenshank	15	6	U	191	-	-	2	6	251	1	7	-
Wood Sandpiper	-	-	N	6	-	-	-	-	-	-	-	-
Terek Sandpiper	-	3	T	10	-	-	50	-	-	-	-	-
Common Sandpiper	-	-	E	-	-	-	-	16	-	1	-	-
Grey-tailed Tattler	-	93	D	558	-	-	55	25	-	-	103	-
Wandering Tattler	-	-		-	-	-	-	-	-	-	-	-
Tattler Spp	-	-		-	-	-	-	-	-	-	-	-
Ruddy Turnstone	-	-		22	-	-	31	-	-	-	23	-
Great Knot	-	4305		785	-	-	13	70	5	-	1	1
Red Knot	-	-		8	-	-	-	-	3	-	-	3
Sanderling	-	-		-	-	-	46	1	-	-	-	-
Red-necked Stint	437	465		7488	-	-	71	-	93	-	194	200
Pectoral Sandpiper	-	-		-	-	-	-	-	-	-	-	-
Sharp-tailed Sandpiper	41	2		318	-	-	-	6	562	261	-	30
Curlew Sandpiper	51	-		1398	-	-	39	-	350	21	9	-
Red-necked Phalarope	-	-		-	-	-	-	-	-	-	-	-
Bush Stone-curlew	-	-		-	-	-	-	-	-	-	-	-
Beach Stone-curlew	-	1		-	-	-	-	-	-	-	1	-
Pied Oystercatcher	-	15		377	6	-	10	4	15	-	61	6
Sooty Oystercatcher	-	-		2	-	-	3	-	1	-	9	-
Black-winged Stilt	-	-		162	13	34	11	-	92	144	4	-
Banded Stilt	-	-		-	-	-	-	-	-	-	-	-
Red-necked Avocet	-	-		60	-	-	-	-	23	2	-	-
Pacific Golden Plover	-	-		822	-	-	57	86	3	4	31	180
Grey Plover	-	1		55	-	-	-	-	-	-	-	-
Red-capped Plover	6	36		357	-	-	4	7	4	-	9	40
Double-banded Plover	-	-		-	-	-	-	2	-	-	-	12
Lesser Sand Plover	110	49		1711	-	-	5	-	-	-	2	-
Greater Sand Plover	18	7		122	-	-	40	-	-	-	-	-
Oriental Plover	-	-		-	-	-	-	-	-	-	-	-
Black-fronted Dotterel	-	-		-	-	3	-	-	4	10	1	-
Hooded Plover	-	-		-	-	-	-	-	-	-	-	-
Red-kneed Dotterel	-	-		1	-	-	-	-	-	3	-	-
Banded Lapwing	-	-		-	-	-	-	-	-	-	-	-
Masked Lapwing	-	2		55	4	7	20	22	72	22	9	-
Long-toed Stint	-	-		-	-	-	-	-	-	-	-	-
Redshank	-	-		-	-	-	-	-	-	-	-	-
Broad-billed Sandpiper	3	-		1	-	-	-	-	-	-	-	-
Ruff	-	-		-	-	-	-	-	-	-	-	-
Swinhoe's Snipe	-	-		-	-	-	-	-	-	-	-	-
Asian Dowitcher	-	-		-	-	-	-	-	-	-	-	-
Oriental Pratincole	-	-		-	-	-	-	-	-	-	-	-
Unidentified small	-	-		-	-	-	-	-	-	-	-	-
Unidentified medium	-	-		-	-	-	-	-	-	-	-	-
Unidentified large	-	-		-	-	-	-	-	-	-	-	-
TOTAL	683	5112		22671	37	46	567	788	3497	683	1192	881
No. SPECIES	9	18		27	6	4	19	15	19	11	18	10

SUMMER 2004	VICTORIA							TASMANIA			
	Corner Inlet East	Corner Inlet West	Westernport	East Port Phillip	Altona	Wrrbee/Avalon	BellarinePen/ Mud Is	E Derwent/ Pittwater	Marion & Blackman Bays	North West	Cape Portland/ NNE
Date	2/3	4/2	21/2	20/2	16/2	16/2	4/2	8/2	7/2	24/1	4/2
Latham's Snipe	-	-	-	21	-	-	64	-	-	-	-
Black-tailed Godwit	-	-	-	-	-	6	-	-	-	-	-
Bar-tailed Godwit	10648	20	358	-	-	-	162	58	-	418	14
Little Curlew	-	-	-	-	-	-	-	-	-	-	-
Whimbrel	4	3	34	-	-	-	-	2	-	-	4
Eastern Curlew	569	182	594	-	-	1	97	90	-	183	40
Marsh Sandpiper	-	-	-	-	87	27	36	-	-	-	-
Common Greenshank	72	-	207	13	13	58	286	52	-	125	19
Wood Sandpiper	-	-	-	-	1	1	-	-	-	-	-
Terek Sandpiper	-	-	-	-	-	-	3	-	-	-	-
Common Sandpiper	-	-	-	-	-	-	-	-	-	-	-
Grey-tailed Tattler	-	-	1	-	-	1	-	-	-	4	-
Wandering Tattler	-	-	-	-	-	-	-	-	-	-	-
Tattler Spp	-	-	-	-	-	-	-	-	-	-	-
Ruddy Turnstone	20	-	81	-	-	2	3	-	-	1176	23
Great Knot	50	-	-	-	-	-	-	-	-	26	34
Red Knot	2501	-	10	-	-	-	64	-	-	273	-
Sanderling	20	-	-	-	-	-	-	-	-	-	-
Red-necked Stint	16210	-	8903	10	4100	7555	11061	2208	212	13882	237
Pectoral Sandpiper	-	-	-	1	-	-		-	-	-	-
Sharp-tailed Sandpiper	-	-	480	50	512	1612	2462	-	-	110	1
Curlew Sandpiper	102	-	2260	-	230	2226	1745	170	-	1959	29
Red-necked Phalarope	-	-	-	-	-	-	-	-	-	-	-
Bush Stone-curlew	-	-	-	-	-	-	-	-	-	-	-
Beach Stone-curlew	-	-	-	-	-	-	-	-	-	-	-
Pied Oystercatcher	738	116	328	-	-	46	56	942	18	1183	85
Sooty Oystercatcher	156	244	2	-	-	-	2	15	2	281	38
Black-winged Stilt	-	-	-	7	39	330	420	-	-	-	-
Banded Stilt	-	-	-	-	450	923	4426	-	-	-	-
Red-necked Avocet	-	-	-	-	341	558	3	-	-	-	-
Pacific Golden Plover	-	-	24	-	54	10	26	25	-	273	23
Grey Plover	300	30	-	-	-	-	120	-	-	308	-
Red-capped Plover	-	-	186	7	12	73	264	65	30	90	21
Double-banded Plover	40	-	36	11	-	4	4	-	-	16	2
Lesser Sand Plover	-	-	-	-	-	-	-	-	-	2	-
Greater Sand Plover	-	-	-	-	-	-	-	-	-	-	-
Oriental Plover	-	-	-	-	-	-		-	-	-	-
Black-fronted Dotterel	-	-	-	25	1	10	7	-	-	-	-
Hooded Plover	2	-	-	-	-	-	10	2	2	27	2
Red-kneed Dotterel	-	-	-	-	-	2	4	-	-	-	-
Banded Lapwing	-	-	-	-	-	-	-	-	-	-	-
Masked Lapwing	-	7	221	138	45	233	840	426	97	67	78
Long-toed Stint	-	-	-	-	-	-	-	-	-	-	-
Redshank	-	-	-	-	-	-	-	-	-	-	-
Broad-billed Sandpiper	-	-	-	-	-	-	-	-	-	-	-
Ruff	-	-	-	-	-	-	-	-	-	-	-
Swinhoe's Snipe	-	-	-	-	-	-	-	-	-	-	-
Asian Dowitcher	-	-	-	-	-	-	-	-	-	-	-
Oriental Pratincole	-	-	-	-	-	-	-	-	-	-	-
Unidentified small	-	-	-	-	-	-	-	-	-	-	-
Unidentified medium	-	-	-	-	-	-	-	-	-	-	-
Unidentified large	-	-	-	-	-	-	-	-	-	-	-
TOTAL	31432	602	13725	283	5885	13678	22165	4055	361	20403	650
No. SPECIES	15	7	16	10	13	20	24	12	6	19	16

SUMMER 2004	SA			WA				NT	Total
	SE coast SA	Gulf St Vincent	Eyre peninsula	Albany	Swan Est/ Rottnest	80 Mile (km 10-30)	Broome	Darwin	All sites
Date	10/2					7/12	8,9/12	23/11	
Latham's Snipe	-			-	-	-	-	-	87
Black-tailed Godwit	-	N	N	-	-	-	2120	130	3299
Bar-tailed Godwit	6	O	O	32	14	20020	16635	120	56819
Little Curlew	-	T	T	-	-	1155	15	-	1170
Whimbrel	1			5	1	1	100	2	924
Eastern Curlew	-	C	C	-	-	34	460	1	4276
Marsh Sandpiper	-	O	O	1	-	-	-	-	330
Common Greenshank	17	U	U	24	18	395	166	4	1948
Wood Sandpiper	-	N	N	-	-	-	-	-	8
Terek Sandpiper	-	T	T	-	-	2945	1840	1	4852
Common Sandpiper	1	E	E	1	10	-	19	1	49
Grey-tailed Tattler	5	D	D	17	2	6695	807	21	8387
Wandering Tattler	-			-	-	-	-	-	0
Tattler Spp	-			-	-	-	-	-	0
Ruddy Turnstone	454			7	236	55	387	14	2534
Great Knot	-			-	-	18115	11071	3000	37476
Red Knot	-			3	-	680	1102	50	4697
Sanderling	-			304	98	122	1	28	620
Red-necked Stint	1937			1105	1261	7945	3899	68	89541
Pectoral Sandpiper	-			-	-	-	-	-	1
Sharp-tailed Sandpiper	54			-	2	1	4	6	6514
Curlew Sandpiper	86			-	-	495	1829	2	13001
Red-necked Phalarope	-			-	1	-	-	-	1
Bush Stone-curlew	-			-	-	-	-	-	0
Beach Stone-curlew	-			-	-	-	-	-	2
Pied Oystercatcher	4			83	81	6	48	4	4232
Sooty Oystercatcher	2			8	-	-	28	-	793
Black-winged Stilt	-			-	106	-	218	-	1580
Banded Stilt	-			4	7617	-	-	-	13420
Red-necked Avocet	-			-	17	-	-	-	1004
Pacific Golden Plover	56			13	-	3	28	-	1718
Grey Plover	-			53	47	216	130	3	1263
Red-capped Plover	29			4	193	2020	912	2	4371
Double-banded Plover	-			-	-	-	-	-	127
Lesser Sand Plover	-			-	2	1	49	-	1931
Greater Sand Plover	-			65	2	9340	4334	682	14610
Oriental Plover	-			-	-	30	305		335
Black-fronted Dotterel	-			-	-	-	-	-	61
Hooded Plover	-			-	-	-	-	-	45
Red-kneed Dotterel	-			-	-	-	-	-	10
Banded Lapwing	-			-	37	-	-	-	37
Masked Lapwing	70			-	-	-	-	1	2436
Long-toed Stint	-			-	-	-	-	-	0
Redshank	-			-	-	-	-	-	0
Broad-billed Sandpiper	-			-	-		101	-	105
Ruff	-			-	-	-	-	-	0
Swinhoe's Snipe	-			-	-	-	-	-	0
Asian Dowitcher	-			-	-		1	-	1
Oriental Pratincole	-			-	-		40	-	40
Unidentified small	-			-	-	-	-	-	0
Unidentified medium	-			-	-	-	-	-	0
Unidentified large	-			-	-	-	-	-	0
TOTAL	2722			0	0	70274	46649	4140	273181
No. SPECIES	14			0	0	21	28	20	42

WINTER 2004	QUEENSLAND						NEW SOUTH WALES						
	Cairns	Townsville	Mackay	Moreton Bay	Bowen		Tweed	Richmond	Clarence	Hunter	Parramatta R	Botany Bay	Shoalhaven
Date			24/7	24/7				4/6		5/6	5/6	5/6	31/5
Latham's Snipe			-	-			-	-		-	-	-	-
Black-tailed Godwit			-	77			-	-		1	-	-	-
Bar-tailed Godwit			-	586			-	37		115	48	70	112
Little Curlew			-	-			-	-		-	-	-	-
Whimbrel	N	N	-	367	N		-	9	N	53	-	17	-
Eastern Curlew	O	O	5	287	O		-	9	O	68	-	25	3
Marsh Sandpiper	T	T	-	-	T		-	-	T	-	-	-	-
Common Greenshank			4	22			-	-		15	-	-	-
Wood Sandpiper	C	C	-	-	C		-	-	C	-	-	-	-
Terek Sandpiper	O	O	-	-	O		-	-	O	-	-	1	-
Common Sandpiper	U	U	-	-	U		-	-	U	-	-	-	-
Grey-tailed Tattler	N	N	28	183	N		-	9	N	-	-	18	-
Wandering Tattler	T	T	-	-	T		-	-	T	-	-	-	-
Tattler Spp	E	E	-	-	E		-	-	E	-	-	-	-
Ruddy Turnstone	D	D	-	-	D		-	4	D	-	-	4	-
Great Knot			-	5			-	-		3	-	-	-
Red Knot			-	1			-	-		4	-	-	-
Sanderling			-	-			-	-		-	-	-	-
Red-necked Stint			-	195			-	20		2	-	30	-
Pectoral Sandpiper			-	-			-	-		-	-	-	-
Sharp-tailed Sandpiper			-	1			-	-		-	-	-	-
Curlew Sandpiper			-	13			-	-		-	-	-	-
Bush Stone-curlew			14	-			-	-		-	-	-	-
Beach Stone-curlew			-	1			-	-		-	-	-	-
Pied Oystercatcher			3	49			-	10		14	-	60	4
Sooty Oystercatcher			-	-			-	-		3	-	7	-
Black-winged Stilt			-	1059			8	44		294	68	12	-
Banded Stilt			-	-			-	-		-	-	-	-
Red-necked Avocet			-	39			-	-		680	1	-	-
Pacific Golden Plover			-	1			-	-		-	-	-	-
Grey Plover			-	-			-	-		-	-	-	-
Red-capped Plover			16	111			-	5		19	8	14	211
Double-banded Plover			-	124			-	43		-	-	58	19
Lesser Sand Plover			-	27			-	-		-	-	-	-
Greater Sand Plover			-	16			-	-		-	-	-	-
Oriental Plover			-	-			-	-		-	-	-	-
Black-fronted Dotterel			-	5			1	-		7	48	2	-
Hooded Plover			-	-			-	-		-	-	-	-
Red-kneed Dotterel			-	12			-	-		1	-	-	-
Banded Lapwing			-	-			-	-		-	-	-	-
Masked Lapwing			2	30			6	21		68	19	2	-
Long-toed Stint			-	-			-	-		-	-	-	-
Redshank			-	-			-	-		-	-	-	-
Broad-billed Sandpiper			-	-			-	-		-	-	-	-
Ruff			-	-			-	-		-	-	-	-
Swinhoe's Snipe			-	-			-	-		-	-	-	-
Asian Dowitcher			-	-			-	-		-	-	-	-
Australian Pratincole			-	-			-	-		-	-	-	-
Unidentified small			-	6			-	-		-	-	-	-
Unidentified medium			-	-			-	-		-	-	-	-
Unidentified large			-	-			-	-		-	-	-	-
TOTAL			72	3217	0	0	15	211	0	1347	192	320	349
No. SPECIES			7	24	0	0	3	11	0	16	6	14	5

WINTER 2004	VICTORIA								TASMANIA			
	Corner Inlet East	Corner Inlet West	Westernport	East Port Phillip	Altona	Wrrbee/Avalon	BellarinePen/ Mud Is		E Derwent/ Pittwater	Marion & Blackman Bays	North West	Cape Portland/ NNE
Date	2/7	19/7	17/7	27/6	16/7	16/7	~17/7		16/7	23/7	3/7	
Latham's Snipe	-	-	-	-	-	-	-		-	-	-	
Black-tailed Godwit	-	-	-	-	-	-	7		-	-	-	
Bar-tailed Godwit	-	500	-	-	-	-	23		18	-	-	
Little Curlew	-	-	-	-	-	-	-		-	-	-	N
Whimbrel	4	5	-	-	-	-	-		-	-	-	O
Eastern Curlew	30	71	83	-	-	-	33		10	-	2	T
Marsh Sandpiper	-	-	-	-	-	1	-		-	-	-	
Common Greenshank	-	14	2	-	-	6	20		3	-	-	C
Wood Sandpiper	-	-	-	-	-	-	-		-	-	-	O
Terek Sandpiper	-	-	1	-	-	-	-		-	-	1	U
Common Sandpiper	-	-	-	-	-	-	-		-	-	-	N
Grey-tailed Tattler	-	-	-	-	-	-	-		-	-	-	T
Wandering Tattler	-	-	-	-	-	-	-		-	-	-	E
Tattler Spp	-	-	-	-	-	-	-		-	-	-	D
Ruddy Turnstone	-	-	7	-	-	-	6		-	-	39	
Great Knot	-	-	-	-	-	-	8		-	-	4	
Red Knot	-	200	13	-	-	-	105		-	-	38	
Sanderling	-	-	-	-	-	-	-		-	-	-	
Red-necked Stint	1543	1359	1659	3	410	848	1287		440	281	2373	
Pectoral Sandpiper	-	-		-	-	-	-		-	-	-	
Sharp-tailed Sandpiper	-	-	10	-	-	1	2		-	-	1	
Curlew Sandpiper	-	15	52	-	-	60	1		-	-	100	
Bush Stone-curlew	-	-	-	-	-	-	-		-	-	-	
Beach Stone-curlew	-	-	-	-	-	-	-		-	-	-	
Pied Oystercatcher	433	85	-	-	-	32	60		879	116	1454	
Sooty Oystercatcher	134	171	-	-	-	-	2		45	-	310	
Black-winged Stilt	-	-	-	170	31	180	281		-	-	-	
Banded Stilt	-	-	-	-	-	-	-		-	-	-	
Red-necked Avocet	-	-	156	-	156	153	130		-	-	-	
Pacific Golden Plover	-	-	-	-	-	-	-		-	-	-	
Grey Plover	40	-	-	-	-	-	3		-	-	-	
Red-capped Plover	3	-	110	3	75	159	220		105	42	183	
Double-banded Plover	240	300	304	-	128	208	98		33	65	1721	
Lesser Sand Plover	-	-	-	-	-	-	-		-	-	-	
Greater Sand Plover	-	-	-	-	-	-	-		-	-	-	
Oriental Plover	-	-	-	-	-	-	-		-	-	-	
Black-fronted Dotterel	-	-	-	-	-	36	20		-	-	-	
Hooded Plover	9	-	-	-	-	-	8		-	-	68	
Red-kneed Dotterel	-	-	-	-	-	11	14		-	-	-	
Banded Lapwing	-	-	-	-	-	-	-		-	-	-	
Masked Lapwing	2	6	53	62	2	86	287		20	41	52	
Long-toed Stint	-	-	-	-	-	-	-		-	-	-	
Redshank	-	-	-	-	-	-	-		-	-	-	
Broad-billed Sandpiper	-	-	-	-	-	-	-		-	-	-	
Ruff	-	-	-	-	-	-	-		-	-	-	
Swinhoe's Snipe	-	-	-	-	-	-	-		-	-	-	
Asian Dowitcher	-	-	-	-	-	-	-		-	-	-	
Australian Pratincole	-	-	-	-	-	-	-		-	-	-	
Unidentified small	-	-	-	-	-	-	-		-	-	-	
Unidentified medium	-	-	-	-	20	-	-		-	-	-	
Unidentified large	-	-	-	-	-	-	-		-	-	-	
TOTAL	2438	2726	2450	238	822	1781	2615	0	1553	545	6346	0
No. SPECIES	10	11	12	4	7	13	21	0	9	5	14	0

WINTER 2004	SA				WA					NT	Total
	SE coast SA	Gulf St Vincent	Eyre peninsula		Albany	Swan Est/ Rottnest	80 Mile (km 10-30)	Broome		Darwin	All Sites
Date	13,14/7				Jun	Jun	16/7	17/7		24/7	
Latham's Snipe	-				-	-	-	-		-	0
Black-tailed Godwit	-				-	-	-	-		-	85
Bar-tailed Godwit	-				8	-	2990	-		7	4514
Little Curlew	-				-	-	-	-		-	0
Whimbrel	1	N	N		1	-	6	-		2	465
Eastern Curlew	-	O	O		-	-	28	-		-	654
Marsh Sandpiper	-	T	T		-	-	-	-		-	1
Common Greenshank	-				-	1	32	-		8	127
Wood Sandpiper	-	C	C		-	-	-	-		-	0
Terek Sandpiper	-	O	O		-	-	895	-		-	898
Common Sandpiper	-	U	U		-	-	-	-		14	14
Grey-tailed Tattler	-	N	N		-	-	680	5		11	934
Wandering Tattler	-	T	T		-	-	-	-		-	0
Tattler Spp	-	E	E		-	-	-	-		-	0
Ruddy Turnstone	2	D	D		-	-	10	11		-	83
Great Knot	-				15	-	1350	-		3	1388
Red Knot	-				10	-	-	-		-	371
Sanderling	-				-	-	1	-		5	6
Red-necked Stint	88				21	126	3915	5		20	14625
Pectoral Sandpiper	-				-	-	-	-		-	0
Sharp-tailed Sandpiper	36				-	-	-	-		-	51
Curlew Sandpiper	-				-	1	50	3		-	295
Bush Stone-curlew	-				-	-	-	-		-	14
Beach Stone-curlew	-				-	-	-	-		-	1
Pied Oystercatcher	22				105	38	-	-		2	3366
Sooty Oystercatcher	10				8	-	-	-		1	691
Black-winged Stilt	-				-	35	-	-		8	2190
Banded Stilt	-				-	9	-	-		-	9
Red-necked Avocet	-				-	-	-	-		-	1315
Pacific Golden Plover	-				-	-	-	-		2	3
Grey Plover	-				-	8	45	-		-	96
Red-capped Plover	80				-	23	60	-		26	1473
Double-banded Plover	81				-	-	-	-		-	3422
Lesser Sand Plover	-				-	-	2			1	30
Greater Sand Plover	-				-	2	1310	7		645	1980
Oriental Plover	-				-	-	-	-		-	0
Black-fronted Dotterel	-				-	-	-	-		-	119
Hooded Plover	8				-	-	-	-		-	93
Red-kneed Dotterel	-				-	-	-	-		-	38
Banded Lapwing	-				-	22	-	-		-	22
Masked Lapwing	28				-	-	-	-		41	828
Long-toed Stint	-				-	-	-	-		-	0
Redshank	-				-	-	-	-		-	0
Broad-billed Sandpiper	-				-	-	-	-		-	0
Ruff	-				-	-	-	-		-	0
Swinhoe's Snipe	-				-	-	-	-		-	0
Asian Dowitcher	-				-	-	-	-		-	0
Australian Pratincole	-				-	-	-	-		9	9
Unidentified small	-				-	-	-	-		-	6
Unidentified medium	-				-	-	-	-		-	20
Unidentified large	-				-		-	-		-	0
TOTAL	356	0	0	0	168	265	11374	31	0	805	40236
No. SPECIES	10	0	0	0	7	10	15	5	0	17	37

EDITORIAL TEAM

Editor: Ken Rogers
340 Ninks Road, St Andrews North, 3761. Vic., AUSTRALIA.
Ph: 03-9710 1345.
email: kenrogers@hotkey.net.au

Assistant Editor: Phil Straw
P.O. Box 2006, Rockdale Delivery Centre, NSW 2216, AUSTRALIA.
Ph and fax: 02-9597 7765.
email: pstraw@optusnet.com.au

Production Editor: Dr Andrew Dunn
14 Clitus St, Glen Waverley, 3150. Vic., AUSTRALIA.
Ph: 03-9545 0440
email: amdunn@melbpc.org.au

Regional Literature Compilation: Clinton Schipper
2 Orchard Dve, Croydon, 3136. Vic., AUSTRALIA.
Ph: 03-9725 3368.

Indexing: Hugo Phillipps.

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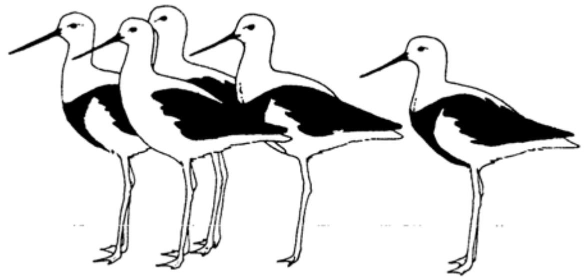
The closing dates for submission of material are **1 March** and **1 September** for the April and October editions respectively. **Extensions to these dates must be discussed with the Editor.** Contributors of research papers and notes are encouraged to submit well in advance of these dates to allow time for refereeing. Other contributors are reminded that they will probably have some comments to consider, and possibly incorporate, at some time after submission. It would be appreciated if this could be done promptly.



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