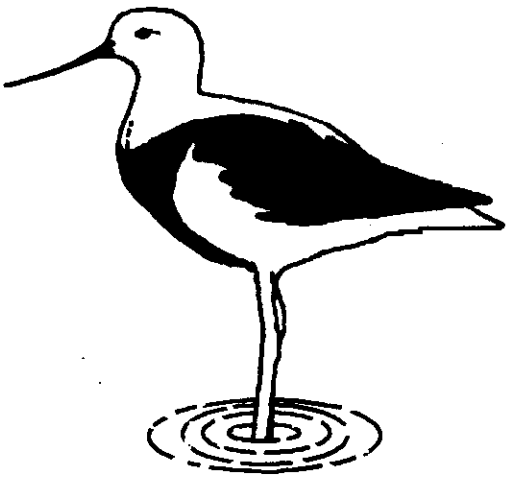
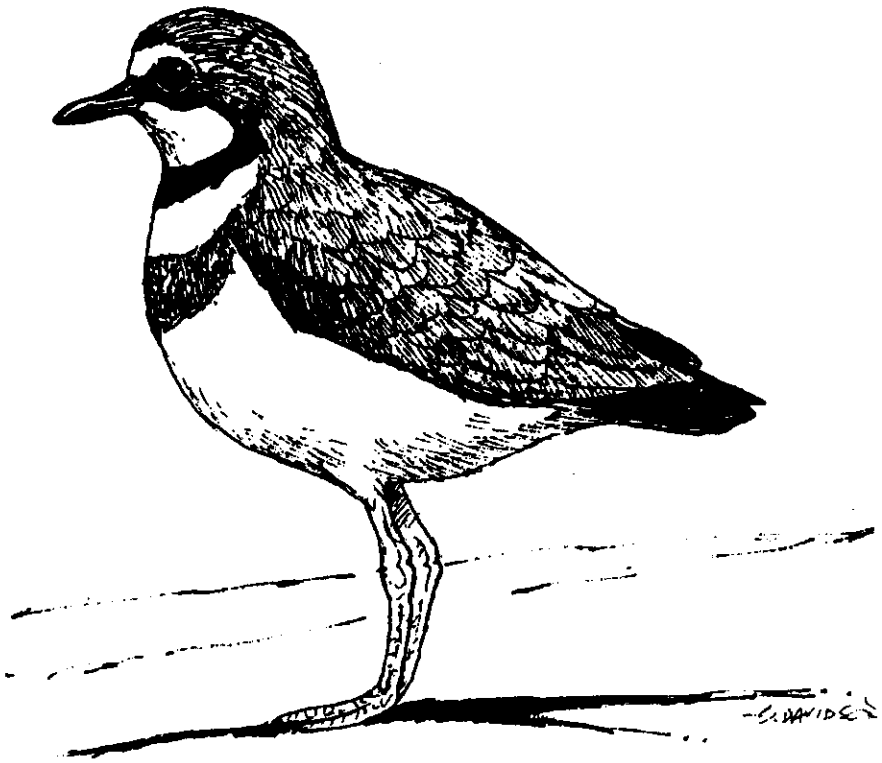
The Stilt



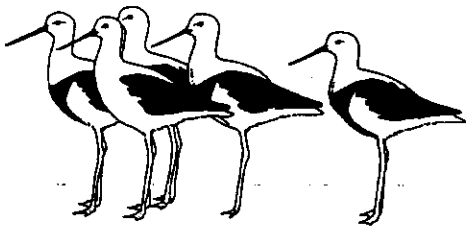
The Bulletin of the East Asian-Australasian Flyway



Australasian Wader Studies Group

A special interest group of Birds Australia

Number 39
July 2001



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.
Email: membership@raou.com.au

Annual Subscriptions:		
	Australia	A$30.00
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Cover Illustration: Stephen Davidson

EDITORIAL

I hope you enjoy the large, extra issue of *Stilt* that has been brought about by the increasing number of manuscripts submitted to the bulletin since late-2000. This is a very good situation for the AWSG to be in and I hope will continue. The standard of material being submitted has steadily improved and I feel this has contributed to the increased rate of submissions. We do not plan to publish other extra issues as the added burden on the editorial staff (Andrew Dunn and I) can not be sustained. Until this year, authors could reasonably expect to have material submitted by the published deadlines (inside back cover) published in the next issue. This may no longer be the case. The AWSG is constrained to a maximum of 72 pages per issue of *The Stilt* by mailing weight restrictions. We already have almost enough material in hand for a full October issue.

In this issue are some important articles that explore key issues for AWSG and waders in the East Asian-Australasian Flyway. Following two consultancies (1997 and 2000) that reviewed the AWSG's Population Monitoring Project (PMP) for Environment Australia (EA), Jim Wilson's perspective on the PMP as AWSG chair highlights the value of the program and offers a balanced argument of its current strengths and limitations. The AWSG committee endorsed Jim's views of the practical way forward and I hope the program can be widened and enhanced with support from EA. Mark Barter continues his excellent series of articles on wader counts in northeastern China that have greatly improved our understanding of the critical stopover sites in the Flyway. Unfortunately, recognizing their importance is only the first step in the process. Much work needs to be done to ensure that waders and their habitats throughout the Flyway become secure. Before we can achieve this, we must have a thorough understanding of the distribution and abundance of most species. This can only be done through continual monitoring of representative sites. This is why the PMP is so highly valuable as its one of the longest-term data sets of wader counts in the Flyway and Jim has attempted to highlight this in his article.

Finally, I would like to express my regret at the resignation of Jim Wilson as the chair of AWSG. I feel that the group has taken new and positive steps forward under his leadership. The future has the potential to be very bright through many of the initiatives Jim has set in place. During his time in Australia, Jim has also tried to unlock some of the important bits of information stored in the enormous unpublished AWSG database. I hope this trend will continue in the future by building on these recent efforts. I wish him every success when he returns to employment in Norway and hope he finds the time and motivation to continue his studies of waders in the East Asian-Australasian Flyway.

David Milton

WORDS FROM THE DEPARTING CHAIR

The annual committee meeting on 9 June marked the end of my three years in the Chair. By the time you read this I will have migrated north to my home in Norway. When I took this position I came to - as we say in Norway - a fully laid table. The group was already in good order and well run by an excellent team. I just had to add a few items to the menu. The Editor of *Stilt*, David Milton, has kindly given me the opportunity to write a few parting words, and in doing so I would like to look to the future.

There are now exciting new developments in the group. The web site is running. This I had always envisaged as an active web site, which in the future could be the site for the Flyway. Two new databases are being developed - one for the flagging and one for the counting. The flag database will enable electronic reporting of flag sightings through the web site, simplify the management of the sightings, and enable easy analysis. The count database will have enormous potential for instant analysis of the Population Monitoring Project, updates of population estimates and instant access to information on wader sites throughout Australia. The period of consultation over the Population Monitoring Project is now over, and we feel we can now move forward to rejuvenate and expand the project.

There is still much for the AWSG to do. Asia lies on our doorstep with large parts still not sufficiently explored for waders, and there have been plans for privately financed trips there. The first two took place in April and May this year. There are quite a few people who would like to take a holiday with the waders. There is also a huge backlog of data that needs analysis. There must be efforts to increase the counting programs. We need constantly to define our goals and how to achieve them. We need to think up new ideas and hypothesis and examine old ones.

I would like to thank the team who run the AWSG. Being Chair has been an interesting and stimulating experience (to put it mildly) far beyond my expectations. It has been all the more pleasurable because of the enthusiasm and dedication of the people one works with. I will leave many good friends behind in Australia. The committee presented me with a complete bound set of the Stilt just to make sure I had some bed-time reading, for which I thank them. They also asked me to retain, at least for the time being, the position of Scientific Coordinator, so you have not quite got rid of me yet!

I wish Ros Jessop all the best with taking over the position of the Chair.

Jim Wilson

The Stilt **39 (2001)**: 2–9 *Research*

SHOREBIRD NUMBERS ON THE TIANJIN MUNICIPALITY COAST IN MAY 2000

M.A. Barter[1], Z.W. Li[2] and J.L. Xu[3]

[1] 21 Chivalry Avenue, Glen Waverley, Vic 3150 AUSTRALIA (Email: markbarter@optusnet.com.au)
[2] Wetlands International, Grand Forest Hotel, 19A Bei Sanhuan Zhonglu Road, Beijing 100029 PRC
[3] College of Life Sciences, Beijing Normal University, Beijing, PRC

ABSTRACT

A count of shorebirds was conducted along the coastline of Tianjin Municipality, and the adjacent salt and shrimp ponds between 10 and 14 May 2000. A total of 73 553 shorebirds of 31 species were counted. The ten most common species being Red Knot, Curlew Sandpiper, Grey Plover, Dunlin, Red-necked Stint, Great Knot, Sharp-tailed Sandpiper, Marsh Sandpiper, Bar-tailed Godwit and Asian Dowitcher. Eight species of shorebird were present in internationally important numbers. Three Australian leg-flagged birds were seen. This is the first site in the five-year old programme of Yellow Sea coastal surveys at which large numbers of Red Knot, Curlew Sandpiper, Sharp-tailed Sandpiper and Asian Dowitcher have been recorded. It is believed that the Municipality could support more than 100 000 shorebirds during the northward migration period.

INTRODUCTION

Little is known about the importance for shorebirds of the coastal mud flats of much of north eastern China. During the last three years, students from the Biology Department at Beijing Normal University (BNU) have been conducting a water bird survey of the sub-coastal wetlands of Tianjin Municipality. During this period they have recorded 23 shorebird species, including internationally important concentrations of Eurasian Curlew, Spotted Redshank, Common Redshank, Common Greenshank, Black-winged Stilt, Pied Avocet, Northern Lapwing, Kentish Plover and Oriental Pratincole (BNU unpub. data).

Two adjacent coastal sites in Hebei Province, one to the north-east (Nanbao Marshes) and one to the south (Nanda Gang Marshes) are mentioned in Scott (1989) as being important staging posts for migratory shorebirds, but no count data are available.

Further to the north-east at Shi Jiu Tuo (Happy Island), about 100 km from Tanggu, internationally important numbers of Eurasian Curlew, Eastern Curlew, Common Redshank, Marsh Sandpiper, Asian Dowitcher, Great Knot, Red Knot, Eurasian Oystercatcher, Black-winged Stilt, Pied Avocet, Northern Lapwing, Grey Plover and Kentish Plover have been recorded by visiting bird watchers (B. Peterson, S. Cherrug, J.Hornskov, F. Heintzenberg, all pers. comm.).

Counts in the Huang He delta in the extreme southeastern part of Bohai Wan, some 150 km from Tanggu, have shown that this region is an extremely important staging site for shorebirds, with probably 250 000 birds passing through on northward migration. The delta is internationally important for at least nineteen shorebird species (Barter *et al.* 1998, 1999; Zhu *et al.* 2000).

The aim of the study was to expand on the shorebird coverage of the Beijing Normal University by surveying the coastal intertidal areas in Tianjin Municipality.

STUDY AREA

The self-governing Tianjin Municipality, with an area of 11,305 km^2 and a population of more than 9M, is located on the north-west coast of Bohai Wan, the westernmost part of Bo Hai (Fig. 1). The Municipality includes the city of Tianjin, several large economic development zones and the seaport of Tanggu at the mouth of Hai He. An oil field is located in the SE coastal area. The region is the largest industrial centre of north China and handles a major share of the region's export and import trade through Tanggu. The Municipality is bordered by Hebei Province to the north, west and south, and Beijing Municipality to the north west.

The coastal area is about 100 km long and is flat and low lying. The intertidal mud flats range from about 1-2 km in width and are backed by very extensive saltpans and shrimp ponds for most of their length. A number of large rivers flow through the Municipality into Bohai Wan, including the Hai He and Jiyun He.

The region has a continental climate with cold, dry winters and hot, humid summers. The average temperature in January is -4° C and in July is 26° C. Annual rainfall varies from 550 to 650 mm, with 75% falling in the summer months.

METHODS

Counting was conducted over a five-day period, from 10 to 14 May, and focused on the coastal mud flats and some of the inland saltpans and shrimp ponds. We generally counted shorebirds in the inland areas as we drove through these on the way to and from the coast. But on one occasion, we surveyed an area of saltpans on foot. It is difficult to estimate what proportion of the pans

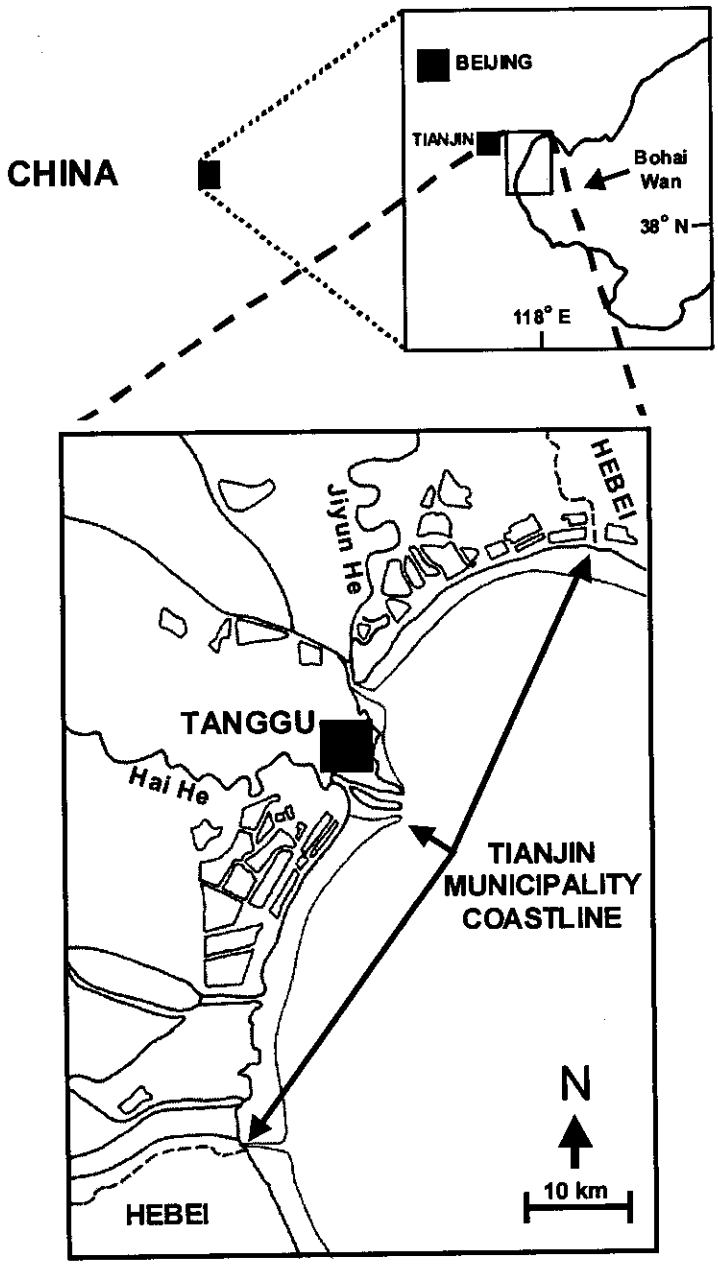

Figure 1. Location of the Tianjin Municipality coastline in northeastern China.

and ponds were covered but it is unlikely to have exceeded 10% of the total.

The coastline was split into three sections, A, B and C (Fig. 2), with the shore length counted being approximately 80 km. About 20 km of coast between sections B and C was not surveyed. This area, which is adjacent to the port city of Tanggu, is highly altered and disturbed. Vehicle access to Sections A and B was good and these were counted on the first day. We then counted section C, where access was not as good, over a period of three days. The saltpans and ponds behind section B and Beidagang Reservoir were surveyed on the morning of the final day.

Tides were generally favourable with high water changing from about 07:13 to 12:21 h over the count period (Fig. 3). Counting started in the early morning and normally extended to mid-afternoon. The tidal range was around 3 m during the survey. High tides reached the sea wall on all days. Birds formed pre-high tide roosts as the tide front approached the sea wall and then moved into the adjacent saltpans and shrimp ponds as the mud flats were covered. As the tide fell they returned to the mud flats and commenced feeding, often quickly moving considerable distances along the receding tide edge. Birds were counted both as they formed pre-roosting flocks and when they returned to the mud flats

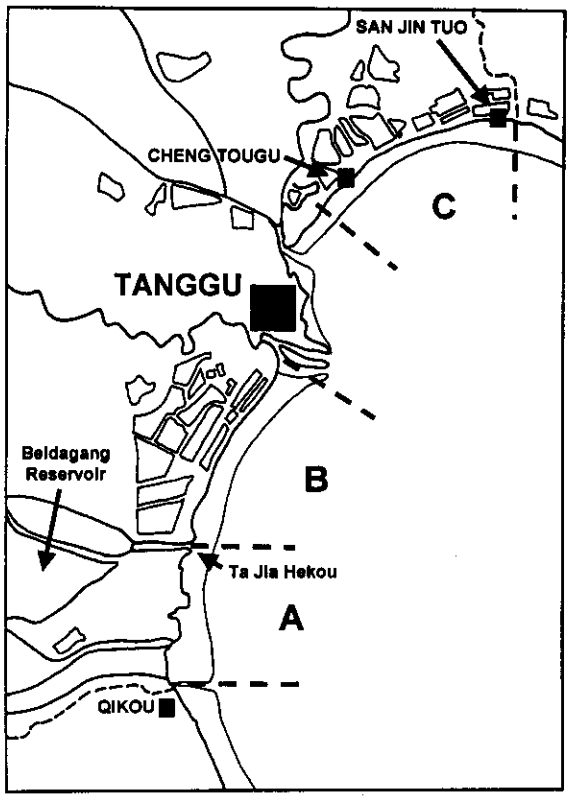

Figure 2. Locations of count sections undertaken along the coast of Tianjin Municipality from 10 to 14 May 2000.

as the tide fell. Generally, only a relatively small fraction of the birds present on the mud flats before high tide could be located roosting in the ponds and pans behind the sea wall.

Counts in the saltpans and shrimp ponds were conducted during the low tide period and it is probable that these birds were spending all, or most, of their time in this habitat. It is unlikely that there was significant duplication with those counted on the mud flats.

The general accuracy of counts is believed to be reasonable, although no check counts were carried out. Any errors would tend to lead to an underestimate of shorebird numbers. Appropriate corrections were made to counts when birds moved between adjacent sections.

Weather conditions throughout the period were good for counting with generally mild, sunny conditions and light winds.

The 1% criteria from WIO (2000) (based mainly on Rose and Scott 1997) were used to determine whether a species was present in internationally significant numbers. The exception was Grey Plover for which a criterion of 1,000 (vs. 250) was employed, as it is believed this more accurately reflects the actual flyway population number

RESULTS

A list of the English and scientific names of all species identified is shown in Table 1. Count data for individual species are listed by section in Table 2.

Numbers and general distribution

A total of 73 553 shorebirds of 31 species was counted during the survey. This number included 16 667 unidentified shorebirds (23% of the total count). Although large numbers of birds occurred in each of the three coastal sections, almost 50% of those counted on mud flats were found in section C, which was the least disturbed area.

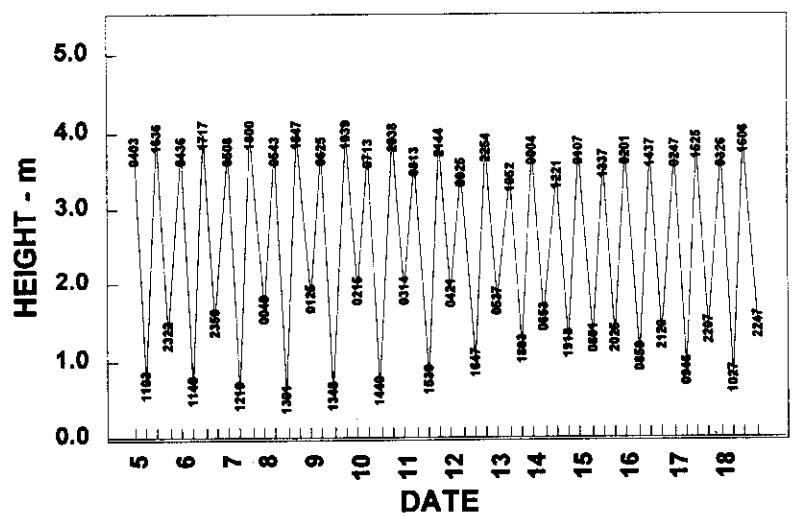

Figure 3. Heights and times of high and low tides at Tanggu 39° 00' N 117° 43' E during the period from 5 to 18 May, 2000.

Table 1. Common and scientific names of shorebird species mentioned in this report.

Common name	Scientific name
Black-tailed Godwit	*Limosa limosa*
Bar-tailed Godwit	*Limosa lapponica*
Whimbrel	*Numenius phaeopus*
Eurasian Curlew	*Numenius arquata*
Eastern Curlew	*Numenius madagascariensis*
Spotted Redshank	*Tringa erythropus*
Common Redshank	*Tringa totanus*
Marsh Sandpiper	*Tringa stagnatilis*
Common Greenshank	*Tringa nebularia*
Wood Sandpiper	*Tringa glareola*
Terek Sandpiper	*Xenus cinereus*
Common Sandpiper	*Actitis hypoleucos*
Ruddy Turnstone	*Arenaria interpres*
Asian Dowitcher	*Limnodromus semipalmatus*
Great Knot	*Calidris tenuirostris*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Red-necked Stint	*Calidris ruficollis*
Long-toed Stint	*Calidris subminuta*
Sharp-tailed Sandpiper	*Calidris acuminata*
Dunlin	*Calidris alpina*
Curlew Sandpiper	*Calidris ferruginea*
Broad-billed Sandpiper	*Limicola falcinellus*
Eurasian Oystercatcher	*Haematopus ostralegus*
Black-winged Stilt	*Himantopus himantopus*
Pied Avocet	*Recurvirostra avosetta*
Northern Lapwing	*Vanellus vanellus*
Pacific Golden Plover	*Pluvialis fulva*
Grey Plover	*Pluvialis squatarola*
Kentish Plover	*Charadrius alexandrinus*
Lesser Sand Plover	*Charadrius mongolus*
Greater Sand Plover	*Charadrius leschenaultii*
Oriental Pratincole	*Glareola maldivarum*

The total counted in the saltpans and shrimp ponds (14 409) is particularly noteworthy, especially as only a small fraction of these were visited. Almost all the birds in this habitat type were located behind section C.

Individual species numbers and distribution

The ten most common species counted were Red Knot (14 277 individuals – 25.1% of identified birds), Curlew Sandpiper (12 489 – 22.0%), Grey Plover (6 493 – 11.4%), Dunlin (4 980 - 8.8%), Red-necked Stint (4 285 – 7.5%), Great Knot (3 610 – 6.3%), Sharp-tailed Sandpiper (2 855 – 5.0%), Marsh Sandpiper (2 425 - 4.3%), Bar-tailed Godwit (2 321 – 4.1%) and Asian Dowitcher (966 – 1.7%). These ten species represented 96% of the identified shorebirds.

The incomplete coverage of inland sites will probably have caused significant underestimation of the numbers of those species which use the salt pan/shrimp pond habitat, such as Black-tailed Godwit, Spotted Redshank, Marsh Sandpiper, Common Greenshank, Wood Sandpiper, Asian Dowitcher, Red-necked Stint, Sharp-tailed Sandpiper and Curlew Sandpiper.

Eight species of shorebird were present in internationally important numbers: Marsh Sandpiper, Asian Dowitcher, Great Knot, Red Knot, Sharp-tailed Sandpiper, Curlew Sandpiper, Grey Plover and Lesser Sand Plover. The distributions of these species are shown in Figs. 4 and 5.

It can be seen that Great and Red Knots and Grey and Lesser Sand Plovers occur almost exclusively on the mud flats. Great Knots distinctly prefer section C, Red Knots occur mainly in sections A and C, Grey Plovers are ubiquitous, whilst Lesser Sand Plovers concentrate in section B. Marsh and Sharp-tailed Sandpipers show a distinct preference for the inland habitats behind section C. Asian Dowitcher and Curlew Sandpiper occurred in large numbers in both habitat types, mostly in or close to section C.

Breeding Black-winged Stilt were seen in Beidagang Reservoir, and Oriental Pratincole, which were probably breeding, were also observed in the same area.

Three leg-flagged birds were seen amongst many thousands of shorebirds scanned for flags. They comprised one Red-necked Stint from north-western Australia and two Curlew Sandpipers from south-eastern Australia.

DISCUSSION

The most noteworthy feature of the count is the very large numbers of Red Knot, Curlew Sandpiper, Sharp-tailed Sandpiper and Asian Dowitcher recorded. This is the first region surveyed during the last five years of counts around the Yellow Sea coastline to hold large numbers of these species. The significance of the counts is demonstrated by the fact that during the previous four years, despite a cumulative count of close to 500 000 shorebirds, only 4 611 Red Knot, 73 Curlew Sandpiper, 379 Sharp-tailed Sandpiper and 16 Asian Dowitcher had been recorded.

Very few individuals of these four species are seen in South Korea (Yi and Kim in prep.) or Japan (JAWAN 1999). Thus, it is likely that Curlew Sandpiper, Sharp-tailed Sandpiper and Asian Dowitcher are following an inland migration route through China, with the Bohai Wan coast lying on the most easterly part of flight path.

The situation with Red Knot, an obligate coastal species, is not so clear. It seems that this species could be using the very extensive mud flats of the west coast of North Korea. If this is so, it may be mirroring the behaviour of its congeners elsewhere in showing a distinct preference for concentrating at a very limited number of staging sites during migration. It is believed that there are two populations of Red Knots in the East Asian-Australasian

Table 2. The number of shorebirds counted in each section (see Fig. 2) of the Tianjin Municipality coast from 10 to 14 May 2000. *Misc.* includes all birds counted away from the mudflats, the great majority of which were in saltpans and shrimp ponds. *Percentage identified* is the species count as a fraction of the total number of birds identified. *Int. Imp.* = Internationally Important; *Criterion* is the 1% portion of the estimated flyway population that determines site international importance.

Species	SECTION			Misc.	TOTAL	Percentage identified	Int. Imp.	Criterion (1%)
	A	B	C					
Snipe sp.				4	4	<0.1		
Black-tailed Godwit				234	234	0.4		
Bar-tailed Godwit	210	1 646	465		2 321	4.1		
Whimbrel	73	1	37	15	126	0.2		
Eurasian Curlew		15	37		52	0.1		
Eastern Curlew			26		26	<0.1		
Curlew sp.	114		140		254	0.4		
Spotted Redshank				24	24	<0.1		
Common Redshank				7	7	<0.1		
Marsh Sandpiper		17		2 408	2 425	4.3	X	900
Common Greenshank	21	37	42	190	290	0.5		
Wood Sandpiper	2			293	295	0.5		
Terek Sandpiper	7		17	7	31	0.1		
Common Sandpiper				6	6	<0.1		
Ruddy Turnstone				32	32	0.1		
Asian Dowitcher	140		244	582	966	1.7	X	180
Great Knot		384	3 226		3 610	6.3	X	3 200
Red Knot	6 160	146	7 958	13	14 277	25.1	X	2 000
Sanderling		2			2	<0.1		
Red-necked Stint	698	2 188		1 399	4 285	7.5		
Long-toed Stint				1	1	<0.1		
Sharp-tailed Sandpiper			910	1 945	2 855	5.0	X	1 700
Dunlin	2 670	860	1 250	200	4 980	8.8		
Curlew Sandpiper		1 734	4 290	6 465	12 489	22.0	X	2 500
Broad-billed Sandpiper				124	124	0.2		
Black-winged Stilt				44	44	0.1		
Pied Avocet				3	3	<0.1		
Pacific Golden Plover				2	2	<0.1		
Grey Plover	2 230	3 151	1 096	16	6 493	11.4	X	1 000
Kentish Plover	88	103	2	68	261	0.5		
Lesser Sand Plover	5	310	31	11	357	0.6	X	350
Greater Sand Plover				1	1	<0.1		
Oriental Pratincole				9	9	<0.1		
Unidentified shorebirds	5 800	1 500	9 061	306	16 667			
SITE TOTALS	18 218	12 094	28 832	14 409	73 553			

Flyway, one breeding on the New Siberian Islands and the other much further east on the Chukotka Peninsular (P. Tomkovich pers. comm.), and it seems that the Tianjin birds are more likely to be heading for the former breeding area.

Three counts at the Huang He delta spread over the northward migration period show that individual shorebird species stage at different times (Zhu *et al.* 2000). In particular, Black-tailed Godwit, Eurasian and Eastern Curlews, and Kentish Plover pass through the delta during April, with relatively few birds of these species occurring in May. All four species occurred at Tianjin during the count, but it seems probable that many more would have been present earlier in the migration period. Beijing Normal University count data confirm that Eurasian Curlew and Kentish Plover occur in internationally important numbers in the hinterland. Dunlin numbers are also comparatively low compared to other counts in the Yellow Sea region and perhaps the sub-species occurring in the Bohai Wan area has mostly passed through by mid-May.

It seems probable that the Tianjin Municipality coastline could be supporting in excess of 100,000 shorebirds on northward migration. This figure is calculated by making allowance for the early migrants missed during this survey, the limited coverage of the inland ponds, and the fact that 20 km of mud flats in the Tanggu area were not surveyed. The large numbers of shorebirds counted during this survey, and at other sites around the Yellow Sea (Barter *et al.* 1998, 1999, 2000a, 2000b, 2000c; Zhu *et al.* 2000), continue to provide convincing evidence that the intertidal mud flats of the northern Yellow Sea are the final coastal staging region for many shorebird

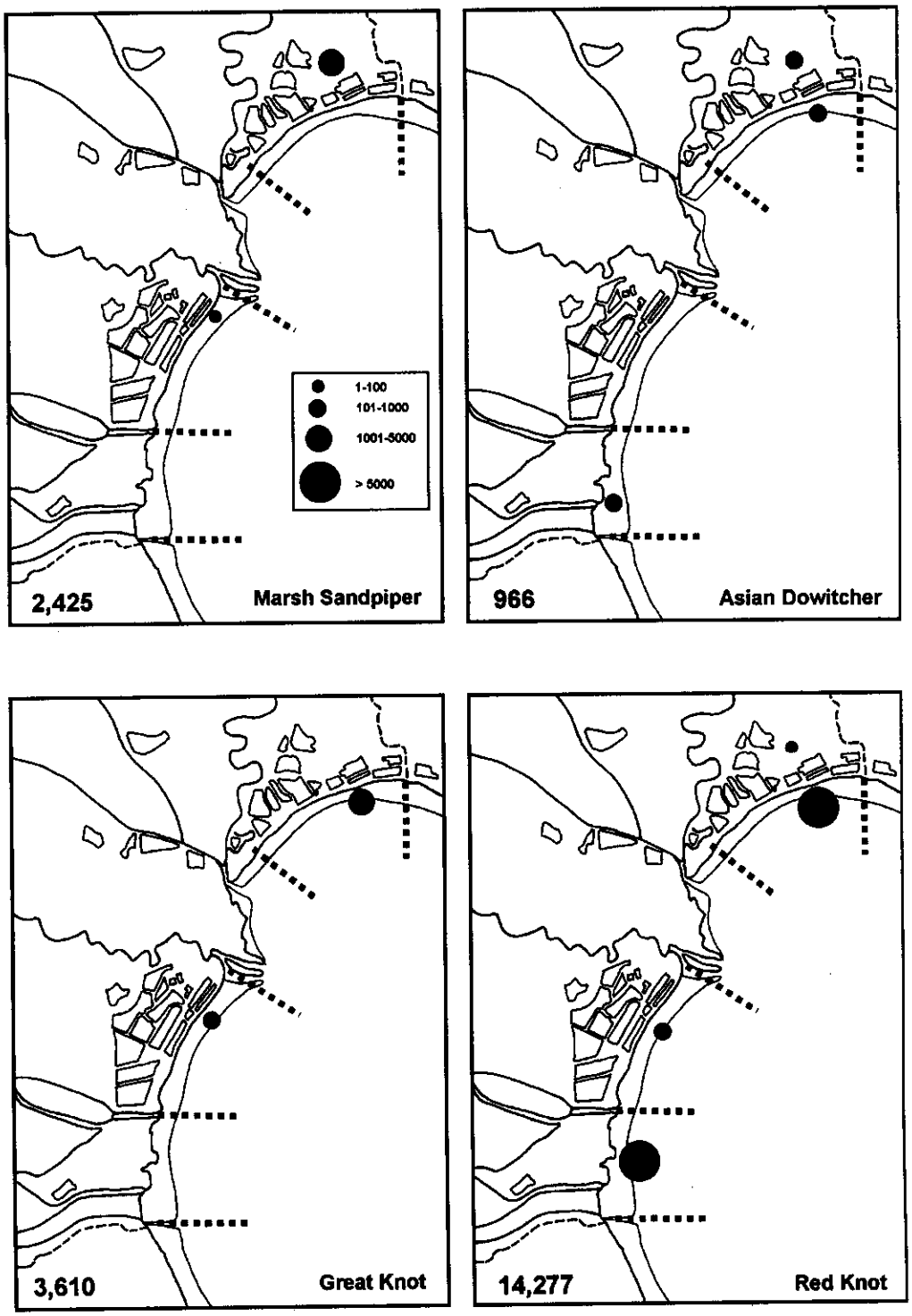

Figure 4. Distribution and numbers of Marsh Sandpiper, Asian Dowitcher, Great Knot and Red Knot

species on northward migration in the East Asian-Australasian Flyway (Wilson & Barter 1998).

The data from this and the Beijing Normal University surveys show that the coastal and inland wetlands of the Municipality support internationally important numbers of seventeen shorebird species. This very high level of species diversity is due to the wide variety of shorebird habitats in the region.

It is very important that more information on shorebird numbers and distribution be obtained so that satisfactory estimates of total and individual species numbers passing through the Tianjin Municipality coastline can be made. This will involve surveys being conducted earlier during

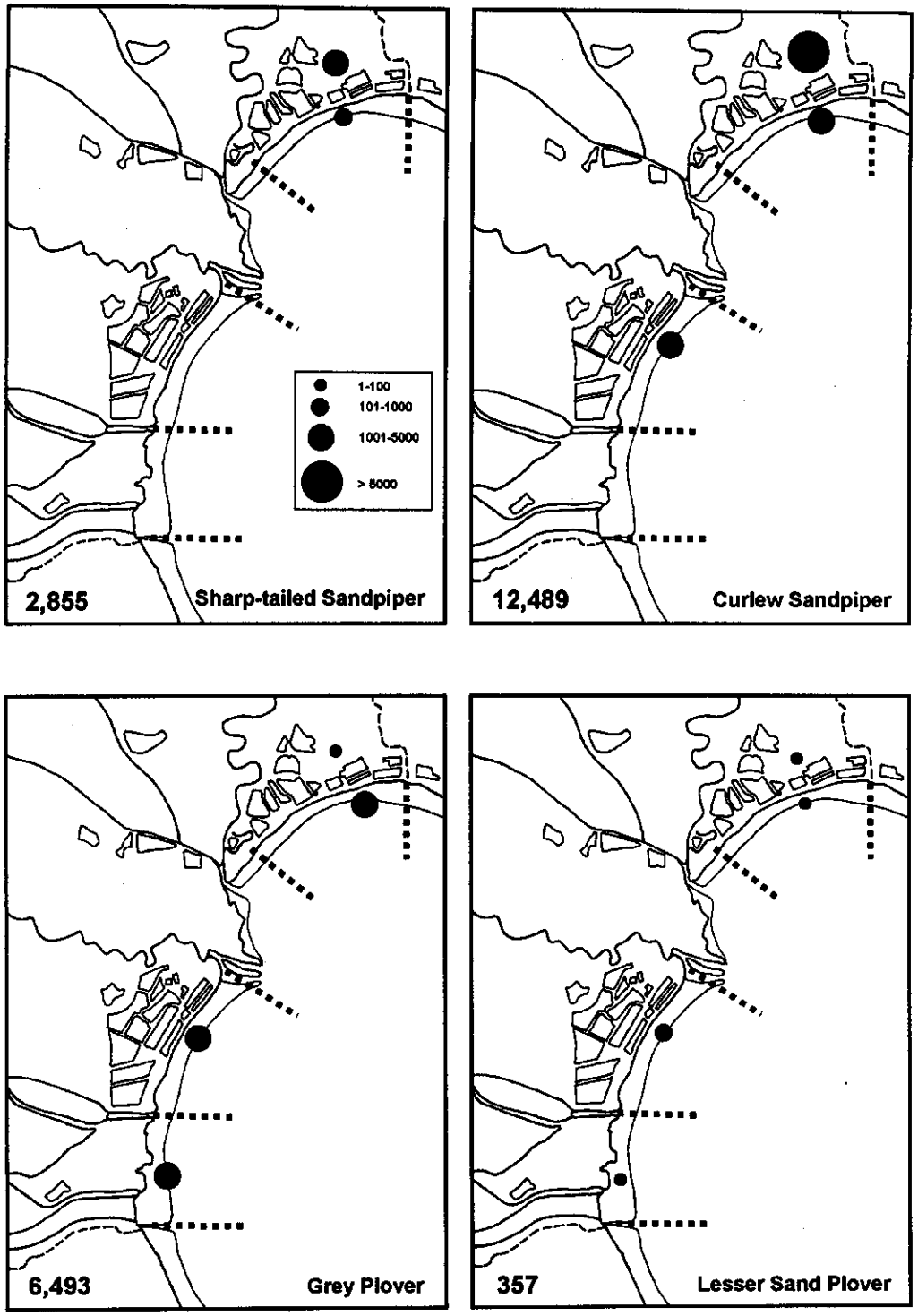

Figure 5. Distribution and numbers of Sharp-tailed Sandpiper, Curlew Sandpiper, Grey Plover and Lesser Sand Plover

northward migration and during the whole of the southward migration period. Improved coverage of the inland areas is necessary. Such additional information would almost certainly lead to an increase in the estimate of total numbers and the number of internationally significant species using the area.

Past reclamation of mudflats for port and industrial development, roads, oil extraction, saltpans and aquaculture has been extensive and is continuing (pers. obs.). It is highly desirable that the Municipality Government and local industry be advised of the importance of the region for feeding and roosting migratory shorebirds and the need for them to plan

activities and developments to minimise disturbance to the birds.

The majority of shorebirds occur in section C, which is currently the least disturbed area. The planned extension of the highway from section B along the sea wall in section C will lead to greatly increased disturbance and probably a reduction in mud flat area, both of which are likely to adversely affect shorebird numbers.

Direct human disturbance of shorebirds on the mud flats occurs along the whole coastline, but is particularly severe in section B where extensive shell fishing occurs (pers. obs.). The harvesting of large quantities of shellfish could affect the availability of food for shorebirds either by the direct removal of prey or by severe disturbance of sediments affecting shellfish productivity. Disturbance of feeding shorebirds by shell fishermen could also affect food intake rates. It is possible that the intensive shell fishing activity in section B is the reason why this region of the coast has the least number of shorebirds. A study of the shell fishing industry and its effects on shorebirds is desirable.

Humans can have a major impact on birds roosting in the saltpans and shrimp ponds. At this stage of their migration, birds are not only putting on nutrient stores (fat) for their long flight into the breeding grounds but also additional stores to sustain them during the period immediately after arrival, when feeding conditions may be poor. Serious disturbance of roosting birds will cause them to consume these valuable reserves whilst they are flying around. It may also affect their ability to reach the breeding grounds and breed successfully. Thus, it is very important that roost disturbance be minimised at this critical time in the annual life cycle.

ACKNOWLEDGEMENTS

Zhang Shupin, Biology Department of Beijing University, provided useful advice on access to wetland areas, as well as making the University's count data available. We thank Environment Australia for providing the funding to cover participants' travel and accommodation costs through its financial support of the Shorebird Action Plan.

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ARRIVAL AND DEPARTURE DATES AND HABITAT OF LITTLE CURLEW *NUMENIUS MINUTUS* AT BROOME, NORTH -WESTERN AUSTRALIA

Peter Collins[1] and Rosalind Jessop[1]

Broome Bird Observatory, PO Box 1313, Broome WA 6725 AUSTRALIA
[1]*Current Address:* Phillip Island Nature Park, PO Box 97, Cowes Vic 3922 AUSTRALIA

ABSTRACT

Little Curlew use the northern areas of Australia as an over-wintering ground. Up until now, few details have been published about their behaviour and other aspects of their biology. Little Curlew are one of the few migratory species to utilise urban grassed areas. The earliest Little Curlew arrived in Broome was 4 September, but most birds arrive in the third week of September. Departure of Little Curlew from Broome commenced during the last week in March and the latest record of a flock in the Broome area was the 15 April.

INTRODUCTION

Most Little Curlew *Numenius minutus* spend their non-breeding season in northern Australia (Crossman 1910, McGill 1960, Crawford 1972, Garnett & Minton 1985, Collins 1995) and southern New Guinea (Irian Jaya) (McKean *et al.* 1986) with a few scattered records of small parties and individuals in the south of Australia (Thomas 1970, Blakers *et al.* 1984). They have been seen on passage in Japan, Philippines and eastern Indonesia (Higgins & Davies 1996), and most recently were seen in large numbers (13,500), in the area of the Huang He delta in China on northward migration (Barter *et al.* 1999).

METHODS

The study was undertaken in Broome in the south-west Kimberley division of Western Australia (17° 58' S, 122° 14' E). Arrival and departure dates were analysed from the Broome Bird Observatory daily bird log (BBO unpublished data) (March 1988-March 1995). The observatory keeps a detailed record of sightings from the immediate area around Broome. Information is most comprehensive for those areas most frequently visited - the Observatory, Broome town, Roebuck Bay and the southern area of Roebuck Plains Station. Lakes Eda and Campion on Roebuck Plains Station, Coconut Well, the Broome Water Treatment Plant (BWTP), Barred and Willie Creeks (to the north of Broome) are also covered on a less regular basis and records are correspondingly less complete (Fig. 1). Little information is available for some areas during the wet season due to difficulty of access. Rainfall figures were supplied by Bureau of Meteorology at Broome (Fig. 2).

RESULTS

Arrival and departure dates

The earliest arrival date recorded for Little Curlew at Broome was 4 September, but birds generally arrived in the third week of September (Fig. 2) (BBO unpublished data). Numbers gradually build up to maximum in late October before decreasing during November and December (Fig. 2).

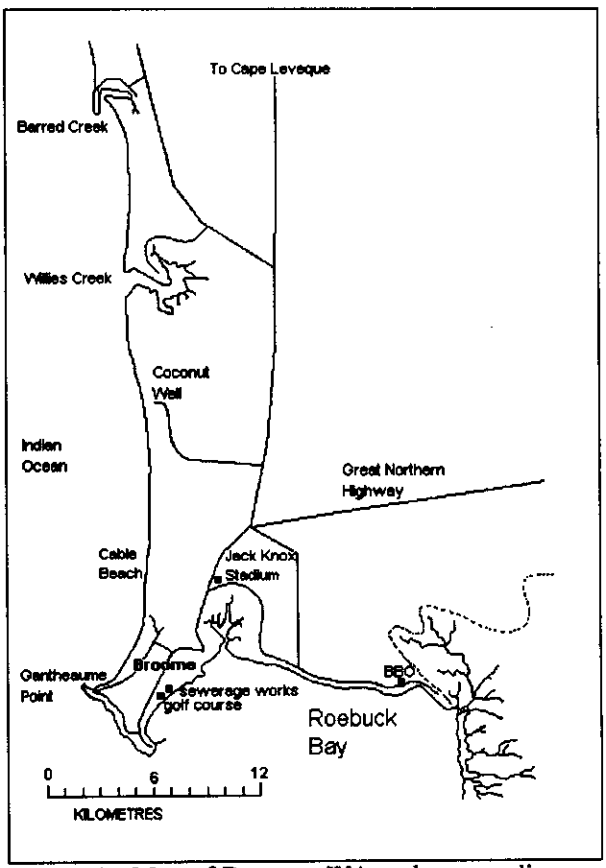

Figure 1. Map of Broome, WA and surrounding areas showing sites visited to monitor Little Curlew numbers.

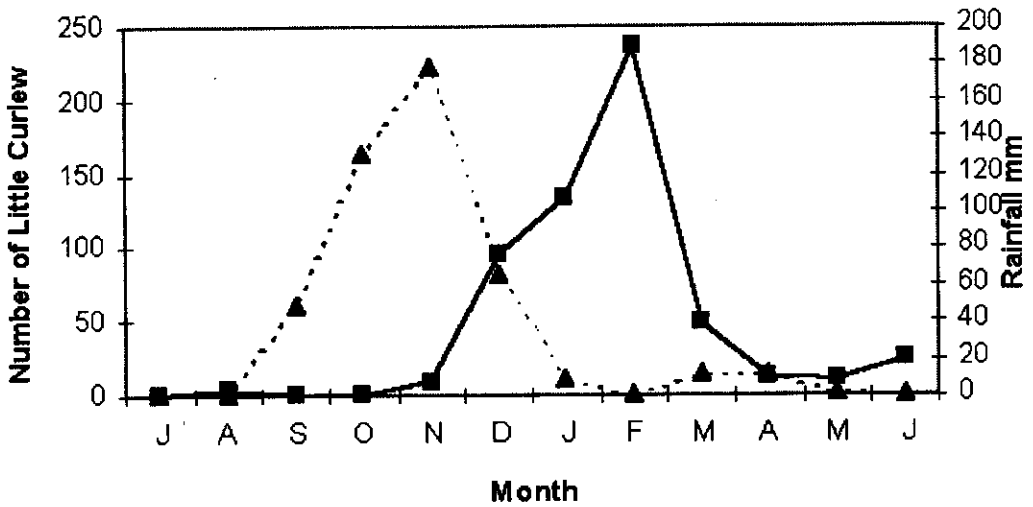

Figure 2. The relationship between rainfall and numbers of Little Curlew in the Broome area (dotted line represents the mean number of Little Curlew seen each month (1988-1995) and solid line the mean rainfall per month (1988 to 1995).

Observations of Little Curlew before departure from Broome on northward migration in late March to early April are more variable. In some years, when rainfall extends into this period, few birds are seen.

DISCUSSION

This arrival dates for Little Curlew in Broome is similar to those for birds arriving in the Darwin area of the Northern Territory (McKean *et al.* 1986). This indicates that birds in Broome probably arrive directly from New Guinea or another staging place, rather than via Darwin and dispersing around the coast as suggested by Bamford (1990).

On arrival, small flocks, of up to 60 birds (Collins 1995), were seen on the mudflats in Roebuck Bay. The majority of observations were made in Broome township with birds utilising modified grassed areas, including nature strips (verges), lawns, ovals, Broome Golf Course (all under irrigation), the grassed area around the airstrip and the Jack Knox Stadium. Few observations have been made of Little Curlew on Roebuck Plains at this time. As there have been no observations of Little Curlew feeding on the mudflats, presumably they use this habitat as a safe resting area before moving out onto feeding areas - similar observations have been noted for Oriental Plover (pers. obs.). In wet years, birds have not been recorded on the beach but the reasons for this are unclear. Occasionally Little Curlew roost on the beach during the day in extremely hot weather.

The majority of Little Curlew disperse from Broome township just before the onset of the first heavy rains of the wet season (Fig. 2). The trigger for this movement is not known but it is likely to be a combination of inaccessibility of food sources, lack of suitable food (Crawford 1978) and possibly a lack of suitable areas for roosting. Birds may move inland into drier areas that have freshwater sources. Observations supporting this idea are: 6,000 Little Curlew seen at Taylors Lagoon on 9 January 1996 (Collins *et al.* 2001); small numbers of birds seen feeding on artificial grassed areas at Cape Leveque (northern end of the Dampier Peninsula); and several small parties (maximum number 11) seen drinking and bathing at freshwater mound springs near Lombadina Mission (Dampier Peninsula) in late November, immediately following the first major thunderstorms of the wet season.

Visible departures of Little Curlew from Broome have been made only once when a flock of 3,000 was seen leaving to the north-west on the 30 March 1984 (Garnett & Minton 1985). Pre-migratory flocks have been noted at Lake Eda on 29 March 1990, the area by the Jack Knox Stadium on 4 April 1990 and again at Lake Eda on 30 March 1994. The latest record for a medium sized flock is 150 on the shore of Roebuck Bay on 15 April 1988 (BBO log).

There are very few plausible records of Little Curlew in the Broome area for the dry season that indicates that the entire population departs from Broome and probably from Australia (Blakers *et al.* 1984). Records from the Broome area at this time generally refer to solitary individuals apparently unable to undergo the rigours of lengthy migration, perhaps because of sickness or injury. Other reports from this period have not been included due to insufficient supporting evidence and have probably been mistakenly identified.

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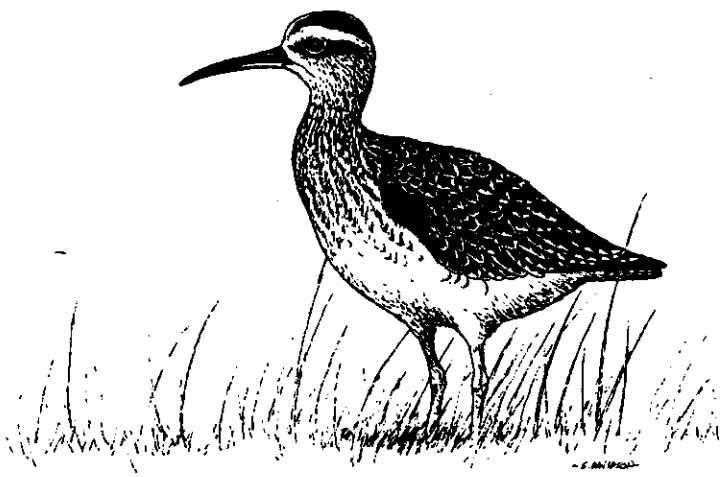

THE AUSTRALASIAN WADER STUDIES GROUP POPULATION MONITORING PROJECT: WHERE TO NOW ? PERSPECTIVES FROM THE CHAIR

J.R. Wilson

13/27 Giles St, Kingston ACT 2604 AUSTRALIA

ABSTRACT

The history, objectives and methods of the AWSG Population Monitoring Project (PMP) are described. Results of monitoring since 1981 of selected species from Victoria and southeastern Tasmania are given as examples to show what the PMP can achieve and to highlight some of its weaknesses and limitations. Recommendations are made as to how the PMP methods and administration can be improved.

THE HISTORY OF THE POPULATION MONITORING PROJECT

The population monitoring project (PMP) of the AWSG can be divided into three phases. It evolved from the RAOU (now Birds Australia) wader counting project that took place from 1981 to 1985. The initial aim of that project was to detect changes in numbers of waders in local areas, by counting as many areas as possible on a twice-yearly basis, and to monitor whole populations of waders. The Australian National Parks and Wildlife Service (ANPWS) funded the project from 1983 to 1985. Mapping the total distribution and numbers of waders in Australia then became the main focus. For most of the five year period there was a paid organizer. This first phase resulted in two major publications (Lane 1987, Watkins 1993).

After the end of funding, the second phase of the PMP began when it was decided that wader monitoring should be continued in February and June for a further 5 years at 23 selected core sites. These sites had been counted since 1981 under the first phase of the PMP. Marilyn Hewish ran this phase on a voluntary basis from the summer of 1986 to winter 1990. At the same time, from 1985 to 1990, the AWSG ran a regular counts project, also under voluntary administration. Sites were counted at regular intervals (mostly monthly) to measure population changes through the year (Alcorn *et al.* 1994). Marilyn Hewish wrote frequent and useful analysis of some results from the PMP for *Stilt*, covering the period from 1981 to 1990 (Hewish 1986, 1987a,b, 1988, 1989a,b, 1990a,b).

At the end of this ten-year period, it was decided to continue monitoring and the project then entered its third phase with Luke Naismith as organizer from summer 1991 to winter 1993. Ken Harris followed him and took over in October 1993. Ken ran the project up to the end of 2000, when it was temporally taken over by Jim Wilson. During this phase additional sites were added to the project. The characteristic of the third phase was that there was no analysis. Ken Harris said when he took on the role of administrator that he would only organize the counts and collect the data. Only the count totals have been reported in *Stilt*.

In 1995, Peter Driscoll was contracted by Environment Australia to analyse the results of the project since its start in 1981 (Driscoll 1997). The report highlighted several problems with the project, including the statistical reliability of the counts and the limited coverage within Australia. Environment Australia then organized a workshop in Canberra in November 1998 to draw up a brief for a consultancy to study some of the problems highlighted by Peter Driscoll. George McKay was contracted in 1999 as the consultant. His brief required him "to develop, document and test a repeatable method, including statistical and logistical procedures, for generating indices of abundance of migratory shorebird species, with associated estimates of variance, based on counts by skilled amateur observers." The focus was to be on migratory species that had at least 50% of their population in Australia in the non-breeding season and with at least 80% of their populations in coastal habitats. The report has been published and circulated to key people working on wader monitoring in Australia (McKay 2000).

The PMP has more or less only been ticking over during the 1990s while the AWSG have waited on the outcome of the two reports. The AWSG now has to decide how the PMP should be further developed in the light of the two reports.

ORIGINAL OBJECTIVES OF THE PMP

The objective of the PMP was stated in *Stilt* as "To monitor, at selected sites, year-to-year changes in population levels of migratory and Australian breeding waders and attempt to account for these in terms of reproductive success and mortality." The methods were stated as: "There will be sample counts in summer (early February) and winter (mid June) each year at selected sites to determine numbers of as many species as possible." Banding was to be used to estimate the annual

percentage of juveniles and generate an index of breeding success. Retraps of banded birds were to be used to give a measure of mortality. Year to year changes in counts could then be linked to breeding success and mortality. Hewish (1987a) also pointed out that as most species of migratory waders do not breed in their first year(s) then a significant change in the total number of over wintering waders is likely to indicate a real change in breeding success the previous year. With identical sampling in summer and winter, the winter count expressed as a percentage of summer count should be a measure of the proportion of immatures in the population, and a meaningful measure of breeding success (Driscoll 1997). However, there are several weaknesses with this approach (see below).

METHODS

The method of counting waders at each site was never defined. In practice, the usual method has been to count all the birds at high tide roosts. As most sites were only counted once in summer (February) and winter (June), there was usually no measure of variability in counts. The number of years that the PMP was to run was not clearly defined. It began as a five-year project, was extended to ten years, and then just kept running. A short-term project has limited value because wader populations can show long-term fluctuations. Also the desired detection level of population change was never clearly stated. We would need a much more rigorous approach if we were trying to detect, for example, a 5% change over 5 years, as opposed to a 50% change.

RESULTS OF THE PMP FROM VICTORIA AND SOUTH-EAST TASMANIA

Driscoll (1997) analyzed population changes at a state level for the period 1981-1994. He pointed out that "the greatest failing of the data, especially in its computerized form, is the lack of a means of accounting for changes in sampling effort to help separate real changes in numbers from artifacts in data collection". This remains a real weakness of the PMP (see discussion). In this paper a preliminary analysis is made for selected species in Victoria and S.E. Tasmania to test whether the PMP is capable of yielding useful results. Victoria was chosen because the coverage there has been most consistent and comprehensive over the 20 years of the project, and there have often been the same, highly skilled, individuals counting. In Victoria, there is less background noise in the data caused by missed counts, or change in count areas at sites. Six sites have been counted in Victoria since 1981 and over 50% of the wader population have been counted there annually. South-east Tasmania has been counted since 1965 and has yielded an extremely valuable and accurate data set. The sources of the data are the counts published in *Stilt* and in the cases where these have not been published, from the AWSG database.

Bar-tailed Godwit. *Limosa lapponica*

Bar-tailed Godwits occur in large numbers at three sites in Victoria: Westernport, Corner Inlet and Mud Island/Swan Bay (Fig. 1). By far the greatest numbers were in Corner Inlet. Counts increased in the early 1980s and then leveled off during the late 1980s and through the 1990s. The increase of the mean for the five years 1995-1999 compared with the five years 1981-1985 was 50% for all sites combined, 68% at Westernport, 50% at

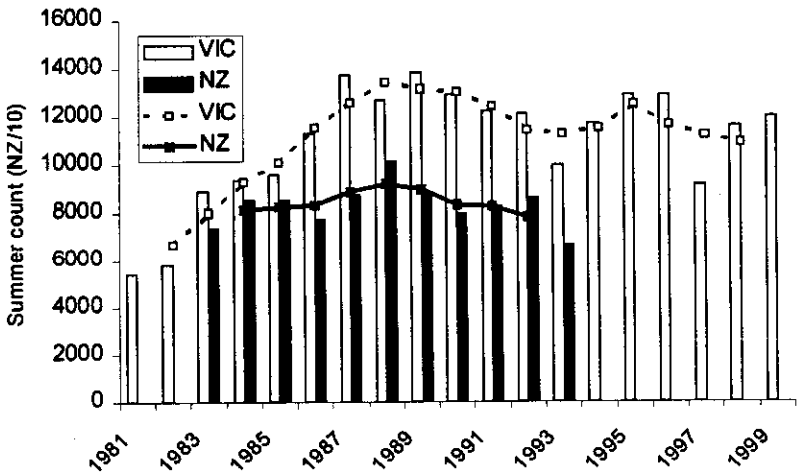

Figure 1. Summer counts of Bar-tailed Godwits in New Zealand at three sites in Victoria. The lines represent the three-year running means in each area. The counts from New Zealand are divided by 10.

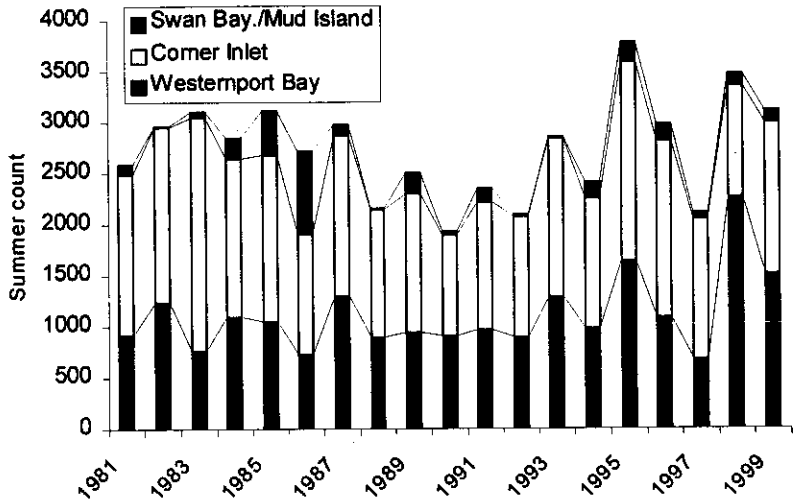

Figure 2. Summer counts of Eastern Curlew at three sites in Victoria.

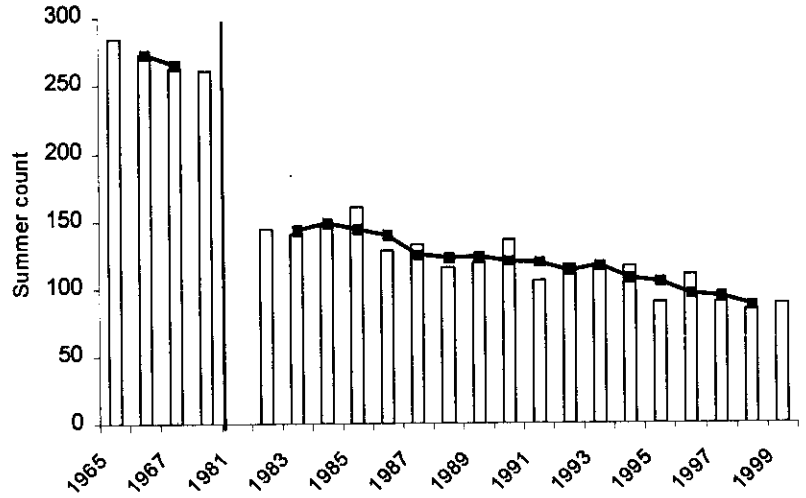

Figure 3. Summer counts of Eastern Curlew in southeastern Tasmania. Note that data exists for most years between 1969 and 1980, but has not been published. The line represents the three-year running mean.

Corner Inlet and 44% at Mud Island/Swan Bay. In the period 1983-1993 populations in New Zealand remained fairly stable (Fig. 1) (Sagar *et al.* 1999). The numbers of New Zealand birds have been divided by 10 for the sake of graphic clarity. There were large variations in the range of the counts for the three Victorian sites (263 - 591 for Westernport, 4,965 -13,139 for Corner Inlet and 6 - 2,007 for Mud Island/Swan Bay).

Eastern Curlew *Numenius madagascariensis*

Eastern Curlew also occurs in large numbers at the same three sites in Victoria: Westernport, Corner Inlet and Swan Bay/Mud Island (Fig 2). There have been variations in the total counts over the 19 years. The highest count was in 1999 (3,779) and the lowest in 1990 (1,926). The mean for the five years from 1995-1999 (3,082) was very similar to the mean 1981-1985 (2,920). This suggests that there has been little overall change in the population. The range in the number of Eastern Curlew counted varied from 678 - 2,251 for Westernport, 986 -2,281 for Corner Inlet and 9 – 815 for Mud Island/Swan Bay. In contrast to Victoria, Eastern Curlews have declined in numbers in southeastern Tasmania (Fig 3). The decline has been more or less constant at 2% per annum over the 19 years since 1981, and the total decline from when counts started in 1965 up to 1999 was also an average 2% per annum.

Common Greenshank *Tringa nebularia*

Greenshanks occur at all six sites counted in Victoria (Fig 4). The mean for the five years 1995-1999 (804) was 20% higher than the mean of the five years 1981-1985 (682). There was often large variation in successive years, the range for each site 25 - 492, 75 - 468, 0 - 18, 16 - 122, 11 – 168 and 168 - 655. The fluctuations were not synchronized among the sites.

Curlew Sandpiper *Calidris ferruginea.*

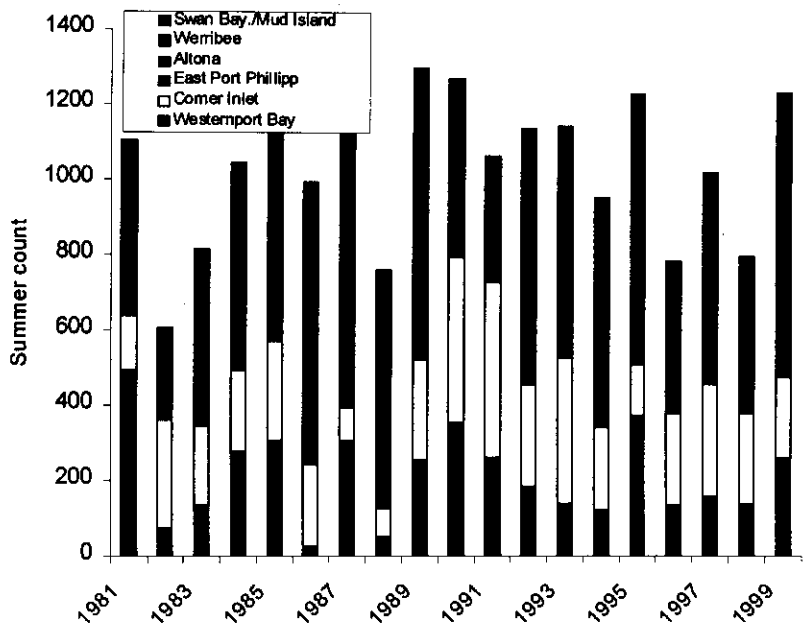

Figure 4. Summer counts of Common Greenshank at six sites in Victoria.

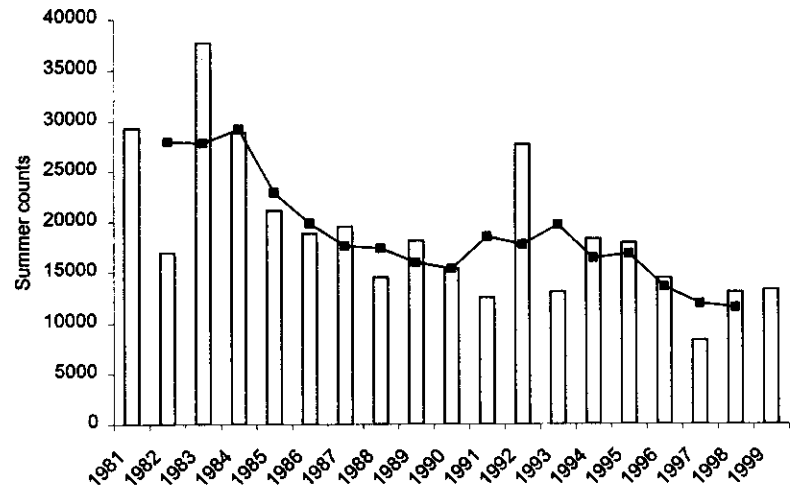

Figure 5. Summer counts of Curlew Sandpiper at six sites in Victoria. The line represents the three-year running mean.

Curlew Sandpipers occur in reasonable numbers at five sites in Victoria (Fig 5). The mean for the five years 1995-1999 (13,424) was 50% lower than the mean of the five years 1981-1985 (26,807). This decrease was apparent at four of the sites, but numbers at Westernport have possibly shown a slight increase (Fig 6). In the years 1981 to 1988 hardly any juveniles were recorded at Westernport in the winter (average 14.yr^{-1}). From 1989 to 1999 juveniles were using Westernport in much greater numbers (average 527.yr^{-1}). At other sites, numbers had decreased or remain stable. Thus, the total numbers of Curlew Sandpipers in Westernport have possibly been maintained through its greater use by juveniles who then remained there when they became adult. This may possibly be linked to habitat change. Since 1982, numbers in southeastern Tasmania have shown a similar decrease to Victoria (Fig 7). There, the limited data from the 1960s suggest that the numbers in the 1990s may merely be a return to previous lower levels. Counts from 1969 to 1981 have been made in southeastern Tasmania, but have not been published. These might clarify the suggested population fluctuations.

In Victoria, an attempt has been made to link changes in populations to overall breeding success. The percentage of juveniles in the population has been calculated from birds banded in the period November to February. Also this index has also been calculated by comparing numbers counted in winter compared to summer in Victoria. The three-year running mean for these indices of breeding success have then been calculated (Fig 8).

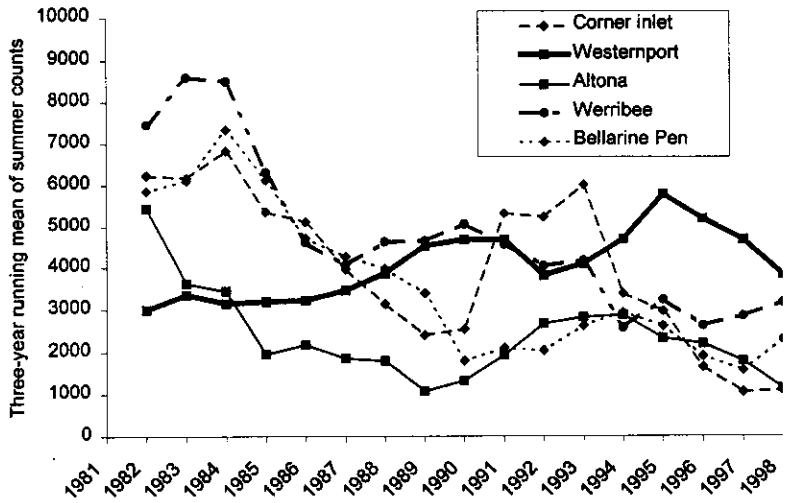

Figure 6. The three-year running means of summer counts of Curlew Sandpiper at five sites in Victoria.

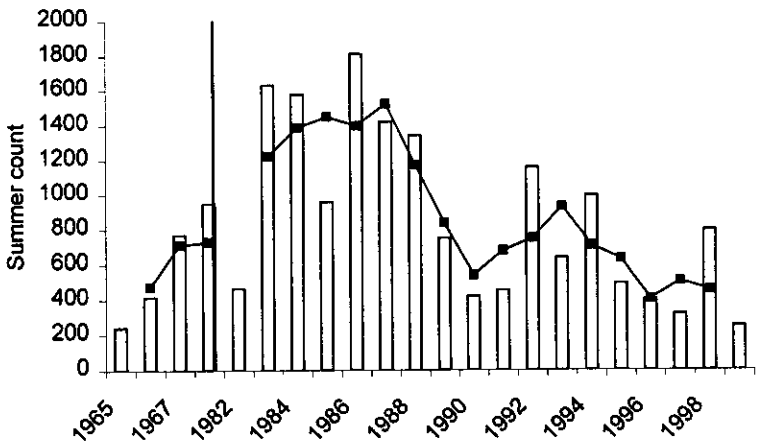

Figure 7. Summer counts of Curlew Sandpiper in southeastern Tasmania. The line shows the three-year running mean.

However, there are biases in this approach (see discussion). The proportion of juveniles banded suggested there was a decline in overall breeding success in the early 1980s, that increased in the late 1980s and early 1990s, and then declined again in the late 1990s. The counts mirrored these trends in the banding data. The three-year running mean of the index of juveniles calculated from banding and counts were synchronized in the late 1980s and through the 1990s, but not in the early 1980s.

Pied Oystercatcher *Haematopus longirostris*

Pied Oystercatchers breed in the early summer and by the February count many have flocked onto non-breeding areas where they remain throughout the winter. The counts are the mean of the summer and winter counts (Fig. 9). Numbers seem to have been stable in Corner Inlet and Westernport over the last 20 years. (Note the 1981 count was not thought to be reliable). However numbers in southeastern Tasmania seem to have almost doubled, although it needs more years of data to check if the 1999 count is truly representative (Fig. 10).

Pacific Golden Plover *Pluvialis fulva*

Pacific Golden Plovers have been recorded at five sites in Victoria. Counts showed a decline at least from the late 1980s to the 1990s (Fig. 11). The mean for the five years 1995-1999 (162) decreased by 60% compared with the mean count during the period 1986-1990 (408) Pacific Golden Plovers in New Zealand (Fig. 11), and throughout south and east Australia seem to have followed the same trend (Harris 1994; Sagar *et al.* 1999).

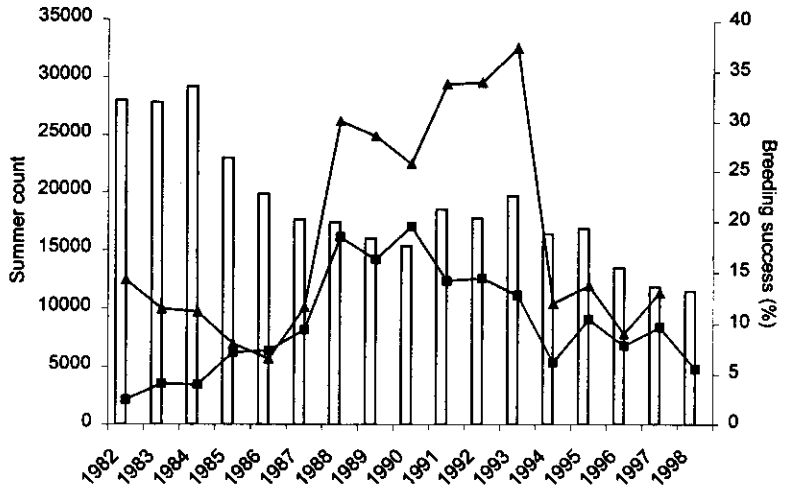

Figure 8. The three-year running mean of the summer counts of Curlew Sandpiper at six sites in Victoria compared to the three-year running mean of breeding success (%) calculated from banding data (triangles) and comparisons of summer and winter counts.

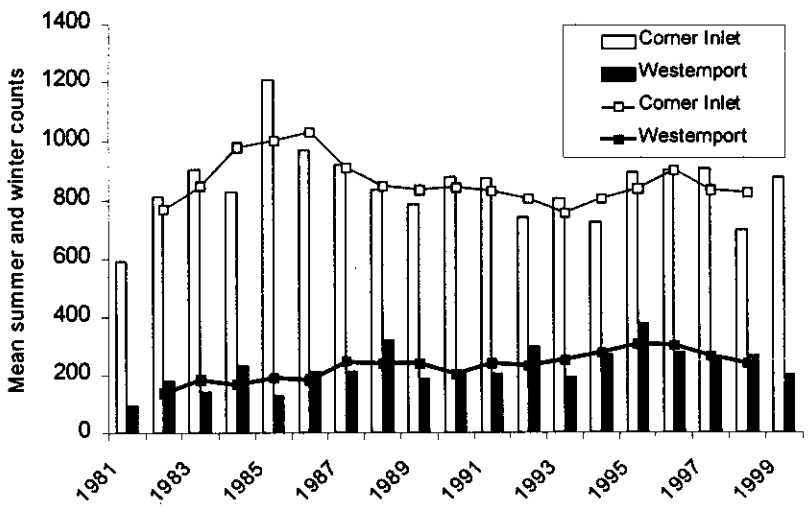

Figure 9. The mean of annual summer and winter counts of Pied Oystercatchers at Westernport and Corner Inlet. The lines represent the three-year running means.

DISCUSSION

Objectives of the PMP: Monitoring flyway populations

One of the main aims of the PMP was to measure population changes of migratory waders. As Australia has high percentages of the Flyway populations of many species in the non-breeding season, it should be the ideal place to monitor these species (Table 1). There is special concern in the East Asian Australasian Flyway about migratory waders, because of habitat destruction in Asia. However, most of the monitoring in Australia has been done in areas where there are relatively few waders, the proportion of the Flyway population being monitored is very low (Barter 1993; Driscoll 1997) (Table 1). A statistician would be able to calculate what proportion of the population and on how many sites a species should be monitored in order to give a meaningful indication of changes in Flyway populations. This was in the brief from Environment Australia (McKay 2000). Unfortunately, this was only tested for Bar-tailed Godwits (enough sites are being monitored, at least on the east coast). This question still remains unanswered for other species. However, the coverage since Barter (1993) and Driscoll (1997) has improved with counting started in northwestern Australia.

The remoteness of many sites with large numbers of waders has traditional been seen as a great disadvantage to monitoring in Australia. However, one fifth of the 2 million migratory waders in Australia are on 80 Mile

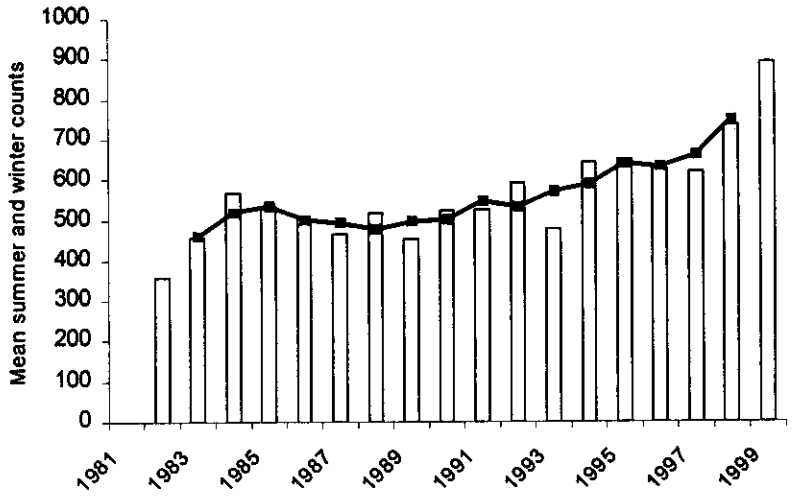

Figure 10. The mean of annual summer and winter counts of Pied Oystercatchers in southeastern Tasmania. The line represents the three-year running mean.

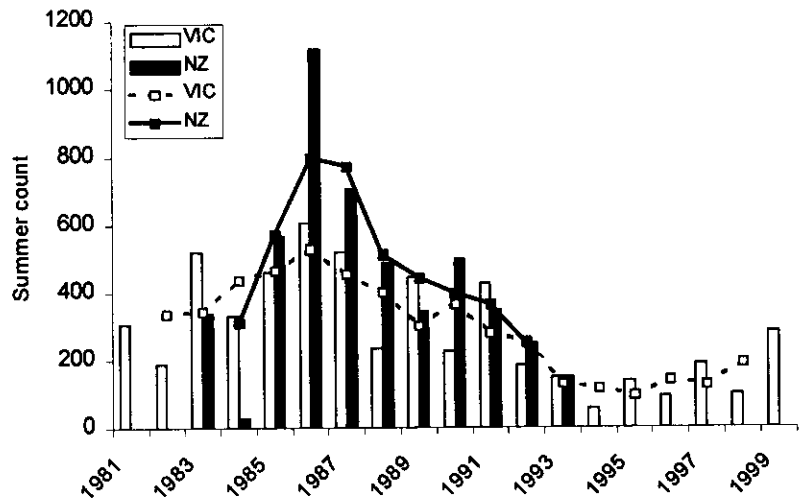

Figure 11. The summer counts of Pacific Golden Plover at five sites in Victoria and in New Zealand. The lines represent the three-year running means.

Beach. This is easily accessible (if remote) and can be counted by five teams in vehicles on one tidal cycle. The first complete counts of the beach were done in 1998. These have not yet been published. The key to successfully monitoring Flyway populations of many species in Australia lies in northwestern

Australia. Expeditions to the region must concentrate more on monitoring, in addition to banding. This is also one region where counts could be easily made on successive days to estimate variances (see below). Monitoring methods for 80 Mile Beach also have to be developed for smaller teams of counters. It might then be possible to concentrate on one or two species and count the population of those on the whole beach, rather than the present strategy of counting all species on a 15 kilometre stretch of beach.

Current results

If it is accepted that there has been a 50% change in the number of Pacific Golden Plovers in Victoria and the change is possibly paralled in New Zealand, can this then be extrapolated to numbers in the rest of the Flyway? Although 63% of Victorian Pacific Golden Plovers were being sampled (Driscoll 1997), this only represents 4% of the Australian population, and 0.4% of the Flyway population. There is some evidence that wader populations have a core range. They expand out of that range at times of population increase, and contract back into the core areas when populations decrease. Thus, population changes may be more marked at the periphery of the range than at the core. The core range is often related to latitude, but even within a more local area

Table 1. The numbers and percentage of the Flyway population of migratory waders occurring in Australia (Watkins 1993) and their percentage distribution through the states and territories. Also shown is the percentage of the Australian and Flyway population being monitored in Australia up to the early 1990s (Driscoll 1997) and the main habitats used (coastal/inland).

Species	Aust. pop	Flyway (%)	WA	NT	QLD	NSW	Vic	SA	Tas	Aust. (%)	Flyway (%)	Coast	Inland
Lathams Snipe	36 000	100			14	28	31	11	17	1	1.0		
Black-tailed Godwit	81 000	50	11	24	64	1		1		0.5	0		
Bar-tailed Godwit	165 000	50	57	6	27	3	6	1		11	5.5		
Little Curlew	180 000	100	28	50	22					0	0		
Whimbrel	10 000	25	10	6	81	2		1		4	1.0		
Eastern Curlew	19 000	90	7	4	67	7	11	2	2	16	14.0		
Marsh Sandpiper	9 000	10	15	40	25	10	3	7		4	0.4		
Common Greenshank	20 000	50	37	10	21	5	7	18	2	11	5.5		
Wood Sandpiper	6 000	10	38	26	17	1		17		1	0.1		
Terek Sandpiper	18 000	50	49	4	46	1				1	0.5		
Common Sandpiper	3 000	10	26	31	25	5	2	10	1	2	0.2		
Grey-tailed Tattler	36 000	75	33	3	61	3		1		3	2.3		
Ruddy Turnstone	14 000	50	27	5	18	5	4	27	15	14	7.0		
Great Knot	319 000	100	55	16	28			1		2	2.0		
Red Knot	153 000	60	61	6	23		3	7		4	2.4		
Sanderling	8 000	75	31	1	3	1	7	50	6	10	8.5		
Red-necked Stint	353 000	75	19	2	14	1	14	46	3	18	14.0		
Sharp-tailed Sandpiper	166 000	100	7	4	7	16	14	51		12	12.0		
Curlew Sandpiper	188 000	75	28	1	8	2	16	42	4	18	14.0		
Broad-billed Sandpiper	8 000	50	75	2	23					1	0.5		
Pacific Golden Plover	9 000	10	5	6	47	18	6	11	7	18	1.8		
Grey Plover	12 000	75	35	11	15		7	31		15	11.0		
Double-banded Plover	30 000	60	1		3	10	30	20	37	1	0.6		
Lesser Sand Plover	20 000	75	9	9	76	5	1			6	4.5		
Greater Sand Plover	74 000	75	81	7	12					1	0.8		
Oriental Plover	40 000	90	50	25	25					0	0		
Oriental Pratincole	60 000	90	58	42						0	0		

there may be a core site which waders expand out of and contract into as populations change. In the case of Pacific Golden Plovers, with such a small part of the population counted at the edge of the range, it is not possible to make any statement about what might be happening to the Flyway population. However, there is evidence that numbers have also declined through southern and eastern Australia (Harris 1994). Here 18% of the Australian population and but still only 1.8% of the Flyway population was being monitored.

The decline of Eastern Curlews in southeastern Tasmania may only reflect changes in local conditions there, as similar declines have not been found in Victoria. However, it might also be the first indication of a general decline at the edge of the non-breeding range.

Monitoring populations at site level

The concentration of thinking on Flyway monitoring has diverted attention away from other important aspects of monitoring. Many wader sites in Australia, especially near centres of human population, have suffered from both wholesale and gradual destruction over the last 100 years. There is a need for monitoring of all good wader sites, and especially Ramsar sites (as called for by the Ramsar agreement). However, it is of limited value monitoring one site, without knowing how populations might be changing in the wider environment. Then changes due to local conditions can be separated from other causes. This was illustrated in the Coorong by the counts in 2000 (Wilson 2000). Here, there had been very large declines in most of the wader species since the 1980s. By linking these to the PMP it was possible to show that, at least in Curlew Sandpipers and Golden Plovers, the declines were only a reflection of what was also happening to populations in Victoria. Thus, these declines might not be related to changing environmental conditions within the Coorong.

Australian population estimates and important sites

The 1981-1985 survey, on which most of the Australian population estimates were based (Watkins 1993), did not achieve complete coverage. Since then, many additional internationally important wader sites have been discovered, and population estimates for some areas have had to be changed. Without new counts over large areas, the Australian population estimates cannot be successfully updated. This is critical, as conservation decisions are being made with these data. The Ramsar convention calls for updates in population estimates every nine years. Continued irregular counts at as many sites as possible, especially the inland, should be continued. There are many counts that have been made all over Australia since 1985, but they have not been collated or entered into one database. Many are still in people's notebooks. There is a great need for a central body to collect and store this data. This should be a future role for the AWSG. Although not strictly part of the PMP, such recording should be integrated into the project.

Breeding success

If populations are declining one needs to know if this is due to poor breeding success or other factors. If populations decline or do not increase while the breeding success is high, then this indicates that a problem might exist on the non-breeding or staging areas, rather than the breeding grounds. Considerable effort is made in obtaining an index of breeding success, especially in Victoria, but also in northwestern Australia, by catching and ageing large numbers of selected species during the Australian summer (November to February).

The index of breeding success has been calculated in the past as the number of juveniles caught expressed as a percentage of all birds caught (including juveniles). This is incorrect. Higher and more accurate success rates are obtained if the index is calculated as the numbers of juveniles expressed as a percentage of the adults. However, as second year, non-breeding birds cannot be aged, they have been assigned as adults in the catches. For Curlew Sandpipers, I have calculated the theoretical number of second year birds from the previous year's breeding success I have allowed for a theoretical mortality rate of 20%. The number of juveniles was then calculated as a percentage of the theoretical number of adults caught (the total catch minus the juveniles and the theoretical number of second year birds). Catching by cannon-netting has potential biases that have not yet been fully quantified. Also large numbers have to be caught to get statistically significant results, and this is only possible for a few species.

In some cases, the PMP can give a second measure of breeding success. Most migratory waders in Australia do not breed in their first year, but remain in Australia in the winter. Early on in the PMP it was pointed out that a comparison of winter and summer counts should give a measure of breeding success. But, this is an over simplification of the situation. At least two species, Pacific Golden Plovers and Sharp-tailed Sandpipers *Calidris acuminata*, are only present in very small numbers in Australia in the winter. Other species, such as Red Knots *Calidris canutus*, Great Knots *Calidris tenuirostris*, Bar-tailed Godwits and Eastern Curlews do not breed until their third year or older. Thus winter populations contain birds from several breeding seasons. However Hewish (1987a) showed that winter counts in 1986 had very high numbers of Red Knots and Grey Plovers *Pluvialis squatarola*, indicating a very good breeding season in 1985. Even for birds that breed in their second year, counts in summer contain an unknown number of second year, immature birds, as in birds

caught for banding. Another weakness of the counting method is that there is increasing evidence that immature waders do not necessarily stay at the same site as they spent the summer. Many individuals move northwards within Australia. Thus one is not comparing like with like.

None the less, if sufficient sites are counted, and the summer and winter counts compared, then it should be possible to get some measure of annual breeding success, at least for species which breed in their second year. At the present level of counting this method can probably be used to state whether a breeding season was very bad (very few birds recorded in winter), very good (large numbers everywhere), or somewhere in between. However, calculating breeding success from birds caught by banding is probably not any better at providing and accurate estimate. With counting, however, there is the possibility to get far larger samples (in the 10s of thousands or even over 100,000), and also of species which are hardly ever caught for banding.

Estimating breeding success from count data has not been done to any great extent. As well, breeding success has never been systematically tied in with the results from population monitoring, except in an anecdotal or ad hoc manner. Despite this being one of the stated aims of measuring breeding success. The Curlew Sandpiper analysis in this paper is the first attempt to do so.

Although one original aim of the project was to tie in mortality rates with population change, mortality rates have not hitherto been calculated for any species in Australia. Although for some species, there are large numbers of banding retraps (several thousand Red-necked Stints *Calidris ruficollis*). There are difficulties to calculating mortality rates because birds may not be as site faithful as assumed, especially the juveniles. It is doubtful, given the limitations to the data that can be collected, whether the effort to obtain estimates of mortality rates (if they are ever calculated) can be balanced against the more easily measurable breeding success indexes.

PERIOD OF MONITORING

The expected monitoring period could have implications for the design of a monitoring program. Because populations can undergo long-term natural variations at least 20 years may be needed to identify real changes in populations from natural cycles. However, since the PMP is used to monitor the health of a population or a site, by its very definition, one never stops. In designing the PMP, it has to be considered that one may be looking back at data collected 50 years ago. When this occurs, the people who collected the data will no longer be around to answer questions about a particular site or what changes in the habitat might have affected wader numbers at that site. Long term monitoring needs good documentation of changes in site conditions and also much stricter reporting of count totals than has occurred until now.

METHODS OF THE PMP

George McKay, under contract from Environment Australia, tested a method of photographing flocks, combined with sample counts on mudflats (McKay 2000). One emphasis of his trials was on getting a good measure of variance in order to apply robust statistical analysis to the count data. The method gave larger standard errors than one would expect to get from roost counts, and its reliability still remains unproved. The method was so complicated that it was recommended that it should only be carried out by trained wildlife biologists. The expenses of such a monitoring method (estimated at over $100,000 per annum) was so great that it was also suggested that it should only be done every 3-5 years, as a control of existing monitoring methods. Simplicity had been sacrificed for statistical robustness. As a basic method for the PMP it was unsuitable because it was too complicated and too expensive. The PMP can only be done by large numbers of amateurs, and the key to long term success is to keep methods as simple as possible.

The principle method of the PMP at most sites has been to count birds on high tide roosts. Although never stated, this approach assumes that counts are replicable from year to year. The method is also based on the assumption that each site is a "closed system". Waders are assumed to return to the same site year after year. All the waders within the "closed system" are counted on the same day. The whole of Corner Inlet is considered a "closed system" in February and June with only a small immigration or emigration of most wader species. However, one roost within Corner Inlet would be an "open system", and counting that single roost would not be an effective way of monitoring the site. For this reason, all Corner Inlet, which contains approximately 40,000 waders, is usually counted over a period of one or two days.

Not all species are "closed system" species. Sanderlings *Calidris alba* are known to rove over several hundred kilometres along the southern beaches of Australia. Other species that switch between the coast and inland areas according to the drought cycle are difficult to monitor accurately with the present method.

At the time of migration, "closed systems" become "open" and can no longer be used effectively for the PMP. This is the reason why summer counts are done in February and winter counts in June. It is then considered that wader numbers are most stable.

The principle of replicability and "closed systems" has not always been fully understood, because it was never

stated when the PMP was originally set up. Some sites are not being counted in the correct way. There is one site in South Australia that is important for Ruddy Turnstones *Arenaria interpres*. The site only covers a small part of the coastline although banding has shown that Ruddy Turnstones rove along a 50 kilometre stretch of coast. The solution to this could be to spend one day just counting Ruddy Turnstones visiting all their known sites. Fifteen kilometres of 80 Mile Beach are counted as part of the PMP. It is now known that the stretch counted does not have the most waders. If a big flock of 10,000 Great Knots moved just outside the count boundaries they would be missed that year. An "open system" is being counted. However, the whole beach could be considered a "closed system".

To be replicable, counts have to be done in the same way each year as consistently as possible. There will be variability in counts due to such factors as observer skills, type of optics used, weather conditions, and tide heights. However, the analyst is often not sure if a count is being done in the same way, or at larger sites, if all the subsites (roosts) are being visited, in every year. One suspects that occasionally counters are just going out to see what they can find. That is not an effective method of monitoring. The sites in the PMP must be so well known that the counter goes to every subsite where they know there should be birds, with the expectation of what might be found there and in what numbers.

One important change to the PMP in the future has to be that each site is registered and mapped, with its boundaries. The method of identifying site boundaries is to be written down in the count instructions for that site. Also the ideal tide height under which to count should be stated. Where the method is to count high tide roosts, then all the known roosts should be marked on the site map. Sometimes the approach might be based on, for example, counting waders on the flats just before they fly into mangroves or even by counting at low tide on smaller sites. There is no universally recognized method for counting. However, to maintain repeatability, the count methods have to be followed as far as possible. Should there be environmental changes at the site that might have affected wader numbers over time (such as, for example, the growth of *Spartina* grass, or increasing disturbance), then this should be recorded. Over time the count instructions may be changed, to suit the changed conditions.

Sometimes comments are made on count sheets as to why numbers might have changed due to local conditions or the circumstance of the count. The old database had no field for recording such comments, so the researcher has to refer back to the original count sheets. This will be changed in the new database (see below). However, with increasing numbers of count reports arriving by email, often all that is received is a species list with no count date, or comments.

Reports to the PMP organizer made against the site count instructions will greatly improve the quality of the PMP data in the future.

VARIANCE

Focus has been placed on getting a measure of variance (Driscoll 1997, McKay 2000). It has been argued that as only one count is made at each site there is only one data point, and no measure of variability. This is not necessarily true. If sufficient sites are counted over enough years, and the counts are made in a replicable way, then the data does lend itself to statistical analysis. Driscoll (1997) recognized this, but did not attempt a statistical analysis because he doubted the quality of some of the data (due to change in coverage, or not knowing exactly what area had been counted). Ideally one would still like two or more counts a season. At many sites in Australia, this will never be practical. An alternative would be to have two observers counting at the same time, but recording their results separately. This will give a measure of among-counter variability for surveys made under the same conditions. However the Victoria data suggests that much of the variance is due to birds being missed, or double counted, rather than inter-observer variance (see below). Attempts to design methods of counting that concentrate more on getting measures of variance, rather than simplicity or accuracy are to be avoided. However, the AWSG should be collecting data on variance at selected sites to test the statistical robustness of point counts.

VARIANCE IN COUNTS BETWEEN YEARS

There are many reason why counts vary between years (changes in the greater populations, the state of inland wetlands for some species, count variance, and inappropriate sites being counted that are "open systems"). Often, given these multiple sources of variation, counts were remarkably consistent from year to year in Victoria and southeastern Tasmania. Numbers did not generally change at random. However, this was not always the case. For example, even for a relatively countable species, Eastern Curlews, in Westernport there were 1,085 in 1996, 678 in 1997 and 2,251 in 1998. It is theoretically possible for a population to fall dramatically - they could have been shot, died because of bad weather on the breeding grounds (or for multiple other reasons). However, it is biologically impossible for a long-lived species such as Eastern Curlew to increase its population by 230% in one year, as the counts from 1997 to 1998 suggested. Even small waders show large fluctuations in breeding success rarely increase their populations. Even after the very best breeding seasons, numbers may increase by over 100%, due to the influx of juveniles.

The high counts in Curlew Sandpipers in 1992 were caused by a very good breeding year in 1991 (Fig. 5). As the populations of Eastern Curlews in Victoria are some hundreds of kilometres from other large populations, immigration or emigration from the state is unlikely. Eastern Curlews are easy to count. It is probable that a roost has been missed in 1997, and possibly there has been some double counting in 1998.

Common Greenshanks and Pacific Golden Plovers show similar discrepancies between years (Table 2). These species are often very site faithful to a particular mudflat or roosting area. Common Greenshanks are often difficult to count, because they fly off to roosts behind mangroves, or away from the shore. Thus sudden declines in numbers in 1982, 1986 and 1988 at Corner Inlet, in 1987 and 1988 at Westernport, in 1982 at Altona, in 1984 at Werribee and in 1982 at Bellarine Peninsula, might be due to the birds being missed. Indeed good counters occasionally note on the count sheets that they have not located or visited the Greenshank roost that year. However, if sudden declines occur at all sites in the same year it might indicate that conditions inland have become very good for Common Greenshanks that year.

Similarly, with Pacific Golden Plovers, there have often been zero or low counts. Then birds have been apparently missed, as they have been found again in subsequent years in approximately the expected numbers. One could manipulate the counts by filling in the zero counts with the mean of the two years on either side. In spite of these weaknesses, the total counts do indicate an overall decline, although this is not obvious at all sites.

DETECTION RATE OF POPULATION CHANGE

The level of change in populations one was hoping to detect by monitoring was never defined in the PMP. Obviously if one was hoping to detect a 5% change over 5 years the monitoring would have to be very accurate indeed and the method would have to be chosen accordingly. For the brief for George McKay's contract, the method was designed to detect 20% change over 10 years, or 50% over 5 years. Have we achieved this detection level in Victoria? Bar-tailed Godwits in Victoria increased 50% over the first five years of monitoring and then remained stable. The counts of Eastern Curlews, Pied Oystercatchers and Common Greenshanks have not changed very much over the entire 20 years. Pacific Golden Plovers and Curlew Sandpipers have declined by about 50% in the 1990s. In southeastern Tasmania, with very accurate monitoring, much smaller changes of about 2% per annum were detected in the numbers of Eastern Curlew. The data does suggest that we are able to detect larger population changes with some degree of confidence.

Table 2. The summer counts of Common Greenshank and Pacific Golden Plover at five sites in Victoria. (CI = Corner Inlet, Alt = Altona, Werr = Werribee, Bell = Bellarine Peninsula/Mud Island).

	COMMON GREENSHANK						PACIFIC GOLDEN PLOVER					
Year	CI	WPB	Alt	Werr	Bell	Total	CI	WPB	Alt	Werr	Bell	Total
1981	492	147	85	33	347	612	0	74	3	44	184	305
1982	75	286	21	57	168	532	3	76	1	15	96	191
1983	134	210	89	72	311	682	303	37	12	62	106	520
1984	278	214	70	11	464	759	61	60	75	36	98	330
1985	307	263	47	48	463	821	87	8	5	35	325	460
1986	25	215	16	80	651	962	250	44	1	64	248	607
1987	306	87	40	99	613	839	71	89	178	71	112	521
1988	50	75	51	74	509	709	0	39	5	64	128	236
1989	254	267	38	87	655	1047	76	162	10	28	171	447
1990	356	442	33	66	376	917	0	92	0	6	131	229
1991	261	468	36	75	219	798	49	136	114	22	107	428
1992	184	272	35	125	519	951	55	66	0	23	42	186
1993	137	391	85	80	453	1009	30	61	0	11	50	152
1994	121	220	41	103	452	816	0	17	0	4	38	59
1995	372	137	73	124	520	854	0	41	31	8	60	140
1996	133	249	63	109	229	650	0	33	0	31	30	94
1997	157	301	122	154	280	857	25	64	42	48	10	189
1998	139	240	81	128	211	660	0	43	0	36	22	101
1999	262	216	92	168	485	961	22	114	48	95	5	284

ANALYSIS OF INDIVIDUAL SITES

There needs to be published detailed analysis of single sites. Often the workers who have collected the data are best qualified for this analysis. They know the factors that might have affected counts, and they have the necessary detailed knowledge of the site. There also needs to be a more detailed analysis of species than the preliminary analysis given in this paper.

ADMINISTRATION OF THE PMP

The underlying cause for the main weaknesses of the PMP stem from lack of good management. The volunteer organizers have done an excellent job to keep the PMP running, but the proper running of the PMP will always be beyond the scope of volunteers. The project will never realize its full potential until there is paid management, even if on a part time basis. If there had been paid management, the two reports commissioned by Environment Australia would not have been necessary. It would be better to put money into management rather than consultancy reports years down the track. The AWSG is now actively working on getting funds for a manager.

There must be a complete annual report that updates population indices for each site, state, and the whole of Australia on an annual basis. Breeding success, as measured from counting and banding, should also be calculated on an annual basis. Changes in populations at individual sites have to be measured against the background of what is happening to the larger population.

The data is partly stored on an old Apple-format database and partly on excel spreadsheets. A new database is currently being designed under contract with Environment Australia. This will greatly simplify future analysis of the PMP. The database will also accommodate comments about factors that might have affected counts.

Some counters have not understood the purpose of the PMP, the methods, or the sites they are counting. A booklet needs to be produced that gives information on the background, objectives and methods of the PMP. The booklet could also include instructions on the standard methods of counting flocks of waders.

INDICATOR SPECIES

Some species are difficult to monitor, because they use the inland, or are inaccessible for counting. Sites should be selected especially for species that can be monitored in large numbers and that can be used as indicator species. For example, with the help of counters in New Zealand, it is possible to monitor a very large proportion of the Flyway populations of Red Knots and Bar-tailed Godwits. On the east coast of Australia, it is possible to monitor a high proportion of the Eastern Curlew present. These species use the intertidal zone in Asia and so could give some indication of possible effects of habitat destruction within that zone. Such indicator species need selecting.

SELECTION OF PMP SITES

A few sites in the PMP show such large and unexpected variation in wader numbers from year to year that one wonders if they are being counted very badly, or if they are such "open systems" that they are not suitable for monitoring. Alternatively they may be so difficult to count that it is not possible to yield consistent results. It would be a pity to stop counting sites, just because they do not yield precise and accurate results. The figures are still often of some use, especially if there is a core of important sites where population changes can be used to help interpret figures from more difficult sites. One alternative might be to have grade A sites that are the core of the PMP, and grade B sites. In the future, before sites are accepted to the PMP, there will need to be a series of trial counts at the site, and a full site investigation. Then site maps and site count instructions must be made. Often efforts have been concentrated on large sites that need many people to count. However, much more accurate and statistically significant results may be obtained from a series of easily counted small sites than from one large site (as in southeastern Tasmania).

TRAINING

It has often been said that the problem with the PMP is that there are insufficient counters and sites. Given the lack of reporting back to the counters, it is perhaps surprising that so many people are still counting, and the numbers are increasing every year. More sites are already being counted than are being recorded by the PMP. The production of a comprehensive annual report would increase interest in counting. Training has been started by the New South Wales and Queensland wader study groups, and needs to be followed up by other groups. More emphasis should be given on taking untrained people on the annual counts. The only way to learn wader identification and counting is to do it. It is also something that one can practice on one's own.

CONCLUSION

- The PMP is a very valuable data set. Counting on the PMP sites must continue.
- There needs to be detailed analysis of individual sites and species.
- To achieve long term success, counts have to be replicable as far as possible. Methods have to be simple.

- Count instructions and accurate count maps have to be made for each site.
- Counts should be reported against the count instructions.
- Efforts have to be made to get some measures of point count variance.
- New sites have to be added to the project.
- Indicator species need identifying.
- The whole of 80 Mile Beach needs to be monitored on a more regular basis.
- Monitoring should be done on all the Ramsar sites that are important for waders, even if these sites are not suitable as first grade sites for the core monitoring.
- There needs to be at least a part-time paid management.
- A new database is needed for the PMP. This is now being developed.
- There needs to be a complete annual report with ongoing analysis for each species, site and groups of sites.
- A booklet needs to be produced informing counters about the aims and methods of the PMP.
- Counting programs need increasing in Australia. Much of the data for population estimates in Australia and hence the measure of the 1% Ramsar criteria still stems from data collected in the 1980s.
- There needs to be increased emphasis on training of counters.

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WATERBIRDS OF TAYLORS LAGOON, NEAR BROOME, WESTERN AUSTRALIA

Peter Collins[1] & Rosalind Jessop[2]
[1]RMB 4009, Cowes, Vic 3922 AUSTRALIA
Email: moonbird@waterfront.net.au

[2]Phillip Island Nature Park, PO Box 97, Cowes, Vic 3922 AUSTRALIA
Email: rjessop@penguins.org.au

ABSTRACT
The waterbirds of Taylors Lagoon (17° 46'S 146° 53'E) in the Kimberley area of WA were counted twice monthly from October 1995 to May 1996. The lagoon was found to support internationally significant numbers of Oriental Pratincole and Little Curlew. The numbers of waterbirds using the lagoon were greatest during the period October to January, as wide muddy fringes were present around the edge of the lagoon.

INTRODUCTION

In the Broome area there are numerous claypans that for most of the year are dry. However, several are deep enough to retain water well into the dry season (April to October) and in some years retain water till the following wet. Taylors Lagoon (17° 46'S 146° 53'E) located about 76 km east of Broome on the Great Northern Highway is one such area. The lagoon is fed by Collins Creek and has been modified by deepening one section so water is usually retained throughout the dry season. Taylors Lagoon is crown land classified as a "Watering Place" Reserve (1510) and covers 404 hectares. This classification does not provide any protection for plant or animal conservation. Originally it was on the Broome to Derby stock route but is presently being used by Roebuck Plains Station.

METHODS

During the wet season of 1995/1996 twice monthly counts of the bird life of the lagoon and surrounds were made (October 1995 to May 1996). The time taken for each count and all bird species present were recorded. Notes were made on species that were breeding. Leica (10 x 42) binoculars and Kowa telescope (25 x) were used. At least two observers counted the number of each species independently, if counts did not agree a further count was made.

RESULTS

In late October when the first count was made the water level in the lagoon was low with a deep-water area in the centre and a shallow channel leading off this. The outer margins of the lagoon consisted of coarse grasses fringed with trees (*Acacia colei),* muddy fringes then gave way to short grassland and a "floating island" of "dead reeds" (*Pseudoraphis spinescens*) was present in the centre of the lagoon where the water was deep.

By mid-November the water level had decreased by 50% and it was possible to walk through the "deep" part of the lagoon. In late November and early December inland thunderstorms started filling the lagoon, eg. 230mm of rain fell on 15/12/95, however by early January most of this water had evaporated leaving large muddy fringes suitable for species such as Oriental Pratincole and Little Curlew. By late January the lagoon was three quarters full and most of the waders had departed. The lagoon continued to fill through out February. When the last count was made in May 1996, no muddy fringes had appeared and the water level in the lagoon remained high.
Rainfall in the area is similar to that of Broome (Fig. 1), however isolated thunderstorms occur at inland localities and these increase the water that flows into this system.

A total of 71 species were recorded at Taylors Lagoon (Table 1), 38 of these were waterbirds and of these,17 were wader species.

DISCUSSION

During October to January waterbirds utilised the available freshwater and significant numbers of waterfowl were present between October 1995 and January 1996; Pacific Black Duck, maximum 900, Grey Teal maximum 600, and Eurasian Coot, maximum 200. Of special interest to the observers and Broome Bird Observatory were the species that are considered migratory waders or shorebirds. The muddy fringes attracted exceptional counts of Little Curlew 6000 (January 1996), Marsh Sandpiper 31 (January), Wood Sandpiper 25 (October), Sharp-tailed Sandpiper 200 (January), Oriental Pratincole 6000 (January) and 200 Australian Pratincole (January). The count for Little Curlew was of international significance representing 3.3% of the flyway population, as was that of Oriental Pratincole representing approximately 9% of the flyway population (Watkins 1993).

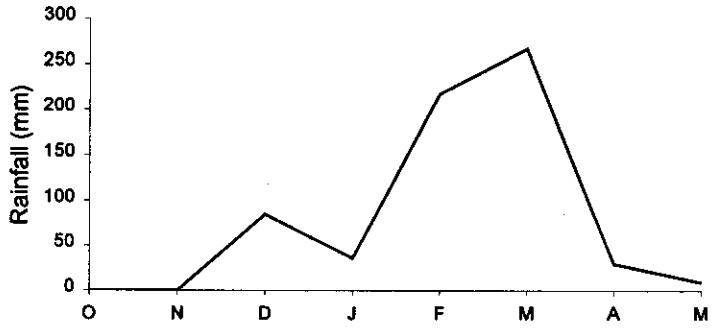

Figure 1. Rainfall in Broome (supplied by Broome Meteorology Station) October 1995 to May 1996.

Snipe species also used the muddy fringes. Snipe usually occur in small numbers in a variety of locations so it was no surprise that a count of 4 was recorded in January. It was not possible to allocate a species for snipe. The two species known to occur in the area have very similar plumage. It is considered that a positive identification is only possible when birds are in the hand.

After the heavy rains of February and March the lagoon had filled to overflowing and the importance of Taylors Lagoon to migratory waders diminished quite significantly. This was probably due to the loss of open areas at the edge of the lagoon as it flooded into the tall grassland. Other waterbirds also decreased in number, perhaps seeking more protected areas where they could breed away from the attention of raptors and shooters. However, eight species bred at Taylors Lagoon. These were Pacific Black Duck, Australian Grebe, Hoary-headed Grebe, Eurasian Coot, Black-winged Stilt, Red-capped Plover, Black-fronted Dotterel and Masked Lapwing. The deeper waters also attracted 200 Hardhead which was a significant number for the Broome area.

In conclusion it can be stated that Taylors Lagoon is a wetland of international importance regularly supporting more than 1% of two species of migratory wader, Oriental Pratincole and Little Curlew. It should be nominated as Shorebird network site in WA, and afforded greater protection by the WA government. It is of great importance to these species as a water resource, feeding and roosting area before the major rains of the wet season fill it to capacity. Little Curlew and Oriental Pratincole may still drink at the site even when it is full if there is suitable feeding habitat within flying distance. Its muddy fringes also provide important feeding habitat for other species of migratory and resident waders as well as resident species of ducks and herons. In drier years than the one experienced here the lagoon habitat could also be used by waders when fattening for migration in March/April. Further monitoring is needed.

It is also worth mentioning that the surrounding woodland hold species of passerine that can be considered localised in the Broome region. Of special note are Black-tailed Treecreeper, Striated and Red-browed Pardalote, Varied Sittella and Black-chinned Honeyeater which are resident breeding birds. Passerines also frequent the area when the Eucalypts flower and nectar migrants visit the area in very large numbers so any development or radical changes to these woodlands would have a detrimental effect to the importance of Taylors Lagoon as an integrated ecosystem. There is the distinct possibility of interfering with a complex system of wetlands, of which the lagoon is a major piece of the jig saw, which is little studied and even less understood.

ACKNOWLEDGEMENTS

Thanks go to Tim Willing of the Broome Conservation and Land Management Office for his confirmation of the status of Taylors Lagoon. We also thank Mavis Russell, Jon Fallaw and Becky Hayward for their assistance during the counts and for access to Broome Bird Observatory unpublished records. Roebuck Plains Station kindly gave permission to visit the site.

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Table 1. Counts of bird species seen at Taylors Lagoon, NW Australia from October 1995 to May 1996.

SPECIES	DATE										
	26/10/95	19/11/95	1/12/95	16/12/95	9/01/96	27/01/96	5/02/96	26/02/96	17/03/96	23/04/96	8/05/96
Start Time	12.00	12.13	11.30	9.30	8.00	14.23	16.47	10.00	13.15	12.00	11.35
Finish Time	13.30	12.45	12.20	10.10	8.45	15.00	17.40	10.30	13.45	12.45	12.00
Plumed Whistling-Duck	5	8	7	15	100	6	28	12	3	18	6
Wandering Whistling-Duck	0	0	0	9	0	0	6	0	0	0	0
Australian Wood Duck	2	5	6	0	0	0	0	0	0	0	4*?
Green Pygmy Goose	1	0	3	0	0	0	0	0	0	0	0
Pacific Black Duck	30*	900	900	30	606	4	0	12	5	22*	4
Grey Teal	300	500	400	25	600	100	7	40	2	10	14
Pink-eared Duck	0	0	0	3	0	0	0	18	3	2	10
Hardhead	60	0	70	0	0	0	0	6	0	200	250*
Australasian Grebe	15	14	21	70	8	4	17	200	4	15	62
Hoary-headed Grebe	0	10	6	1	0	2	4	57	2	20*	10
Little Pied Cormorant	1	0	0	0	0	0	0	0	1	0	0
Little Black Cormorant	0	0	0	0	0	0	0	1	0	0	0
White-faced Heron	0	1	0	0	2	0	0	1	0	1	2
White -necked Heron	5	4	3	0	0	0	0	0	0	0	0
Glossy Ibis	2	1	3	0	0	0	0	9	0	0	0
Australian White Ibis	0	0	0	0	1	0	0	0	0	0	0
Straw-necked Ibis	0	0	4	0	0	57	0	0	0	4	0
Royal Spoonbill	0	0	0	0	0	0	1	0	0	0	0
Black Kite	0	1	0	0	0	0	0	0	0	1	0
Black-breasted Buzzard	0	0	0	0	1	0	0	0	0	0	0
Whistling Kite	0	0	0	0	2	0	0	1	0	0	0
White-bellied Sea-Eagle	0	0	0	0	1	0	0	0	0	0	0
Spotted Harrier	1	0	0	0	0	0	1	0	0	0	0
Brown Goshawk	0	1	2	0	0	0	0	0	0	0	0
Wedge-tailed Eagle	0	0	1	0	0	0	0	0	2	0	0
Little Eagle	0	0	0	0	1	0	0	0	0	0	0
Brown Falcon	0	0	1	0	0	0	0	0	0	0	0
Australian Hobby	0	0	0	0	0	0	0	0	0	1	0
Peregrine Falcon	0	0	0	1	1	0	0	1	0	0	0
Nankeen Kestrel	1	0	0	0	1	0	0	0	0	1	0
Brolga	3	3	3	0	0	0	1	0	0	0	0
Purple Swamphen	0	0	0	0	0	0	0	0	0	0	1
Eurasian Coot	24	28	24	26	0	2	10	20	24	150*	400
Snipe sp.	0	0	0	0	4	2	0	0	0	0	0
Black-tailed Godwit	0	0	0	0	1	0	0	1	0	0	0
Little Curlew	4	0	0	16	6000	0	1	0	0	0	0
Marsh Sandpiper	33	14	26	5	31	9	1	2	0	0	0
Common Greenshank	1	3	3	3	50	0	3	7		4	14
Wood Sandpiper	25	2	3	0	0	0	0	0	0	0	0
Red-necked Stint	0	1	0	0	0	0	0	0	0	0	0
Long-toed Stint	0	0	0	0	3	2	1	0	0	0	0
Sharp-tailed Sandpiper	7	17	30	6	200	30	5	30	0	0	0
Curlew Sandpiper	0	1	0	0	0	1	0	0	0	0	0
Black-winged Stilt	30	19	19	92	40	20	54	35*	30*	10*	11

SPECIES	DATE										
	26/10/95	19/11/95	1/12/95	16/12/95	9/01/96	27/01/96	5/02/96	26/02/96	17/03/96	23/04/96	8/05/96
Red-capped Plover	0	1	0	0	0	0	7	0	0	0	0
Black-fronted Dotterel	2	4	8*?	0	4*?	2	0	0	0	1	1
Red-kneed Dotterel	12	6	6	0	6	6	0	0	0	0	0
Masked Lapwing	8	7	10	12	5*	12*	7	1	3	0	5
Oriental Pratincole	0	5	0	0	6000	500	0	4	0	0	0
Australian Pratincole	1	77	60	0	150	50	0	1	0	0	0
Gull-billed Tern	0	0	0	0	0	0	1	1	2	0	0
Whiskered Tern	0	0	0	23	2	7	50	36	12	0	0
White-winged Black Tern	0	0	0	2	0	1	2	0	0	0	0
Crested Pigeon	0	0	0	0	4	0	0	0	0	0	0
Diamond Dove	0	0	2	0	0	0	0	0	0	0	0
Peaceful Dove	0	0	33	0	0	0	0	0	0	0	0
Red-tailed Black-Cockatoo	0	0	50	0	4	0	0	0	0	0	0
Galah	0	0	0	0	8	0	0	0	0	31	0
Little Corella	12	0	0	0	6	0	0	0	0	0	0
Cockatiel	0	10	109	3	0	0	0	0	0	0	0
Budgerigar	0	0	0	0	0	0	0	0	2	0	0
Rainbow Bee-eater	0	8	15	0	0	0	0	0	2	0	0
Rufous-throated Honeyeater	0	0	13	0	0	0	0	0	0	0	0
Magpie-lark	2	1	8	2	1	12	0	0	0	0	0
Willie Wagtail	0	1	0	2	0	0	0	0	0	1	0
Little Woodswallow	0	0	5	0	0	0	0	0	0	0	0
Little Crow	6	3	6	0	0	0	0	0	0	0	0
Zebra Finch	500	80	150	0	0	0	0	0	0	0	0
Long-tailed Finch	0	60	0	0	0	0	0	0	0	0	0
Tree Martin	0	0	0	0	6	0	4	0	0	0	0
Fairy Martin	0	4	30	0	10	0	0	0	0	0	0

* = indicates birds on nests or with chicks during this period.

*?=indicates birds suspected of breeding during this period usually accompanied by fledged chicks or by other behaviour

SOUTHWARD MIGRATION OF SHOREBIRDS IN THE GANGES DELTA, BANGLADESH

M. S. Islam

House No-15/22. Munshi Bari, South Chartha, Comilla-3500 BANGLADESH
Email: msislam2000@yahoo.com

ABSTRACT

A total of 216,774 shorebirds of 31 species were counted in the south central coastal zone of Bangladesh from 22 to 26 October 2000. Highest species diversity (29 species) was recorded at Damar Char and this site also had the majority of the birds (135,302). The lowest diversity (15 species) was observed at Namar Bazar of Nijhum Dwip. The large number of migratory shorebirds makes it essential that monthly population counts are made in this region, at least at Damar Char, in order to monitor both southward and northward migration through Bangladesh.

INTRODUCTION

Bangladesh contains the large delta formed by the Ganges, Brahmaputra and Meghna river systems that are historically rich in biological resources. Rahman (1988) has described characteristics of the Bangladesh coast. He states that the rich delta of the Bangladesh coast is the product of the high river flows from the huge drainage system of the western Himalayas. The enormous rainfall associated with the monsoon climate and the snow melt in the Himalayan ranges are the main sources of water that pass through a myriad of rivers. Most of the water flows through Bangladesh via the Brahmaputra, the Ganges and their tributaries. These two major rivers join into the Meghna River and fall into the Bay of Bengal through the Bangladesh coastal region.

In geological time scale, the Himalayas are one of the youngest mountain ranges and at the same time the largest. The Brahmaputra-Gangetic-Meghna delta that covers most of Bangladesh is one of the youngest and again one of the largest and most dynamic deltas. The lower part, included in the coastal region is a nascent delta. The central region is the most active area of the delta where the massive sediment load of the Ganges-Brahmaputra-Meghna river systems fall into the Bay of Bengal through the Meghna estuary. Land errosion and accresion is a continuous process and land reclamation prospects are high (Hossain 1989). There is a series of offshore islands (Nangulia Char and Boyer Char) located south of Banshkhali that are formed by sedimentation. Reedlands and mudflats are common feature here. A number of rivers, channels and canals circulated in and around the area. There is a channel located between Hatiya and Nijhum Dwip, called Nijhum Dwip Channel and locally called Moktaria Khari. On the north of this channel is the southern tip of the Hatiya main land, on the south is the northern tip of the Nijhum Dwip mentioned as Bandar Tila, on southeastern side is the Damar Char and on the west side is the Shahbazpur river (Fig. 1). On further west is the Manpura Island and on further east is the West Hatiya Channel. Namar Bazar located in southern part of Nijhum Dwip. Banda Khali starts from Nijhum Dwip Channel and entered into Bandar Tila of Nijhum Dwip. For the nature of characteristics the mouth of Banda Khali is very important feeding ground for local and migratory shorebirds. Table 1 shows the English common and scientific names of the species recorded in this study.

Very little ornithological work has been carried out in this region. During December 1999 a total of 96 000 shorebirds of 34 species were counted in Nijhum Dwip including Namar Bazar and Bandar Tila (Islam 2000a).

MATERIALS AND METHODS

The shorebird count was carried out over a 5-day period from 22 to 26 November 2000. The team was transported in a fishing boat with 26 hp engine. The straight-line length of coastline along which shorebirds were counted was approximately 50 km. The six south central coastal sites visited included Nanguliar Char, southeastern part of Boyer Char, Namar Bazar, Banda Khali Mouth, Bandar Tila and Damar Char (Fig. 1). Counting started in the late morning and extended to mid-afternoon. Counts in adjacent parts were adjusted when birds moved between areas. Even at high tide, much of the intertidal mudflats were uncovered and the counting technique involved walking just inland of the tide edge and counting roosting and feeding birds. This meant that counters walked quite long distances. Boat surveys were also used where possible. Birds flying over the split were taken into account. Weather conditions throughout the count period were generally favourable. The survey started from Nangulia Char and finished at Damar Char.

RESULTS AND DISCUSSION

A total of 216,774 birds of 31 species were counted including 9,120 unidentified shorebirds (Table 2). Unidentified birds repesented 4.3% of the total count. According to site, a total of 9,329 individuals were observed in Nangulia Char and then 13,471 individuals

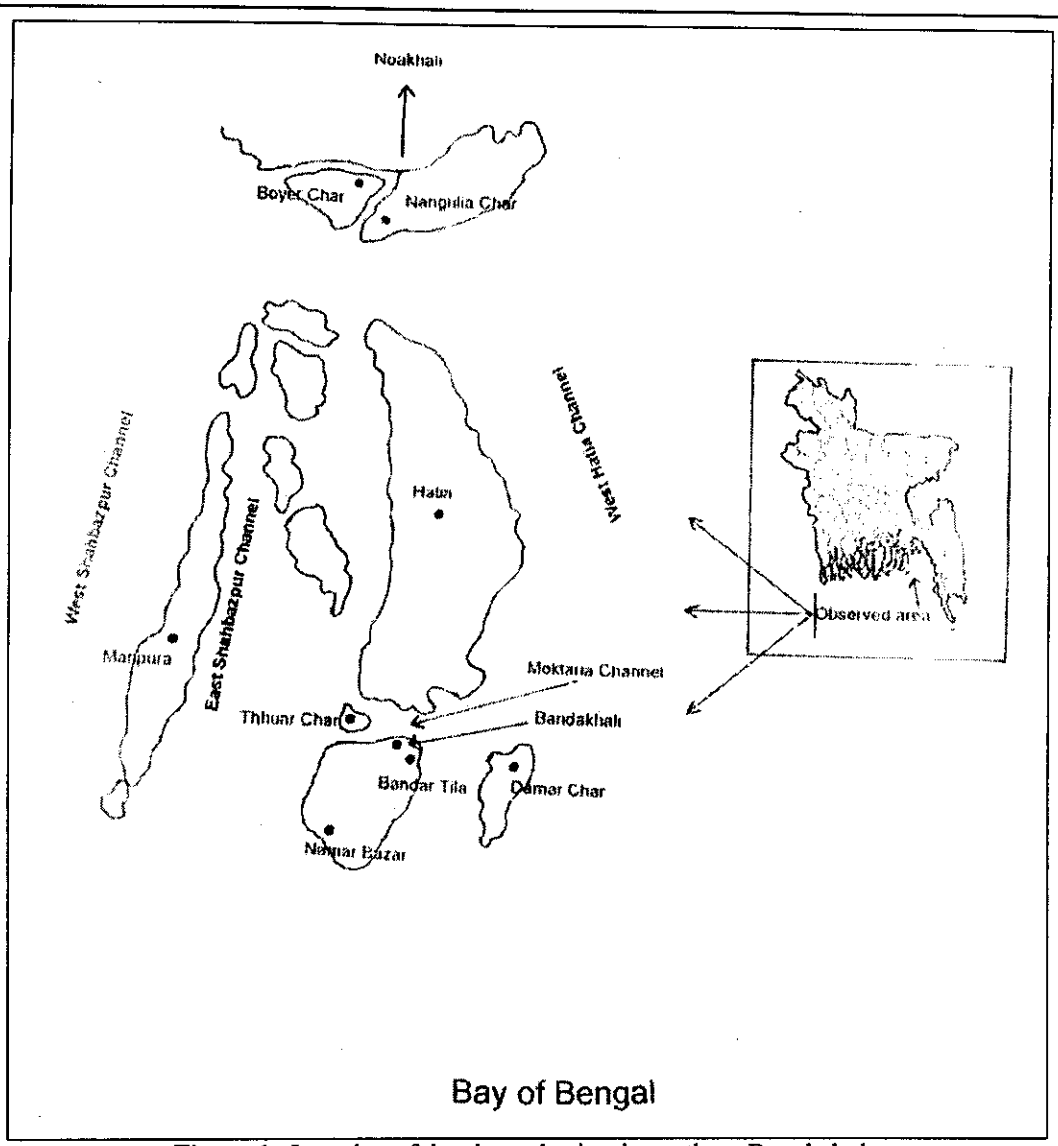

Figure 1. Location of the six study sites in southern Bangladesh.

for Boyer char, 1,535 individuals for Namar Bazar, 52,519 for Bandar Tila including 3027 unidentified birds, 4618 for Bandakhali Mouth and 135,302 for Damar Char. Figure 2 shows the comparison of abundance among the six sites.

The most abundant species in this study were Kentish Plover *Charadrius alexandrinus* (50.9% of identified birds found at all the sites) (Fig. 3). The next six most abundant species were Little Ringed Plover *Charadrius dubius* (20.8% of total identified counts), Temminck's Stint *Calidris temminckii* (5 %), Common Redshank *Tringa totanus* (3.5%), Little Stint *Calidris minuta* (3.2%), Common Sandpiper *Actitis hypoleucos* (2.7%) and Black-tailed Godwit *Limosa limosa* (2.3% of total identified counts). These seven species represented 88.4% of the total identified shorebirds and 84.7% of total numbers including unidentified individuals.

Most of the species were concentrated in the south east of the study area. The highest species diversity was recorded at Damar Char (29 species). Of the other sites, there were 21 species in Nangulia Char, 27 at Boyer Char, 15 at Namar Bazar, 25 at Bandar Tila and 17 species at the Bandakhali Mouth. Unidentified birds were observed at Bandar Tila and Damar Char.

The most notable feature of the count is the very large number of Kentish Plover *Charadrius alexandrinus* seen at Damar Char (Fig. 4). The largest flock observed was 45,000 individuals in the south eastern part of this Char land on 25 October 2000. A large number of Kentish Plover were also recorded at Bandar Tila and these represented 16.6% of the total coverage of this species. The 79,500 Kentish Plover recorded at Damar Char represented 61.5% of all the identified birds recorded at Damar Char and the 20,400 Little Ringed Plover *Charadrius dubius* corresponded to a further 15.8% in this site (Fig. 5). These two species make up 77.4% of the total identified birds recorded at Damar Char and this was the most significant record. According, at the other 5 sites, Kentish Plover *Charadrius alexandrinus*

Table 1. The common and scientific name of species observed in southern Bangladesh during 2000.

English Name	Scientific Name
Common Snipe	*Gallinago gallinago*
Pintail Snipe	*Gallinago stenura*
Black-tailed Godwit	*Limosa limosa*
Bar-tailed Godwit	*Limosa lapponica*
Eurasian Curlew	*Numenius arquata*
Whimbrel	*Numenius phaeopus*
Common Redshank	*Tringa totanus*
Spotted Redshank	*Tringa erythropus*
Marsh Sandpiper	*Tringa stagnatilis*
Common Greenshank	*Tringa nebularia*
Wood Sandpiper	*Tringa glareola*
Common Sandpiper	*Actitis hypoleucos*
Terek Sandpiper	*Xenus cinereus*
Ruddy Turnstone	*Arenaria interpres*
Asian Dowitcher	*Limnodromus semipalmatus*
Great Knot	*Calidris tenuirostris*
Little Stint	*Calidris minuta*
Temminck's Stint	*Calidris temminckii*
Curlew Sandpiper	*Calidris ferruginea*
Broad-billed Sandpiper	*Limicola falcinellus*
Ruff	*Philomachus pugnax*
Small Pratincole	*Clareola lactea*
Pied Avocet	*Recurvirostra avosetta*
Grey-headed Lapwing	*Vanellus cinereus*
Red-wattled Lapwing	*Vanellus indicus*
River Lapwing	*Vanellus duvaucelii*
Pacific Golden Plover	*Pluvialis fulva*
Kentish Plover	*Charadrius alexandrinus*
Little Ringed Plover	*Charadrius dubius*
Lesser Sand Plover	*Charadrius mongolus*
Greater Sand Plover	*Charadrius leschenaultii*

represented 25.2% of total counts of Nangulia Char, 39% for Boyer Char, 35.4% for Namar Bazar, 35.4% of total identified counts for Bandar Tila and 12% for Banda Khali Mouth.

The Common Sandpiper *Actitis hypoleucos* was the most common sandpiper species in the study area. In Bandakhali Mouth and in Damar Char, their number were 2,530 and 2,290 respectively, which represented 45.6% and 41.3% of all Common Sandpiper *Actitis hypoleucos* seen (Fig. 6).

Due to the south central coastal zone of Bangladesh containing extensive mudflats, good numbers of Whimbrel *Numenius phaeopus* and Eurasian Curlew *Numenius arquata* occur at all sites. In Damar Char and Bandar Tila, 885 and 700 Whimbrel *Numenius phaeopus* were seen and these represented 51.4% and 40.6% of total counts of this species. At Damar Char, a total of 125 Eurasian Curlew *Numenius arquata* represented 50.2% of total count of this species. A sizable population of Wood Sandpiper *Tringa glareola* were observed in both Bandar Tila and Damar Char. Here, 866 and 592 individuals represented 58.4% and 39.9% of total count respectively. In Namar Bazar, 123 Lesser Sand Plover *Charadrius mongolus* represented 4.1% coverage whilst 148 individuals of Greater Sand Plover *Charadrius leschenaultii* represented 8.1% coverage of this two species respectively. The 542 Kentish Plover *Charadrius alexandrinus* seen at Namar Bazar represented 35.3% of the total count there.

Nijhum Dwip, Kalkini, Hatailla, Jangalia, Manpura, Damar Char, Dhal Char, Moheshkhali, St. Martin's Island and Shahparir Dwip are very important coastal locations for wintering waders because of their zoogeographical position (Islam 2000b). At St. Martins Island during the monsoon to pre-winter period, a large shallow lagoon is located at Uttarpara that is connected to the sea in the west by a narrow channel. This area serves as a fishing ground for most of the period and a harbour for wintering birds. The entire shoreline is bordered by dense *Pandanus* and *Ipomea* covers the sand dunes and flat ground (Islam et al. 1999). During southward migration shorebirds began to arrive in this area from August to September, increased maximum from December to January, started

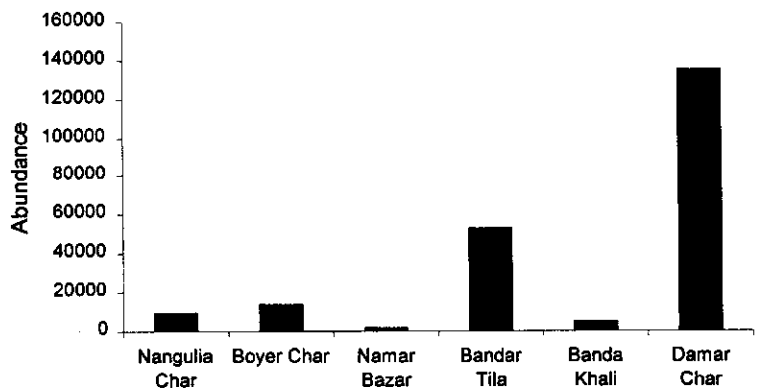

Figure 2. Comparison of the overall abundance of shorebirds at the six sites during October 2000.

Table 2. Number of birds and number of species at the six sites surveyed in southern Bangladesh in October 2000.

Species	Nangulia Char	Boyer Char	Namar Bazar	Bandar Tila	Banda Khali	Damar Char	Total
Common Snipe	-	3	-	3	-	5	11
Pintail Snipe	-	3	-	1	-	1	5
Black-tailed Godwit	218	520	-	2503	21	1560	4822
Bar-tailed Godwit	100	113	-	974	-	800	1987
Eurasian Curlew	13	9	22	50	30	125	249
Whimbrel	56	23	33	700	26	885	1723
Common Redshank	400	530	55	1160	117	5000	7262
Spotted Redshank	10	-	20	106	-	175	311
Marsh Sandpiper	70	80	-	224	46	480	900
Common Greenshank	328	113	-	-	-	675	1116
Wood Sandpiper	-	23	-	866	2	592	1483
Common Sandpiper	177	187	153	210	2530	2290	5547
Terek Sandpiper	200	702	-	120	26	1522	2570
Ruddy Turnstone	-	54	23	908	104	1683	2772
Asian Dowitcher	-	14	-	39	-	199	252
Great Knot	8	-	27	178	-	439	652
Little Stint	1022	799	135	1542	58	3020	6576
Temminck's Stint	104	220	30	4044	20	6002	10420
Curlew Sandpiper	20	21	-	72	-	88	201
Broad-billed Sandpiper	-	26	-	38	5	385	454
Ruff	308	253	-	773	27	1023	2384
Small Pratincole	-	-	-	-	-	10	10
Pied Avocet	-	-	-	-	-	1	1
Grey-headed Lapwing	3	5	2	-	-	2	12
Red-wattled Lapwing	-	7	-	-	-	-	7
River Lapwing	-	2	-	-	-	-	2
Pacific Golden Plover	13	22	75	1188	-	875	2173
Kentish Plover	2343	5248	542	17501	554	79500	105688
Little Ringed Plover	3225	3591	147	15008	877	20400	43248
Lesser Sand Plover	687	523	123	663	105	880	2981
Greater Sand Plover	24	380	148	621	70	592	1835
Unidentified Waders	-	-	-	3027	-	6093	9120
Total Number	9329	13471	1535	52519	4618	135302	216774
Total Species	21	27	15	25	17	29	

leaving from February to March and finally, leave the areas between April and May. Larger migrants usually arrived later and left earlier then the smaller migrants (Hossain & Sarker 1997a; Husain *et al.* 1983; Sarker 1984; 1991; Sarker & Sarker 1983).

Large numbers of people live around Banda Khali. This Khal is also used for navigation and people from Moktaria go to Bandar Tila through this Khal. Small-scale fishing also observed in this Khal. The eastern part of the Moktaria Channel is heavily silted up and during low tide, the water depth is minimal. There is another char raised at the west part of the channel and the size of the char is increasing gradually. The northeastern and southeastern mudflats of Nijhum Dwip are very suitable habitat for water birds and for local and migratory shorebird species.

Interviews with local people indicated that the shorebird populations in the area had declined over the past few years, particularly those of plovers, sandpipers, snipes, whimbrel and curlews. However, the population of species like Sunbirds , Black Drongo *Dicrurus adsimilis*, Pied Myna *Sturnus contra* and other species of disturbed areas have increased. This could be attributed to loss of wilderness and expansion of agriculture and human inhabitation. Most of the islands in the coastal areas have been heavily exploited in the recent decades by human settlement and other social activities. The types of activities that affect the quality of the habitat include exploitation of woodland and forests and over-fishing in the rivers throughout the year (Hossain & Sarker 1997b). Due to an absence of human settlement, Damar Char is less disturbed and it has extensive feeding grounds.

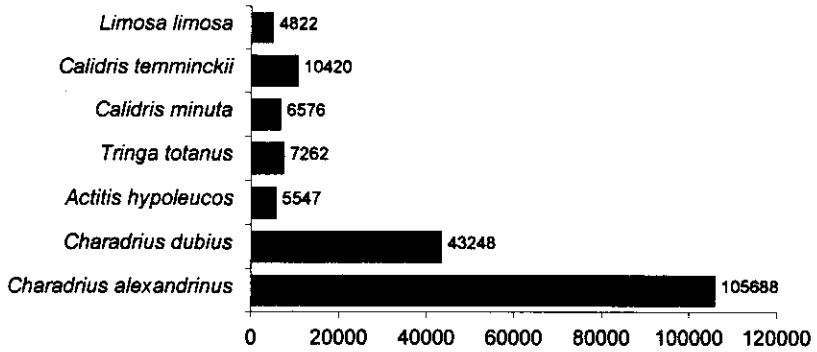

Figure 3. The overall abundance of the seven most abundant species in the lower Meghna River estuary in October 2000.

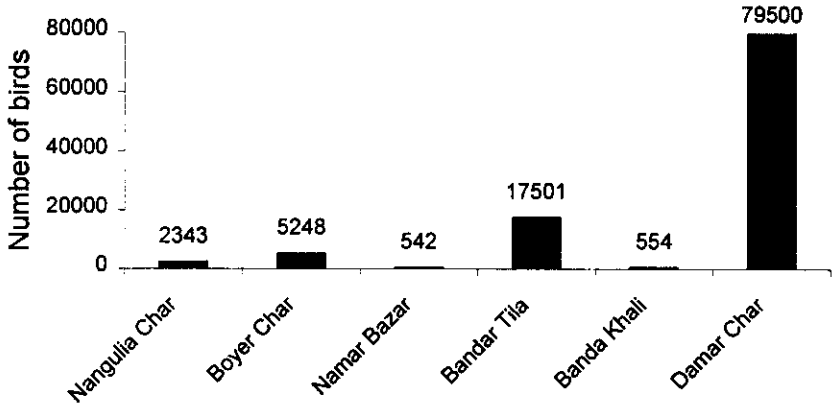

Figure 4. The abundance of Kentish Plover *Charadrius alexandrinus* at the six sites surveyed in October 2000.

Further movement of people along the beach creates disturbances to the shorebirds. Accordingly, the populations and species diversity should be record throughout the year. There is an urgent need for continuous population monitoring in order to conserve the tremendous Ganges delta that supports a significant number of migratory shorebirds.

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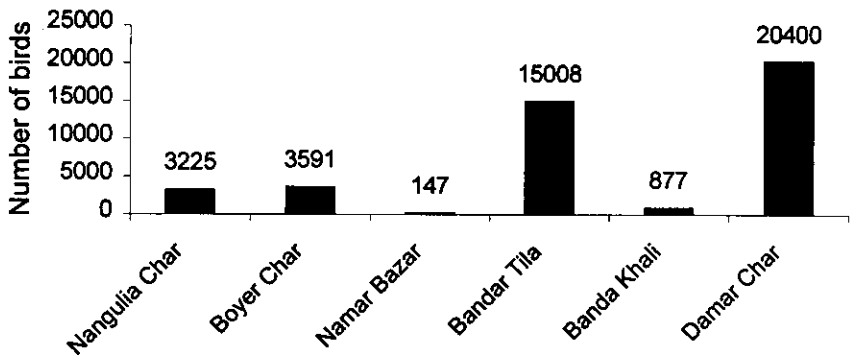

Figure 5. The abundance of Little Ringed Plover *Charadrius dubius* at the six sites surveyed in October 2000.

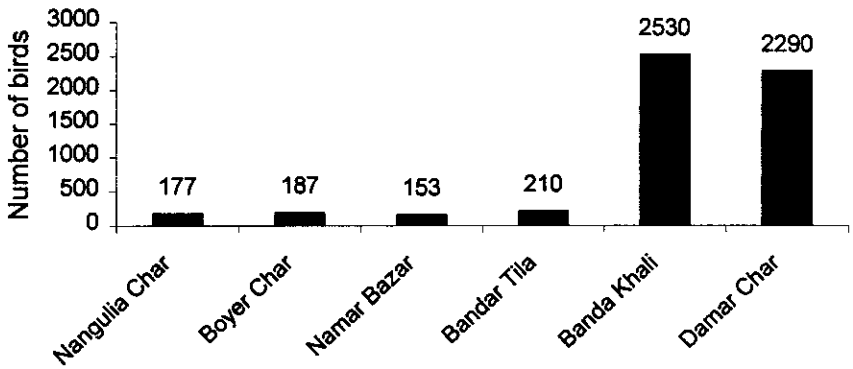

Figure 6. Abundance of Common Sandpiper *Actitis hypoleucos* at the six sites surveyed in October 2000.

RECORDS OF NORTHWARD MIGRATION OF DUNLIN *CALIDRIS ALPINA* THROUGH KAMCHATKA, RUSSIA

Yu. N. Gerasimov and N. N. Gerasimov

Kamchatka Institute of Ecology, Far-East Branch Russian Academy of Science, Rybakov 19A, Petropavlovsk-Kamchatsky 683024 RUSSIA
Email: bird@svyaz.kamchatka.su

METHODS

This paper has been prepared from information obtained in various parts of Kamchatka over the period 1965-1999. During 1975-1989, spring counts of northward migrating ducks (Anatidae) were carried out periodically. During these activities, some data were collected on Dunlin migration. Since 1990, the authors have carried out special spring counts focusing on shorebirds. The areas covered and the methods used in making these counts are described in (Gerasimov & Gerasimov 2000a).

RESULTS

Southwest coast

Observations of migration at the Opala River mouth (Fig.1, Site 1) commenced on 29 April 1994. The first Dunlin (2 individuals) were seen on May 8, with the next sighting being on 16 May. From 19 May onward, Dunlin were common in the area. In total, more than 35,000 individuals were counted between 8-25 May. A very distinct migration peak occurred on 21 May, when more than 32,300 Dunlins were counted or 92 % of the total for the observation period (Fig. 2). The most active migration took place in the

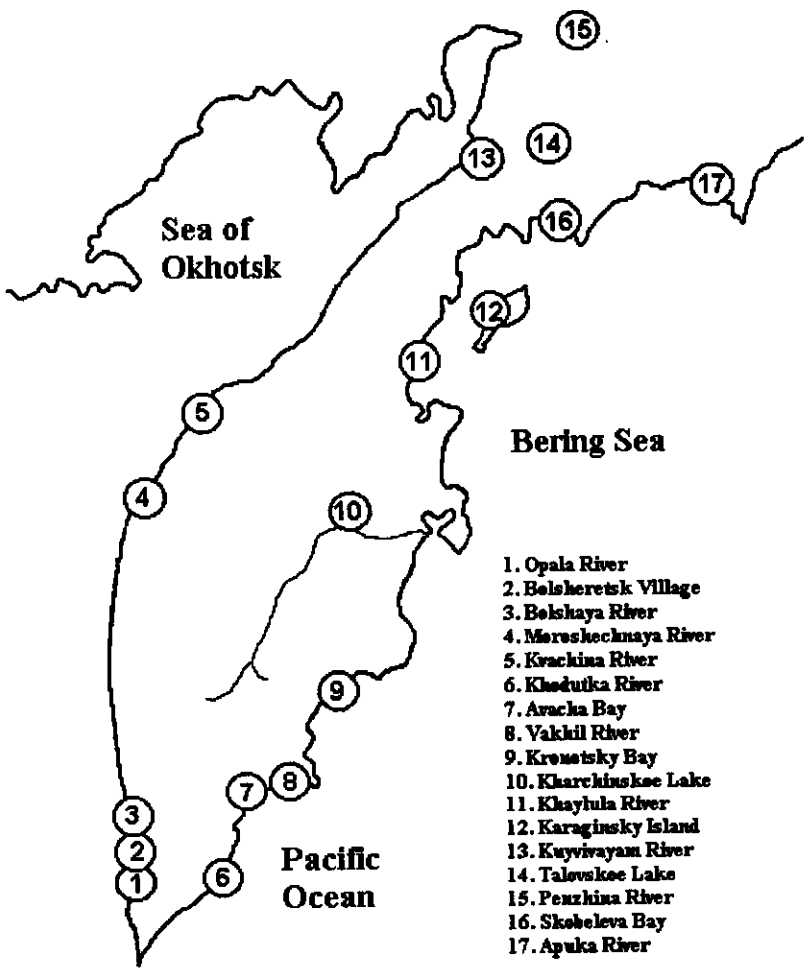

Figure 1. Map of Kamchatka peninsula, eastern Russia, showing the location of sites mentioned in the text.

evening, with some flocks numbering up to 1000 birds. Counting ceased at 11 pm, due to the onset of darkness, but for several hours afterwards flocks were heard flying past (Gerasimov & Kalyagina 1995).

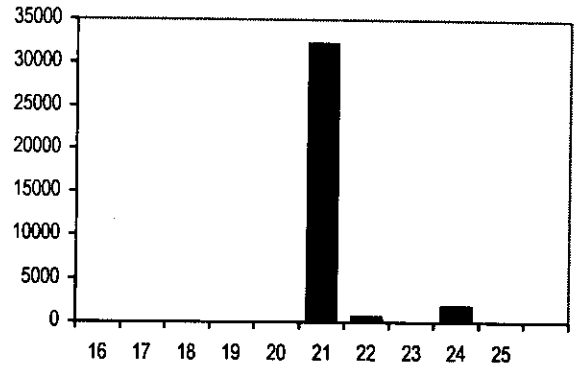

Figure 2. Daily numbers of Dunlin counted at the Opala River mouth in May 1994.

Active Dunlin migration took place on 24 May near Bolsheretsk Village (Fig. 1, Site 2) in 1980. During the second half of the day, flocks, from 200 to more than 500 birds, flew past at 0.5 - 2 minute intervals. Less intensive migration occurred on the next day. In 1974 near the Bolshaya River mouth, (Fig. 1, Site 3) the first small flock (3 birds) appeared on 15 May. Mass migration was observed on 16-17 May (Ostapenko *et al.* 1975).

In the same area in 1993, migrating flocks first appeared on 13 May, when we saw significant numbers of birds. In total, about 55,000 Dunlins were counted from 13-26 May. Peak migration occurred on 18 May, when about 25,000 individuals were counted (Fig. 3). On this day, 66 flocks were observed between 6 and 7 a.m., varying from 10 to 600 individuals each, and totalling more than 9300 birds (Gerasimov 1998).

In 1993, daily counts of Dunlin feeding on the mudflats of Bolshoe Lake were carried out. The lake has a diameter of about 10 km and an area of 53.5 km^2, and has large mudflats at low tide. The count data are given in a Figure 4.

West Coast

On the west coast of Kamchatka, the most complete migration data were obtained at the Moroshechnaya River estuary (Fig. 1, Site 4). In 1974, the first Dunlin arrived on 15 May, with mass migration starting on 27 May and reaching a maximum on 30 May – 1 June (N. Mironov pers. comm.).

In 1975, the first Dunlin also arrived on 15 May. A flock of about 1,000 birds was observed on the mudflats on 17 May, but mass migration only started from 23 May. On the morning of 24 May, more than 2,200 birds were counted during a one hour period. A second migration peak occurred on 29 May, when

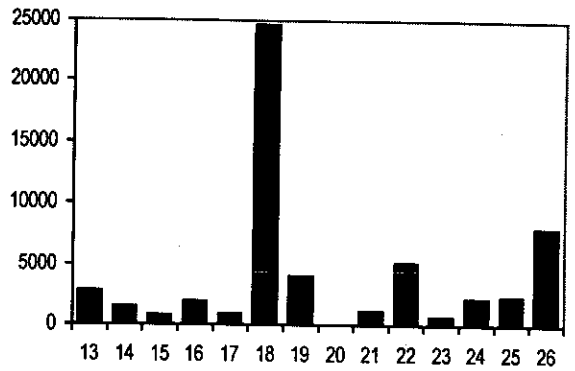

Figure 3. Daily numbers of Dunlin near Bolshaya River mouth in May 1993.

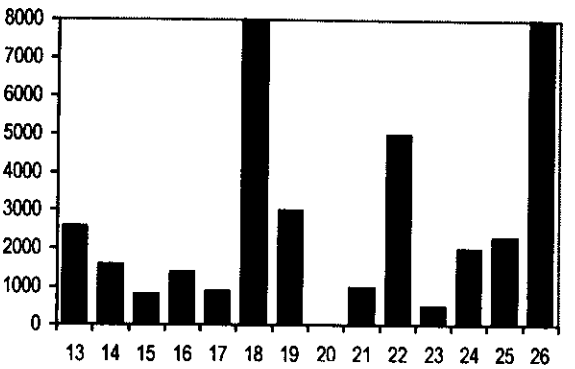

Figure 4. Daily number of feeding Dunlins counted during low tide on the north-western side of Bolshoe Lake in May 1993.

some flying flocks consisted of more than 1,000 individuals (Gerasimov *et al.* 1992).

In 1976, the first Dunlin appeared on 14 May, with mass migration occurring during 23-25 May. The situation was very similar in 1977, with the first birds also being seen on 14 May and the most active migration taking place on 22, 23 and 26 May. In 1979, mass migration began on 20-21May (N. Mironov pers. comm.) Whereas, in 1980 we observed the first Dunlin on May 14. Mass migration took place from May 22-25, when 5,000-10,000 birds were observed daily at the estuary mouth.

In 1983, the first Dunlin were not seen until May 20, but on the next day more than 10,000 were observed feeding on mudflats at the estuary mouth. Mass migration proceeded until May 25.

In 1990, the first birds were observed on May 13. Observations made from the sea coast resulted in 36,000 migrating Dunlin being counted. However, no count was made of the estuary mouth region where the majority of the birds occurred. Most active migration occurred on May 26 (Fig. 5; Gerasimov 1991; Gerasimov & Gerasimov 2000a).

In 1977, during waterfowl counts at the Kvachina River mouth (Fig. 1, Site 5), 150 km north of the Moroshechnaya

River estuary, a colleague saw the first Dunlin arriving on 12 May, and mass migration began on 23-24 May (A. Novopashin pers. comm.).

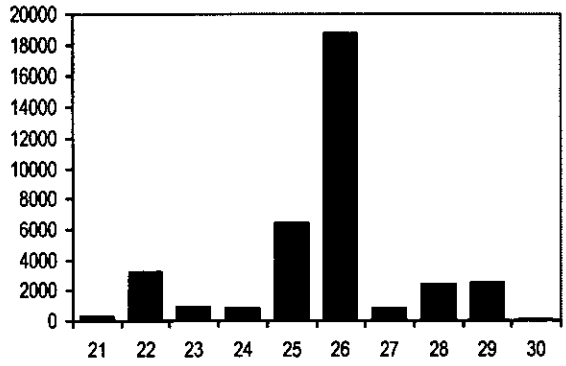

Figure 5. Daily number of Dunlin migrating along the sea coast near the Moroshechnaya River mouth in May 1990.

North-western Coast

At the Kuyvivayam River mouth (Fig 1, Site 13) in 1998, we saw the first Dunlin on 20 May. On the nearby Kuyul River (Fig. 1, Site 14), the first Dunlin were noted on the same date in 1981.

Further north, in the Penzhina River mouth (Fig. 1, Site 15), during waterfowl counts conducted since 1980, the first Dunlin were seen around 25 May, with mass migration commencing on about May 28 (V. Smirnov pers. comm.).

Central Kamchatka

During 1980-1984, waterfowl migration was studied at Kharchinskoe Lake (Fig. 1, Site 10). The first Dunlin were recorded on 24, 19, 17, 21 and 8 May successively during those five years (A. Varankin pers. comm.). In 1999, at the same place we noted the first Dunlin on 18 May. Peak migration occurred on 24 May (about 2,600) and 25 (about 1,800) (Fig. 6). In total, up to 27 May, we counted about 7,300 birds (Gerasimov 2000). As observations were only made from the western part of the Lake, we estimate that not less than 10,000 individuals passed through the area.

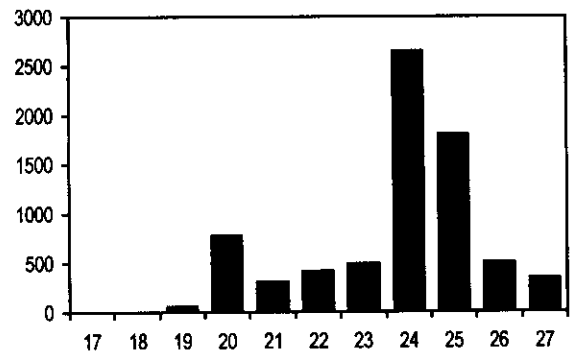

Figure 6. Daily number of Dunlin at Kharchinskoe Lake in May 1999.

South-eastern Coast

At the Khodutka River mouth (Fig. 1, Site 6), the first Dunlin were seen on 12 May in 1995

In Avacha Bay (Fig. 1, Site 7), birds were first seen on 15 May in 1965 and 12 May in 1966. In both instances the flocks consisted of several tens of individuals.

In 1991, at the Vakhil River mouth (Fig. 1, Site 8), the first Dunlin were observed on 16 May and on 18 May in 1992. In 1991, mass migration started on 20 May. Unfortunately, in both years we finished counts early (22 and 21 May respectively) and are not able to estimate the total number of Dunlin migrating through the area. However, about 1350 birds were counted in the first year (Gerasimov *et al.* 1998) and we can assume that at least several thousand individuals pass through the river mouth. On the coast of Kronotsky Bay (Fig. 1, Site 9), Dunlin arrive from 12 - 28 May, with the most common first date over 8 years of observations being 18 May (Lobkov 1986).

North-eastern Coast

In 1990, at the Khaylula River mouth (Fig. 1, Site 11), mass migration of Dunlins was observed on 23-28 May.

On Karaginsky Island (Fig. 1, Site 12), the first birds were observed on 21 May 1979, 19 May 1982, 25 May 1983 and 22 May 1984 (A. Kuznetsov pers. comm.).

On the coast of Skobeleva Bay (Fig. 1, Site 16) in 1998, we observed active Dunlin migration from 24-31 May (Gerasimov 1999). Large flocks were feeding on the mudflats at low tide in the northern part of the bay. At high tide, most of the birds continued migrating northwards. The maximum number of Dunlin, about 4,000 individuals, occurred on 29 May. We estimate that no less than 20,000 Dunlins migrate northwards through the bay each year. At the Apuka River mouth (Fig. 1, Site 17) in 1960, the first Dunlin arrived on 21 May. Active migration had finished by 25 May, although some birds continued moving north until 4 June (Kistchinski 1980).

DISCUSSION

Dunlins are the most numerous migrating and nesting shorebirds in Kamchatka. The earliest dates for the first birds to arrive are 8 May (for south-western and central areas of the peninsula). The date changes to 12 May (for the south-eastern coast), 14 May (for the central part of western coast), 19 May (for the north-east) and 20 May (for the north-west). The interval between first arrival and mass migration can be 10 days or more. On the south-western coast, the most active migration is observed at the end of the first decade (10 May) and the beginning of the second decade of May. Whereas in northern Kamchatka, peak migration occurs in the second half of the third decade.

At two places on the south-western coast of Kamchatka, counts of more than 35,000 (Opala River) and 55,000 Dunlin (Bolshaya River) were made (Gerasimov 1998;

Gerasimov & Kalyagina 1995). We estimate that the number of Dunlin migrating northwards annually through the Moroshechnaya Estuary is 100,000 - 150,000 individuals (Gerasimov & Gerasimov 1997; 1998; 2000b). At least 20,000 Dunlins migrate through the central Kamchatka and 20,000 - 40,000 through the north-eastern coast. In total, we estimate that 200,000 - 250,000 Dunlins migrate in spring through Kamchatka and includes birds that remain to nest. However, despite the significant amount of information we have on numbers in different areas, it is still not possible to identify the major flyways used by Dunlin.

ACKNOWLEDGEMENTS

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NORTHWARD MIGRATION OF SHOREBIRDS AT KHARCHINSKOE LAKE, KAMCHATKA, RUSSIA

Yu.N. Gerasimov

Kamchatka Institute of Ecology, Far-East Branch Russian Academy of Science, Rybakov 19A, Petropavlovsk-Kamchatsky 683024 RUSSIA
Email: bird@svyaz.kamchatka.su

STUDY AREA

The Game Refuge "Kharchinskoe Lake" is located in the central part of the Kamchatka Peninsula (56°32′ N 160°11′ E) on the left bank of the Elovka River, a tributary of the Kamchatka River. The area of the refuge is about 100 km^2, with the centrally located Kharchinskoe Lake having an area of 26.4 km^2. Some small rivers run into the lake and the Tikhaya River connects the lake with the Elovka River. Marshy plains occur on the western and north eastern sides of the lake and the other shores are bordered by woodland (Fig. 1).

In summer, the large coastal shallows are covered by Horsetail (*Equisetum fluviatile*). However, by the following spring, after the snow cover has melted, the Horsetail has died and shallow mudflats have formed.

Detailed studies over the period from 1975 to 1990 have shown that Kharchinskoe Lake is very important for swans, geese and ducks during northward migration (Gerasimov 1977, Gerasimov & Gerasimov 1995a, b; 1996; 1997). In spring 1999, we visited the Lake to study migration, particularly of shorebirds, as these had not been covered during the previous counts.

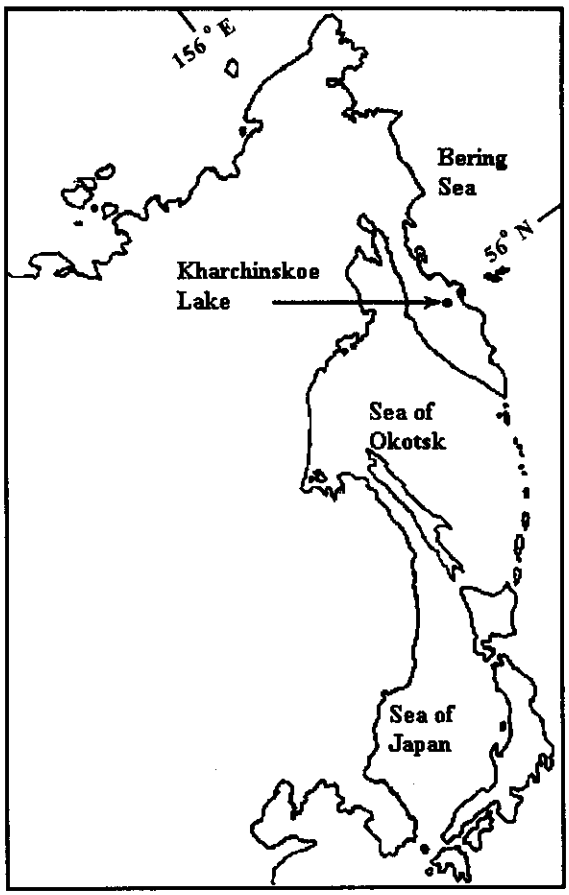

Figure 1. Location of Kharchinskoe Lake in central Kamchatka Peninsula, Russia.

METHODS

Migration observations were carried out from 27 April to 27 May 1999. The observation point was at the top of a small rocky island located at the north-western end of the lake. Counts were made with10x binoculars and a 20x field scope. We counted mostly flying birds, with the daily observation periods varying from 13 - 18 hours; the observation period was reduced to 8 - 10 hours on two days with adverse weather conditions. Transect counts of Common Snipe and Long-toed Stint were carried out on adjacent marshy lowland to the west of the lake with the purpose of obtaining an approximate estimate of the numbers of these two species.

WEATHER CONDITIONS

There was an extremely large snowfall during the winter of 1998-1999. The whole game refuge was covered with snow at the beginning of observations on 27 April. The lake was covered with ice except for holes at the mouths of two small rivers and the Tikhaya River, and near the rocky island on which the observation point was located. From 1-12 May, the weather was sunny and dry, with the daytime temperature reaching 19°C. By 7-9 May, as the result of the long period of very warm weather, massive thawing occurred on marshy lowland along the eastern side of the lake. From 13-26 May, the weather became windy and rather cool, with daytime temperatures of 4° to 15°C. Sometimes rain fell during this period and ash from the Sheveluch volcano fell on the refuge on 15 May. On 27 May, the last day of observations, dry, calm and warm weather returned, with a temperature of 22°C.

RESULTS

Common Snipe *Gallinago gallinago*

These were seen for the first time on 9 May, when we saw single birds on thawed patches on the western side of the lake. The number of snipe increased appreciably on 12 May. The "song" activity of males gradually increased from 13 May onwards and achieved its maximum on 19 May. The intensity of migration increased considerably on the evening of 20 May, when we observed arrivals of single birds and small flocks of up to 10 individuals,. On the same day, we saw simultaneously tens of flying singing males. Active migration proceeded on 21 and 22 May. Transect counts undertaken on 23 May on the western side of the lake indicated that this part of the refuge supported at least 5,000 Common Snipe.

Black-tailed Godwit *Limosa limosa*

Seen for the first time (a single bird) on 16 May. Intensive migration took place from 19-25 May. Maximum numbers flying past occurred on 23 May, when 1355 birds were counted (Fig. 2). Migrating flocks numbering up to several tens and feeding flocks of up to 250 individuals were sometimes observed.

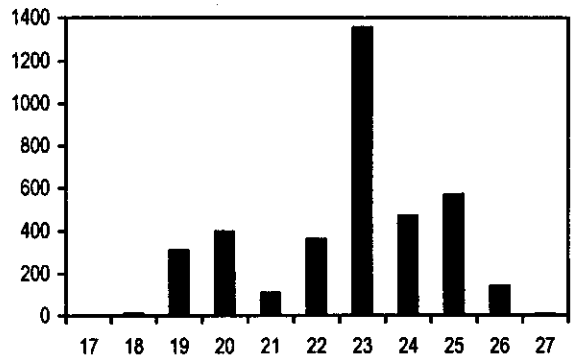

Figure 2. Daily numbers of Black-tailed Godwit at Kharchinskoe Lake in May 1999.

Bar-tailed Godwits *Limosa lapponica*

A flock of about 60 birds flew past on 24 May.

Whimbrel *Numenius phaeopus*

A single bird was observed on 26 May.

Eastern Curlew *Numenius madagascariensis*

First observed on 11 May, when a single bird flew northward; next observed on 19 May. The maximum number of Eastern Curlew (three flying flocks of 7, 2 and 8 individuals) was counted on 20 May. Low intensity migration proceeded until 26 May.

Spotted Redshank *Tringa erythropus*

Some birds were seen at the edge of the Lake between 21 and 26 May.

Common Greenshank *Tringa nebularia*

First appeared on 19 May, when we counted a total of 81 birds. Most active migration took place on 23-25 May (Fig. 3). Flock sizes were generally larger than we had encountered elsewhere on Kamchatka (up to 32 individuals).

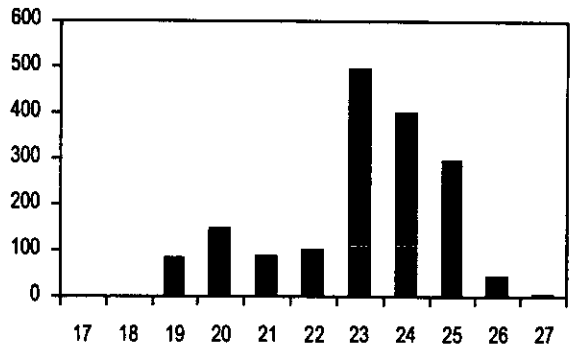

Figure 3. Daily numbers of Common Greenshank at Kharchinskoe Lake in May 1999.

Wood Sandpiper *Tringa glareola*

First seen on 11 May, when a short "song" was also heard. The next observations, both of two birds, were on 13 and 17 May. Active migration began on 19 May and was probably continuing after we finished our observations on 27 May. The highest number counted was 1314 individuals on 24 May (Fig. 4).

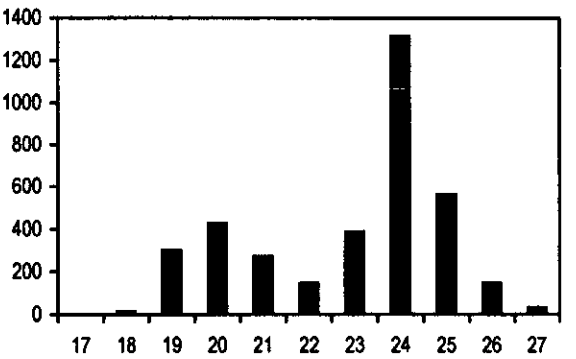

Figure 4. Daily numbers of Wood Sandpiper at Kharchinskoe Lake in May 1999.

Terek Sandpipers *Xenus cinereus*

These were seen from 24-26 May, with a flock of 13 birds on the first day.

Common Sandpiper *Actitis hypoleucos*

Seen on last two days of observations.

Grey-tailed Tattler *Heteroscelus brevipes*

Some individuals were observed from 20-27 May.

Ruddy Turnstone *Arenaria interpres*

First seen (two birds) on 25 May, feeding together with a flock of Lesser Sand Plover. Two single individuals were observed on 27 May.

Great Knot *Calidris tenuirostris*

Three flocks of 3, 14 and 5 individuals were counted by 20 May. From 3 up to 10 birds were observed daily in the period from 21-24 May.

Red-necked Stint *Calidris ruficollis*

First arrivals seen on 20 May. The most intensive migration took place on the last day of observations (27 May) (Fig. 5). Flock sizes were rather small for this species (up to 60 individuals).

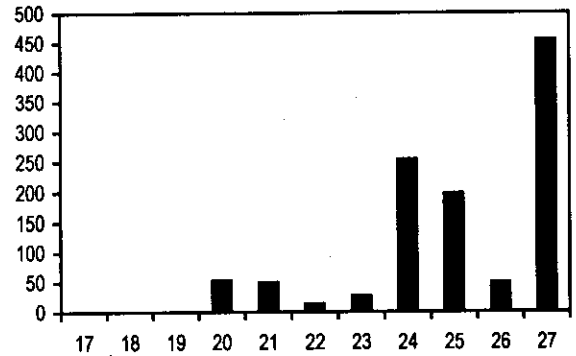

Figure 5. Daily numbers of Red-necked Stint at Kharchinskoe Lake in May 1999.

Temminck's Stint *Calidris temminckii*

Some were heard flying above us.

Long-toed Stint *Calidris subminuta*

Seen for the first time on 23 May. Most of the migration occurred at night and we counted 130 birds, with the maximum occurring on 24 May. However, a transect count on 24 May indicated that at least 1,000 birds were present in the lowland to the west of the lake.

Dunlin *Calidris alpina*

The first single bird was observed on 18 May, and most intensive migration was on 24and 25 May (Fig. 6). Observations varied from single birds up to large flocks of 500. One of the most typical feeding areas was lake-side ice, where the birds fed on insects which were blown from marshland by the wind.

Ruff *Philomachus pugnax*

Three single birds and two birds together were observed on the Lake edge on 24 May. Another single seen on 26 May.

Pacific Golden Plover *Pluvialis fulva*

The first (single) birds were observed on 20 May and 22 May, with fairly active migration taking place from

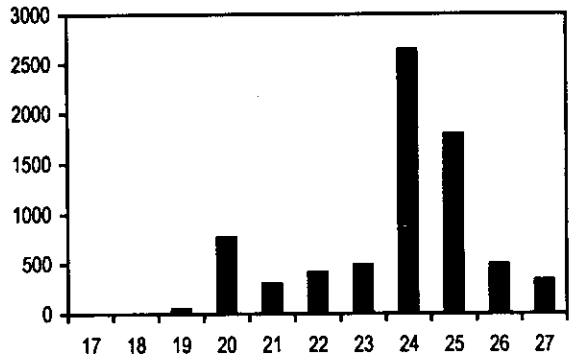

Figure 6. Daily numbers of Dunlin at Kharchinskoe Lake in May 1999.

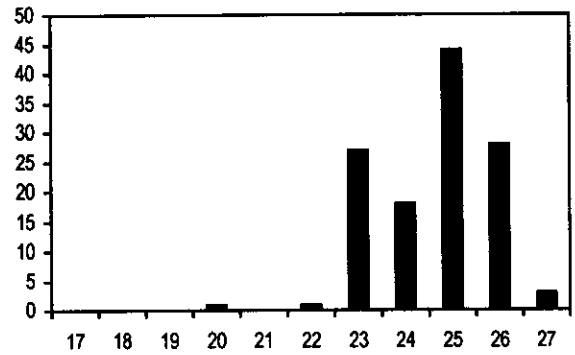

Figure 7. Daily numbers of Pacific Golden Plover at Kharchinskoe Lake in May 1999.

23-26 May (Fig. 7). Migration consisted of single birds and small flocks of up to 9 individuals.

Ringed Plover *Charadrius hiaticula*

A single bird flew over the Lake on 19 May.

Lesser Sand Plover *Charadrius mongolus*

First seen at the lake on 19 May. Maximum numbers were counted on 24-26 May (Fig. 8). The largest flock was seen feeding on the mudflat on 25 May.

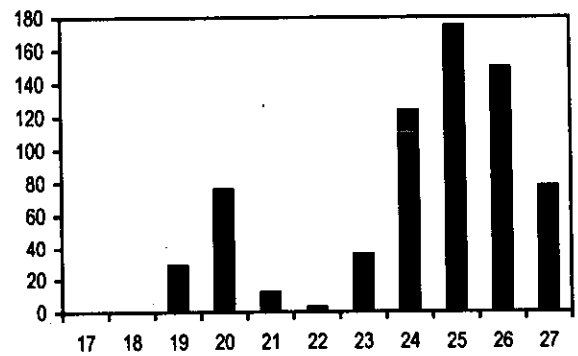

Figure 8. Daily numbers of Lesser Sand Plover at Kharchinskoe Lake in May 1999.

DISCUSSION

A lot of interesting information was obtained on shorebird migration during our visit. For the first time on Kamchatka, an inland area was found that had a high concentration of the shorebirds during northward migration. It is estimated that a total of 33,000-50,000 shorebirds migrate in spring through the Game Refuge. Some of the common species that occurred around the lake have not been seen in significant numbers in the coastal areas of Kamchatka. These included Common Snipe, Black-tailed Godwit, Wood Sandpiper, Common Greenshank and Long-toed Stint. The total of these five species was more than 60 % of the total shorebirds counted (Table 1).

Table 1. Number of counted shorebirds and estimation of total number that migrated through Kharchinskoe Lake.

No	Species	Counted	Total number estimation
1	*Pluvialis fulva*	122	200-300
2	*Charadrius mongolus*	683	1 000
3	*Charadrius hiaticula*	1	5-10
4	*Arenaria interpres*	4	10-20
5	*Tringa glareola*	3 600	4 000-5 000
6	*Tringa nebularia*	1 652	2 000-2 500
7	*Tringa erythropus*	13	20-40
8	*Tringa brevipes*	24	30-50
9	*Actitis hypoleucos*	10	30-50
10	*Xenus cinereus*	18	30-50
11	*Philomachus pugnax*	6	30-50
12	*Calidris ruficollis*	1 101	2 000-3 000
13	*Calidris subminuta*	Not counted	2 000-3 000
14	*Calidris temminckii*	8	50-100
15	*Calidris alpina*	7 290	10 000-20 000
16	*Calidris tenuirostris*	46	100
17	*Gallinago gallinago*	Not counted	7 000-10 000
18	*Numenius madagascariensis*	56	80-100
19	*Numenius phaeopus*	1	0-100
20	*Limosa limosa*	3 722	4 000-5 000
21	*Limosa lapponica*	60	100
	Total	18 417	33 000-50 000

Observations of migration direction were interesting. Common Snipe, Black-tailed Godwit, Common Greenshank and Wood Sandpiper, which are not observed in large numbers on the west coast but are common at Kharchinskoe Lake, arrived from the north and continued flying in a south-west to south-east direction. Those species that are common on the west coast, such as Dunlin and Red-necked Stint, arrived from the south-west and west, which are more expected directions. These species flew on eastwards from the lake.

Our observations in 1999 confirmed the great importance of the Game Refuge for waterfowl. The Refuge is not only on the migration corridor, but is also a very important resting and feeding place for waterfowl during northward migration. It was estimated that about 2,200 swans, 31,000 geese and 130,000 ducks migrated through the Lake over the full observation period.

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SUMMARY OF OVERSEAS SIGHTINGS OF WADERS LEG FLAGGED IN VICTORIA AND SOUTH EASTERN SOUTH AUSTRALIA

Clive Minton
165 Dalgetty Rd., Beaumaris Vic 3193 AUSTRALIA
Email: mintons@ozmail.com.au

Orange flagging, normally on the right tibia, was commenced in Victoria in December 1989 and since then approximately 45,000 waders have been flagged (Table 1). These include several hundred Sanderling and Ruddy Turnstone that were flagged in the southeast corner of South Australia between November 1993 and the end of 1998. However, since April 1999, waders in South Australia have been marked with a different code (orange right tibia and yellow right tarsus) enabling them now to be separately identified.

Lists of sightings of leg flagged birds away from the banding areas have been published annually in VWSG Bulletins and reprinted in issues of the Australasian Wader Studies Group bulletin, *The Stilt*. The latest list (Number 8) covers reports of birds seen up to the end of December 2000.

A summary table (Table 2) has now been prepared of all overseas sightings published in these lists. This enables the pattern of flag sightings for each species, or each country, to be easily assessed. Those birds which can be attributed to the new South Australian colour code are shown separately, following the + sign. These correspond to 35 of the total of 1053 sightings.

The marked differences in the pattern of overseas sightings for each species are strikingly apparent in the table. A few examples will illustrate this: -

(a) The concentration of Grey Plover sightings in Japan.
(b) Eastern Curlew mainly being seen in Japan and Korea.
(c) The strong movement of Bar-tailed Godwits into New Zealand. This is also the only species to be recorded in Alaska.
(d) The huge movements of Red Knot to New Zealand and the scarcity of reports elsewhere in the Flyway.
(e) The wide spread of locations visited by Red-necked Stints. Here the 29 reports in New Zealand are misleading – these mainly emanated from one bird which returned to the same location each year, over 7 years, and which was regularly observed.
(f) The intense concentration of Curlew Sandpiper sightings in Hong Kong.
(g) The predominance of Japanese sightings of Sanderling.
(h) The paucity of sightings from China, even though the majority of waders from Australia migrate through that country. This is primarily a reflection of the lack of observers. The contrast with Hong Kong (listed separately even though now part of China) is phenomenal, this intensely watched site being responsible for 364 reports.
(i) The relative lack of sightings in any of the countries between the Asian mainland and the northern coast of Australia (except Taiwan). Even through all of the migratory waders pass over this area on both northward and southward migration few make stopovers there.

The volume of flag sightings now being received annually is enabling a much clearer picture of the migration patterns of species to be determined and is especially valuable in enabling quantitative comparisons to be made. It is important to ensure that observers continue to record and send in sightings and that they don't incorrectly assume that they are reducing in value – the opposite is true.

Table 1. Waders leg-flagged by the VWSG in Victoria (orange) since 1989.

Species	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
Latham's Snipe	0	0	0	0	40	0	110	56	70	0	2	0	278
Black-tailed Godwit	0	0	0	0	0	0	0	1	1	0	0	0	2
Bar-tailed Godwit	0	1	157	6	64	0	43	173	16	84	388	324	1256
Whimbrel	0	0	0	0	16	0	0	0	0	2	0	2	20
Eastern Curlew	0	0	8	0	73	88	87	4	37	35	91	27	450
Common Greenshank	0	0	21	21	51	0	1	109	131	19	0	0	353
Terek Sandpiper	0	0	2	2	2	2	0	0	0	0	0	1	9
Grey-tailed Tattler	0	0	0	0	0	0	0	3	1	0	0	0	4
*Ruddy Turnstone	0	99	188	37	35	1	194	129	194	372	75	54	1378
Great Knot	0	0	2	0	4	0	3	36	31	21	21	53	171
Red Knot	0	0	302	26	88	1	52	59	295	289	175	334	1621
*Sanderling	0	0	163	0	191	1	47	328	148	342	51	118	1389
Little Stint	0	0	0	1	0	0	0	0	0	0	1	0	2
Red-necked Stint	0	799	1259	2516	2282	1661	1384	3065	1434	3224	4215	6038	27887
Pectoral Sandpiper	0	0	0	0	0	0	0	0	1	0	0	0	1
Sharp-tailed Sandpiper	0	4	250	111	71	21	59	145	155	474	212	105	1617
Curlew Sandpiper	146	462	367	1255	808	839	469	753	270	633	770	1162	7934
Cox's Sandpiper	0	0	0	1	0	0	0	0	0	0	0	0	1
Broad-billed Sandpiper	0	0	0	0	0	1	0	0	0	0	0	0	1
Banded Stilt	0	0	0	0	0	0	0	0	0	0	0	151	151
Red-necked Avocet	0	0	0	0	5	0	0	0	27	0	0	46	78
Pacific Golden Plover	0	10	10	1	0	0	0	6	0	10	13	0	50
Grey Plover	0	0	0	1	0	0	6	0	22	0	0	21	50
Red-capped Plover	0	0	0	0	0	19	0	0	29	3	10	2	63
Double-banded Plover	0	0	0	0	0	8	0	0	0	40	24	98	170
Lesser Sand Plover	0	0	0	14	6	8	9	13	0	4	1	0	55
Greater Sand Plover	0	0	0	0	3	6	0	0	0	2	4	0	15
Black-fronted Dotterel	0	0	0	0	0	0	0	1	0	0	0	0	1
Red-kneed Dotterel	0	0	0	0	0	0	0	0	1	0	0	0	1
Masked Lapwing	0	0	0	0	0	0	1	0	4	0	0	2	7
35 Species	**146**	**1375**	**2729**	**3992**	**3739**	**2656**	**2475**	**4881**	**2867**	**5554**	**6089**	**8536**	**45039**

*Includes Ruddy Turnstone and Sanderling flagged with orange (only) in the south east of South Australia between 1993 and 1998.

Table 2. The number of sightings of each wader species leg-flagged in Victoria and south eastern South Australia (separated by +) in countries of the East Asian-Australasian Flyway.

Species	Russia	Alaska	Mongolia	Korea	Japan	China	Hong Kong	Taiwan	Vietnam	Thailand	Malaysia	Brunei	Indonesia	New Zealand	TOTAL
Black-tailed Godwit				1											1
Bar-tailed Godwit		15		13	32	3								58	121
Eastern Curlew				4	13			1							18
Terek Sandpiper							1								1
Ruddy Turnstone					3 + 1		1	1						2	7 + 1
Great Knot				2	1			1							4
Red Knot				1			2	2						235	240
Sanderling	2 + 1			2 + 2	72 + 23	1	1	1 + 1					1		80 + 27
Red-necked Stint	21 + 1		17	3 + 1	31 + 2	1	87	30	2	1	1	2	3	29	228 + 4
Sharp-tailed Sandpiper				3			2	0 + 1					1		6 + 1
Curlew Sandpiper	2					3	266	12 +2	1		1				285 + 2
Grey Plover				1	19										20
Double-banded Plover														2	2
Lesser Sand Plover							1								1
Greater Sand Plover							3	1							4
TOTAL	**25 + 2**	**15**	**17**	**30 + 2**	**171 + 26**	**8**	**364**	**49 + 4**	**3**	**1**	**2**	**2**	**5**	**326**	**1018 + 35**

Includes all reports up to the end of Dec 2000.

SIGHTINGS OF WADERS LEG-FLAGGED IN VICTORIA: REPORT NUMBER 8

Clive Minton[1], Rosalind Jessop[2], Peter Collins[2] and Doris Graham[3]

[1] 165 Dalgetty Rd., Beaumaris Vic 3193 AUSTRALIA
[2] Phillip Island Nature Park, PO Box 97, Cowes Vic 3922 AUSTRALIA
[3] 14 Falconer Street, Fitzroy Vic 3068 AUSTRALIA

An orange plastic leg-flag has been placed on the right tibia of most migrant and some resident waders banded in Victoria since 1990. This has led to a significant increase in the rate at which data has been generated on migration routes and key stopover regions in the Flyway.

Lists of orange-flagged birds away from the banding areas have been published in past VWSG Bulletins and in *The Stilt.*

This new list covers all new sightings of birds seen up to 31 December 2000. It follows list number 7 in VWSG Bulletin No.23, July 1999, and the reprint of that list in *The Stilt*, October 1999. Sightings have been placed in approximately N/S geographic order, and within each approximate locality in date order.

Black-tailed Godwit

D	M	Y	No.	Location seen		Lat	Long	Finder
15	8	2000	1	Gulmae-Ri, Asan Bay	Korea	36 54 N	126 54 E	Jin-Young Park
26	9	2000	1	Roebuck Bay, Broome	WA			G. Swann

Only 2 Black-tailed Godwits have ever been caught (and flagged) in Victoria, and now we have 2 flag sightings! Interestingly 1 is in Korea, where 2 flagged birds from NW Australia have previously been seen. The other is from Broome, NW Australia. It seems quite possible that these 2 records refer to the same bird.

Bar-tailed Godwit

5-10	9	1999	14	Embayment N. 10k West of Chefornak	Alaska, USA	60	07	N	164	27	W R. Gill
8	6	2000	1	Safety Sound, 15 miles east of Nome	Alaska, USA	64	00	N	165	00	W S. Howell & R. Gill
2	5	1999	3	Tori-no-Umi, Watari, Miyaga	Japan	38	02	N	140	55	E Hiroshi Ikeno
4	5	1999	3	Tori-no-Umi, Watari, Miyaga	Japan	38	02	N	140	55	E Hiroshi Ikeno
9	5	1999	3	Tori-no-Umi, Watari, Miyaga	Japan	38	02	N	140	55	E Hiroshi Ikeno
3	5	1999	1	Mouth of Shirakawa River, Kumamoto	Japan	32	47	N	130	37	E Kvoilhoro Imamura
3	5	2000	1	Arao Beach, Arao, Kumamoto	Japan	33	00	N	130	30	E Takatsune Nagai
15	4	1999	1	Namyang Bay	Korea	37	05	N	126	45	E Jin-Young Park
10	5	1999	1	Namyang Bay	Korea	37	05	N	126	45	E Jin-Young Park
16	4	2000	1	Gulmae-Ri, Asan Bay	Korea	36	54	N	126	54	E Jin-Young Park
16	4	2000	1	Kum Estuary	Korea	36	01	N	126	45	E Mark Barter & Jin-Han Kim
16	4	2000	2	Imgok-Ri, Masan City	Korea	35	06	N	128	27	E N. Moores
19	4	2000	1	Okku, Mankyung Estuary	Korea	35	52	N	126	43	E Mark Barter & Jin-Han Kim
24	8	1999	1	Happy Island, Hebei	China	39	47	N	119	27	E J. Kriegs
26	12	1999	2	Tapora South, Kaipara	New Zealand	36	21	S	174	18	E C. Grant & G. Pulham
14	10	2000	1	Jordans, Kaipara	New Zealand	36	21	S	174	18	E A. Riegan
25	11	2000	1	Papakanui Spit, Kaipara	New Zealand	36	21	S	174	18	E T. Harbraken
25	1	2000	1	Colville, Coromandel	New Zealand	36	37	S	175	28	E B.& B. Woolley
9	8	1999	1	Mangere SP, Manukau	New Zealand	36	57	S	174	46	E R. Clough
20	8	2000	1	Mangere SP, Manukau Harbour	New Zealand	36	57	S	174	46	E R. Clough

21	11	1999	2	Kidds, Manukau,	New Zealand	37	05	S	174	50	E	T. Habraken
2	9	2000	1	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Harbraken et.al.
16	9	2000	1	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Harbraken
15	10	2000	1	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Harbraken and D. Lawrie
28	10	2000	1	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Harbraken and D. Lawrie
9	9	2000	1	Miranda Firth of Thames	New Zealand	37	10	S	175	19	E	K. Woodley
26	9	1999	2	Farewell Spit, Banana Pan	New Zealand	40	31	S	172	51	E	R. Schuckard
26	9	1999	1	Farewell Spit	New Zealand	40	34	S	173	02	E	R. Schuckard
15	10	1999	1	Farewell Spit	New Zealand	40	34	S	173	02	E	R. Schuckard
23	2	2000	1	Gobi (Farewell Spit)	New Zealand	40	30	S	172	46	E	R. Schuckard
18	3	2000	1	Lagoon (Farewell Spit)	New Zealand	40	32	S	172	58	E	R. Schuckard
13	6	2000	2	Farewell Spit, Banana Pan	New Zealand	40	31	S	172	51	E	R. Schuckard
29	10	2000	1	Farewell Spit,Nelson	New Zealand	40	31	S	172	51	E	D. Melville
27	8	1999	1	Rototai Beach, Golden Bay	New Zealand	40	50	S	172	49	E	K. Stark
12	10	1999	1	Bells Island, Waimea Inlet, nr. Nelson	New Zealand	41	17	S	173	10	E	W. Cook c/o R. Schuckard
12	10	1999	1	near Nelson	New Zealand	41	21	S	173	08	E	W. Cook
23	1	2000	2	New Brighton Spit, Christchurch	New Zealand	43	30	S	172	43	E	P. Schweigman
26	12	1999	2	Avon-Heathcote Estuary	New Zealand	43	33	S	172	44	E	N. Allen
17	1	2000	2	Avon-Heathcote Estuary	New Zealand	43	33	S	172	44	E	S. Butcher
23	1	2000	2	Avon-Heathcote Estuary	New Zealand	43	33	S	172	44	E	N. Allen
10	2	2000	1	Avon-Heathcote Estuary	New Zealand	43	33	S	172	44	E	S. Petch
19	2	2000	1	South Shore Spit, Christchurch	New Zealand	43	33	S	172	44	E	N. Allen via D Tofield
7	5	2000	1	South Shore Spit, Christchurch	New Zealand	43	33	S	172	44	E	N. Allen via D Tofield
10	6	2000	1	South Shore Spit, Christchurch	New Zealand	43	33	S	172	44	E	N. Allen via D Tofield
16	11	1999	1	Roebuck Bay, Broome	WA							J. Matsui c/o A. Boyle
23	11	1999	1	Roebuck Bay, Broome	WA							J. Matsui c/o A. Boyle
23	12	2000	1	Roebuck Bay, Broome	WA							A. Boyle
24	10	2000	1	Broome	WA							D. James
1	11	2000	1	Broome	WA							A. Boyle
18	1	1999	1	Wellington Point, Moreton Bay	QLD							C. Catterall & P. Battley
12	9	1999	1	Manly Boat Harbour, Moreton Bay	QLD							A. & S. Keates
4	4	2000	1	Tin Can Bay	QLD							J. Ibbotson
7	7	2000	1	Poona, Great Sandy Strait	QLD							P. & L. Cross
30	9	2000	1	Manly Boat Harbour, Moreton Bay	QLD							A. & S. Keates
15	10	2000	1	Dux Creek	QLD							T.Ford
15	10	2000	1	Manly Boat Harbour, Moreton Bay	QLD							A. and S. Keates
17	10	2000	1	Manly Boat Harbour, Moreton Bay	QLD							A. and S. Keates
21	10	2000	1	Boonooroo, Great Sandy Strait	QLD							S. Redenbach
21	10	2000	1	Green Island, Cairns	QLD							R. Spencer
21	10	2000	1	Toorbul	QLD							G. Goodyear
11	11	2000	1	Manly Boat Harbour, Moreton Bay	QLD							A. and S. Keates
19	11	2000	1	Manly Boat Harbour, Moreton Bay	QLD							A. and S. Keates
10	12	2000	1	Manly Boat Harbour,Moreton Bay	QLD							A. and S. Keates
29	9	2000	1	Merimbula	NSW							G. Beal
25	9	2000	1	Merrimbula	NSW							B. Jones et.al.
30	12	2000	1	Mallacoota	VIC							C. Lester

This is an unprecedented list of 94 sightings, partly a reflection of the VWSG's success in catching Bar-tailed Godwits in recent years.

The most revealing were the 15 sightings in Alaska - our first. One was on the breeding grounds on the west coast of Alaska. The others were at a pre-migratory collecting area in early September in SW Alaska. With them were 10 flagged Godwits from Queensland and 10 from New Zealand and, significantly, none from NW Australia. These sightings lend strong support to the segregation of the two different races of Bar-tailed Godwits in Australia, *L.l. menzbieri* breeding in Central North Siberia (especially Yakutia) go to NW Australia whilst the East Australian and New Zealand birds, *L.l. baueri,* come from Alaska. The timing of the Alaskan sightings also further supports the view that they may fly direct from there to Eastern Australia and New Zealand (10,000 kms).

The sighting in China on southward migration is the first ever in that country (although there have been 2 on northward migration). The seven sightings in Korea and 11 in Japan were, as previously, during the northward migration. These further support the view that the Asian areas are largely bypassed on southward migration by birds on their way to SE Australia.

The 14 sightings in Queensland further reinforce the view that this is the gateway to Victoria for some birds on southward migration. However several of the records seem to relate to birds which appear to have changed their non-breeding areas to Moreton Bay. The same is true for our first Victorian flagged Bar-tailed Godwits in NW Australia - all five sightings probably refer to the same bird that has changed its non-breeding area away from Victoria.

Eastern Curlew

12	3	2000	1	Sone Shinden, Kokura, Fukuoka	Japan	33	49	N	130	58	E	Masafumi Takeshita
19	3	2000	1	Sone Shinden, Kokura, Fukuoka	Japan	33	49	N	130	58	E	Masafumi Takeshita
15	3	2000	1	Yooboo Island	Korea	35	59	N	126	36	E	Han-Soo Lee
22	3	2000	1	Yooboo Island	Korea	35	59	N	126	36	E	Han-Soo Lee
13	10	2000	1	Roebuck Bay, Broome	WA							A. Boyle
5	5	1999	1	Dux Creek, Bribie Island	QLD							T. Ford
9	8	2000	1	Boonooroo	QLD							S. Redenbach
25	8	2000	1	Tweed River Entrance	QLD							E. Kleiber
27	8	2000	1	Tweed River Entrance	QLD							E. Kleiber
30	8	2000	1	Tweed River Entrance	QLD							E. Kleiber
11	12	1999	1	Port Arthur, Yorke Peninsula	SA							R. Clarke

As in previous reports most sightings were in Japan, Korea and Queensland. The 15th March is a very early date for a bird to have reached Korea. The sighting at Broome is the first Victorian flagged Eastern Curlew to be reported in WA. The SA record is the second only for that state.

Grey-tailed Tattler

25	9	1999	1	Boonooroo, Great Sandy Straits	QLD	A. & S. Keates

1999 is the third successive year that a Victorian flagged Grey-tailed Tattler has been seen in S.E. Queensland in September, presumably on southward migration back to Victoria. The 1998 record was also at Boonooroo. As only four Tattlers have ever been flagged in Victoria it is likely that the same individual is involved.

Ruddy Turnstone

27	9	2000	1	Darwin Wharf	NT	D. Henderson, K. Cridland
9	3	2000	1	W. of Stoney Point, 8 Mile Creek Point	SA	R. Jessop & P. Collins
23	12	2000	1	Eyre Island, Western Eyre Pen.	SA	C. Rogers
4	1	2000	1	Waterhouse Is., 100km W of Flinders Is	TAS	P. Johns

A real miscellany. The bird at Darwin was probably on its way south back to Victoria (in 1998 one was seen at Port Hedland, WA, also in September - see VWSG Bulletin 23 page 31). The bird seen on an island off the north coast of Tasmania was probably originally flagged in Victoria when on migration. The two South Australian sightings seem to be birds which had moved their non-breeding areas from Victoria/ S.E. corner of SA (the latter area also used orange leg flags until April 1999.).

Great Knot

17	4	2000	1	Mankyung Estuary	Korea	35	52	N	126	43	E	M. Barter & Jin-Han Kim
19	4	2000	1	Mankyung Estuary	Korea	35	52	N	126	43	E	M.Barter & Jin-Han Kim
17	9	1998	1	Sandgate, Moreton Bay	QLD							F. Armbrust
15	9	1999	1	Karumba Point	QLD							J. Bedwell
11	12	1999	1	Price's Saltworks, Gulf St Vincent	SA							R. Clarke
28	11	2000	1	Price's Saltworks, Gulf St Vincent	SA							J. Cox and C. Rogers
30	12	2000	2	Cape Missiessie, W. Eyre Pen.	SA							C. Rogers

Korea is extensively used as a stopover location on northward migration by Great Knot. The Queensland sightings were probably of birds en route back to Victoria. In contrast the two SA records look like birds which have changed their non-breeding area away from Victoria.

Red Knot

8	5	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Y-T Li
16	1	2000	1	Takahiwai, Whangarei Harbour	New Zealand	35	50	S	174	22	E	C. Grant & M. Twyman
31	12	2000	2	Takahiwai, Northland	New Zealand	35	50	S	174	72	E	G. Grant & M. Twyman
30	12	1999	1	Mangawhai, N. Auckland	New Zealand	36	05	S	174	36	E	T. Habraken
18	11	2000	2	Mangawhai, N. Auckland	New Zealand	36	05	S	174	36	E	G. Pulham
13	12	2000	1	Mangawhai Spit, Aukland	New Zealand	36	05	S	174	36	E	G. Grant & M. Twyman
30	12	1998	2	Mangawhai Spit	New Zealand	36	06	S	174	36	E	NZ Banding Scheme
27	11	1999	1	Tapora South, Kaipara	New Zealand	36	21	S	174	18	E	G. Grant
26	12	1999	4	Tapora South, Kaipara	New Zealand	36	21	S	174	18	E	G. Grant & G. Pulham
22	1	2000	1	Tapora, Kaipara	New Zealand	36	21	S	174	18	E	C. Grant & M. Twyman
22	1	2000	1	Tapora South, Kaipara	New Zealand	36	21	S	174	18	E	T. Habraken
27	11	1999	2	Papakanui Spit, Kaipara,	New Zealand	36	26	S	174	12	E	T. Habraken
23	12	1999	1	Papakanui Spit, Kaipara	New Zealand	36	26	S	174	12	E	G. Pulham et. al
25	11	2000	3	Papakanui Spit, Kaipara Harbour	New Zealand	36	26	S	174	12	E	T. Harbraken
9	8	1999	1	Mangere SP	New Zealand	36	57	S	174	46	E	R. Clough
21	11	1999	2	Kidds, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken
15	8	1999	2	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken et. al.
16	9	1999	1	Kidds, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken
9	1	2000	6	Kidds, Manukau	New Zealand	37	05	S	174	50	E	T. Habraken
20	2	2000	3	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken
22	4	2000	3	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken
2	9	2000	3	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken
16	9	2000	2	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken
1	10	2000	2	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken
15	10	2000	1	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken & D. Lawrie
28	10	2000	3	Clark's Bay, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken & D.

28	10	2000	5	Karaka, Manukau Harbour	New Zealand	37	05	S	174	50	E	T. Habraken & D. Lawrie
12	11	1999	3	Miranda, Firth of Thames	New Zealand	37	10	S	172	19	E	W. Perry
14	11	1999	1	Rangipo, Miranda, Firth of Thames	New Zealand	37	10	S	175	19	E	W. Perry
14	11	1999	2	Waihua River, Firth of Thames	New Zealand	37		S	175		E	T. Habraken
9	12	1999	1	Waihua River, Firth of Thames	New Zealand	37		S	175		E	K. Woodley & T. Habraken
26	2	2000	6	Miranda, Firth of Thames	New Zealand	37	10	S	175	19	E	T. Habraken
12	3	2000	2	Miranda, Firth of Thames	New Zealand	37	10	S	175	19	E	I. Wilson
9	9	2000	1	Miranda, Firth of Thames	New Zealand	37	10	S	175	19	E	K. Woodley
3	12	1999	1	Foxton Estuary	New Zealand	40	29	S	175	14	E	C. Scadden
23	2	2000	1	Gobi (Farewell Spit), Nelson	New Zealand	40	30	S	172	46	E	R. Schuckard, P. Tomkovich
24	2	2000	1	Bush End Point (Farewell Spit)	New Zealand	40	33	S	173	01	E	R. Schuckard, P. Tomkovich
18	3	2000	1	Mudflats near Mullet (Farewell Spit)	New Zealand	40	32	S	172	56	E	R. Schuckard, P. Tomkovich
19	3	2000	2	Banana Pan (Farewell Spit)	New Zealand	40	31	S	172	51	E	R. Schuckard, P. Tomkovich
29	10	2000	1	Farewell Spit, Nelson	New Zealand	40	30	S	172	46	E	R. Schuckard
26	11	2000	1	Farewell Spit, Nelson	New Zealand	40	30	S	172	46	E	R. chuckard
27	10	2000	1	Motuaka Sand Spit, Nelson	New Zealand	41	06	S	173	02	E	R. Schuckard
30	12	2000	1	Motueka Sandspit	New Zealand	41	07	S	173	01	E	D. Tofield
7	11	1999	1	near Nelson	New Zealand	41	21	S	173	08	E	W. Cook
12	12	1998	1	Ashley River Mouth	New Zealand	43	17	S	172	43	E	N. Allen
22	1	1999	1	Ashley River Mouth	New Zealand	43	17	S	172	43	E	N. Allen
20	9	1998	1	Yarrs, Lake Ellesmere	New Zealand	43	42	S	172	30	E	C. Hill
26	9	1998	1	Wolfes Road, Lake Ellesmere	New Zealand	43	43	S	172	27	E	N. Allen
26	11	1998	1	Lake Ellesmere	New Zealand	43	43	S	172	29	E	C. Hill
18	11	2000	1	Sandfly Creek	NT	12	20	S	130	53	E	G. O'Brien
10	6	1999	1	Roebuck Bay, Broome	WA							A. Boyle
1	9	1999	1	Roebuck Bay, Broome	WA							D. Burrell
27	9	1999	1	Roebuck Bay, Broome	WA							D. Burrell
9	11	1999	1	Roebuck Bay, Broome	WA							J. Matsui c/o A. Boyle
15	11	1999	1	Roebuck Bay, Broome	WA							J. Matsui c/o A. Boyle
16	11	1999	1	Roebuck Bay, Broome	WA							J. Matsui c/o A. Boyle
15	12	1999	1	Roebuck Bay, Broome	WA							A. Boyle
6	2	2000	1	Roebuck Bay, Broome	WA							A. Boyle
7	3	2000	1	Roebuck Bay, Broome	WA							Jeong-Yeon Yi
9	3	2000	1	Roebuck Bay, Broome	WA							Jin-Young Park
2	4	2000	1	Roebuck Bay, Broome	WA							A. Boyle
31	5	2000	1	Roebuck Bay, Broome	WA							C. Minton
13	10	2000	1	Roebuck Bay, Broome	WA							A. Boyle
7	10	1999	1	Toorbul Point	QLD							L. Cross
14	9	1998	1	"The Oaks" S. Gulf of Carpentaria	QLD							P. Driscoll
18	9	1998	2	30 kms W of Norman River mouth	QLD							P. Driscoll
3	9	1999	1	Manly Boat Harbour, Moreton Bay	QLD							T. Tarrant
5	9	1999	1	Manly Boat Harbour, Moreton Bay	QLD							A. & S. Keates
12	9	1999	1	Manly Boat Harbour, Moreton Bay	QLD							A. & S. Keates
3	9	2000	1	Thornside, Brisbane	QLD							F. Armhurst
9	9	2000	1	Manly Esplanade	QLD							P. Walbridge &T. Tarrant

16	9	2000	1	Manly Boat Harbour, Moreton Bay	QLD									A. and S. Keates
19	9	2000	1	Manly Boat Harbour, Moreton Bay	QLD									D. Edwards & B. Ley
1	10	2000	1	Lytton	QLD									A.& S. Keates
21	10	2000	1	Toorbul	QLD									G. Goodyear
4	12	1999	1	Price Saltfield, Yorke Peninsula	SA									R. Clarke
6	12	1999	3	Price Saltfield, Yorke Peninsula	SA									M. Carter
10	12	1999	3	Price Saltfield, Yorke Peninsula	SA									R. Clarke
11	12	1999	4	Price Saltfield, Yorke Peninsula	SA									R. Clarke
6	1	2000	1	Price Saltfields, Yorke Peninsula	SA									K. Taylor
17	11	2000	1	Price Saltfield, Gulf St.Vincent	SA									J. Hatch
28	11	2000	3	Price's Saltworks, Gulf St Vincent	SA									J. Cox, C. Rogers
3	12	2000	1	Price's Saltworks, Gulf St Vincent	SA									J. Hatch, D. Close
24	1	2000	1	Ward Spit, Port Augusta	SA	33	01	S	137	55	E			J. Wilson
4	2	2000	1	Eyre Island	SA	32	23	S	133	50	E			J. Wilson

This huge list of 135 sightings is surprising, not only for its absolute size or its dominance of 88 sightings from New Zealand, but for the presence of only 1 record from Asia (Hong Kong). Why should Bar-tailed Godwits and Great Knot from NW Australia produce a stream of sightings in Korea, Japan and China and yet Red Knot produce so few? Presumably their main stopover location, at least on northward migration, is in less well-watched areas in China, or even in North Korea.

Quite clearly there is a large interchange of birds with New Zealand. As band recoveries show this is not a simple matter of birds being banded and flagged on their migration through Victoria to New Zealand. Many relocations involve birds that have spent the non-breeding season, or an austral winter, in Victoria and have then turned up in a subsequent non-breeding season in New Zealand. The data so far suggests that this is mainly a one way traffic of birds being in Australia when immature, but relocating to New Zealand when adult.

As with the sightings of Bar-tailed Godwits, the Queensland (15) and NW Australia (13) records contain some birds that may be on passage to Victoria, but are boosted by other individuals that have clearly changed their non-breeding area. The SA sightings (19) also probably fall into the latter category.

Sanderling

21	8	2000	1	Chaivo Bay, NE Sakhalin Island	Russia	52	23	N	143	14	E			A. Blotkin
24	8	2000	1	Shimo-Arachi, Kashima,Ibaraki	Japan	36	09	N	140	35	E			T. Kawamata
26	8	2000	1	Shimo-Arachi, Kashima,Ibaraki	Japan	36	09	N	140	35	E			T. Kawamata
6	8	2000	1	Hasaki, Kashima, Ibaraki	Japan	35	52	N	140	41	E			I. Tanabe
20	8	2000	1	Hasaki, Kashima, Ibaraki	Japan	35	52	N	140	41	E			I. Tanabe
11	8	1999	4	Ichinomiya River, Chiba	Japan	35	23	N	140	24	E			Suzuki Yasuo
12	8	1999	2	Ichinomiya River, Chiba	Japan	35	23	N	140	24	E			Suzuki Yasuo
22	8	1999	2	Ichinomiya River, Chiba	Japan	35	23	N	140	24	E			Tozo Suzuki
27	8	1999	4	Ichinomiya River, Chiba	Japan	35	23	N	140	24	E			Suzuki Yasuo
8	9	1999	1	Ichinomiya River, Chiba	Japan	35	23	N	140	24	E			Suzuki Yasuo
10	9	1999	1	Ichinomiya River, Chiba	Japan	35	23	N	140	24	E			Ajiro Haruo
26	8	2000	1	Ichinomiya River Estuary, Chiba	Japan	35	23	N	140	24	E			T. Kawamata
27	8	2000	1	Ichinomiya River Estuary, Chiba	Japan	35	23	N	140	24	E			T. Kawamata
5	9	1999	1	Shiratsuka Beach, Tsu, Mie	Japan	34	46	N	136	33	E			Nishiyama Yasunobu
30	8	1999	2	Yooboo Island	Korea	35	59	N	126	36	E			Jeong-Yeon Yi, Han-Sao Lee, Hwa-Jung Kim
21	5	1999	1	Masuda River, Masuda, Shima	Japan	34	42	N	131	50	E			Kenjii Ishimoto
19	9	1999	1	Casuarina Beach, Darwin	NT									G. O'Brien
7	2	2000	1	Yokinup Bay, Cape Arid NP	WA									A. Rose
25	8	2000	1	Cape Leveque, Dampier Penin.	WA									Broome BBO
6	9	2000	1	Roebuck Bay, Broome	WA									Broome BBO

10	9	2000	1	Coconut Wells, Broome	WA	Broome BBO
7	9	2000	1	Chili Beach, Iron Range NP	QLD	H. Smit
23	10	2000	1	South Ballina Beach	NSW	B. Totterman
16	11	2000	1	South Ballina Beach	NSW	B. Totterman
29	1	2000	1	Lone Nose, Anxious Bay, Eyre Penin.	SA	J. Wilson & M. Christie
9	2	2000	4	Murray Mouth, Coorong	SA	P. Collins, R. Schuckard
24	8	1999	1	Summerland Beach, Phillip Island	VIC	R. Jessop
28	9	1999	1	Cape Woolamai, Phillip Island	VIC	B. Hayward
16	12	2000	1	Perkins Island	TAS	R. Ashby

This list contains the first ever sightings from Korea (2) and only the second from Russia. Japan (22) again dominates the list. Of special note is that all except one of these overseas sightings relate to birds on southward migration. Where do they stop on northward migration?

Within Australia, Sanderlings are particularly mobile as evidenced by a large number of retraps/controls/flag sightings between Victoria and the eastern parts of the South Australian coast (see previous VWSG bulletins and the "recoveries" sections). The report from Cape Arid on the south coast of WA in January, the bird seen on the Eyre Peninsula SA, also in January, and the 4 birds at the mouth of the Coorong (SA) in early February have clearly changed their non-breeding locations. However the sighting near Darwin (NT), the 1 on Cape York Peninsula (QLD) and the 2 reports from the mid NSW coast were all probably returning to Victoria. Two birds were on the Victorian coast at least 50 kms from the nearest Sanderling flagging location are also listed.

Red-necked Stint

29	7	2000	1	Kosa Is, off Sarma Delta, Lake Baikal	Russia	53		N	107		E	H-H. Bergman
21	7	1999	3	Chaivo Bay, NE Sakhalin	Russia	52	23	N	143	14	E	A. Blokhin, A. Kokorin
23	7	1999	1	Chaivo Bay, NE Sakhalin	Russia	52	23	N	143	14	E	A. Blokhin, A. Kokorin
27	5	2000	2	Kleje Strait, Chaivo Bay, NE Sakhalin Island	Russia	52	21	N	143	12	E	A. Blokhin
22	5	2000	1	Ussuri Bay Coast, Vladivostok	Russia	43		N	132		E	V. Nechaev
31	5	2000	3	Lake Hadsin Zagaan, Nuur,	Mongolia	49	42	N	115	42	E	C. Ketzenberg
1	6	2000	2	Lake Hadsin Zagaan Nuur	Mongolia	49	42	N	115	42	E	C. Ketzenberg
2	6	2000	3	Lake Hadsin, Zagaan Nuur	Mongolia	49	42	N	115	42	E	C. Ketzenberg
3	6	2000	2	Lake Hadsin, Zagaan Nuur	Mongolia	49	42	N	115	42	E	C. Ketzenberg
4	6	2000	2	Lake Hadsin, Zagaan Nuur	Mongolia	49	42	N	115	42	E	C. Ketzenberg
6	6	2000	1	Galuth Nuur	Mongolia	49	43	N	115	18	E	C. Ketzenberg & J. Leyrer
8	6	2000	1	Lake Hadsin, Zagaan Nuur	Mongolia	49	42	N	115	42	E	C. Kertzenberg & J. Leyrer
9	6	2000	1	Lake Hadsin, Zagaan Nuur	Mongolia	49	42	N	115	42	E	C. Kertzenberg
19	7	2000	1	Western Coast of Dalaihu	Mongolia	48	48	N	116	58	E	Wang Tainhou
3	8	2000	1	Hime River Estuary, Itoigawa, Niigata	Japan	37	02	N	137	50	E	K. Nawa
11	8	2000	1	Nanko Bird Sanct., Suminoe, Osaka	Japan	34	38	N	135	24	E	Takada et al
12	8	2000	1	Nanko Bird Sanct., Suminoe, Osaka	Japan	34	38	N	135	24	E	Takada et al
14	8	2000	2	Nanko Bird Sanct., Suminoe, Osaka	Japan	34	38	N	135	24	E	Takada et al
17	8	2000	1	Nanko Bird Sanct., Suminoe, Osaka	Japan	34	38	N	135	24	E	Takada et al
24	8	2000	1	Hama Koshien, Nishinomiya, Hyogo	Japan	33	57	N	133	05	E	K. Miki
16	8	1999	1	Shigenobu River, Iyo, Ehime	Japan	33	49	N	132	42	E	Yoshizumi Ueda
24	8	1999	1	Mouth Shigenobu River, Iyo, Ehime	Japan	33	49	N	132	42	E	Iwamoto Takashi
5	8	1999	1	Masaki, Iyo, Ehime	Japan	33	48	N	132	45	E	Yoshizumi Ueda
3	8	1999	1	Chiong Cho Lake, Sokcho City	Korea	38	27	N	128	26	E	N. Moores
17	8	2000	1	Okku, Mankyung Estuary	Korea	35	52	N	126	43	E	Jin-Han Kim
29	8	2000	1	Okku, Mankyung Estuary	Korea	35	52	N	126	43	E	Jin-Young Park

30	4	2000	1	Kang-Nan, Hsinchu City	Taiwan	24	48	N	120	55	E	Shih-Min Mao, Wen-Hsiung
10	5	2000	1	Kang-Nan, Hsinchu City	Taiwan	24	48	N	120	55	E	Shih-Min Mao, Wen-Hsiung
14	5	2000	1	Kang-Nan, Hsinchu City	Taiwan	24	48	N	120	55	E	Shih-Min Mao
16	9	2000	1	Tatu Estuary, Changwha County	Taiwan	24	11	N	120	28	E	Chung-Huang Tsai
4	8	2000	2	Fu-Pao wetland, Changhwa County	Taiwan	24	02	N	120	21	E	Chih-Yuan Tsai
22	8	1999	1	Mai-Liao, Yun-Lin County	Taiwan	23	45	N	120	15	E	H-Y Chen
28	8	1999	1	Tung-Shih, Chiayi	Taiwan	23	28	N	120	08	E	H-Y Chen
13	5	2000	1	Pu-Tai, Chiayi	Taiwan	23	25	N	120	12	E	Li-Lan Wu
23	8	1999	1	Hsin-Wen, Chiayi	Taiwan	23	20	N	120	10	E	H-Y Chen
17	8	1999	1	Tseng-Wen Estuary, Tainan	Taiwan	23	08	N	120	07	E	Y-T Fu
14	5	2000	1	Tseng-Wen Estuary, Tainan	Taiwan	23	08	N	120	07	E	Yuan-Tsan Fu
19	8	2000	1	Tseng-Wen Estuary, Tainan County	Taiwan	23	06	N	120	03	E	Yuan-Tsan Fu
14	5	2000	1	Szu-Tsao, Tainan City	Taiwan	23	01	N	120	08	E	Kuo-Chang Huang
17	5	2000	1	Szu-Tsao, Tainan City	Taiwan	23	01	N	120	08	E	Yuan-Tsan Fu
30	8	2000	1	Yuang-An wetland, Koahsiung County	Taiwan	22	47	N	120	12	E	T-H Wu
1	5	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Y-T Yu
3	5	2000	4	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	R. Lewthwaite
5	5	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Y-T Yu
8	5	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	G. Carey
14	5	2000	2	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Y-T Yu
17	5	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Y-T Yu
21	5	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Y-T Yu
31	7	2000	1	Sibuga, 8 km N. of Sandakan, Sabah	N.W. Borneo							C. Hassell & L. Taylor
30	8	2000	1	Palu, Sulawesi	Indonesia	01		S	114	50	E	D. Taylor
15	1	1999	1	Kaituna, Lake Ellesmere	New Zealand	43	47	S	172	39	E	C. Hill
22	2	1999	1	Kaituna, Lake Ellesmere	New Zealand	43	47	S	172	39	E	C. Hill
11	4	1999	1	Kaituna, Lake Ellesmere	New Zealand	43	47	S	172	39	E	C. Hill
19	4	1999	1	Kaituna, Lake Ellesmere	New Zealand	43	47	S	172	39	E	C. Hill
23-28	9	1999	1	Darwin	NT							N. McCrie
8	5	1999	1	Alice Springs SP	NT							S. Holliday
16	10	2000	1	Ashmore Reef	WA							R. Clarke
16	8	1998	1	Roebuck Bay, Broome	WA							A. Boyle
27	8	1999	2	Roebuck Bay, Broome	WA							A. Boyle
1	9	1999	1	Roebuck Bay, Broome	WA							A. Boyle
11	9	1999	3	Roebuck Bay, Broome	WA							A. Boyle
18	9	1999	1	Roebuck Bay, Broome	WA							A. Boyle
21	9	1999	1	Roebuck Bay, Broome	WA							D. Rogers
23	9	1999	1	Roebuck Bay, Broome	WA							A. Boyle
28	8	2000	1	Roebuck Bay, Broome	WA							A. Boyle
30	8	2000	2	Roebuck Bay, Broome	WA							A. Boyle
6	9	2000	1	Roebuck Bay. Broome	WA							Broome BBO
14	9	2000	1	Roebuck Bay, Broome	WA							C. Hassell
18	9	2000	1	Roebuck Bay, Broome	WA							C. Hassell
26	9	2000	1	Roebuck Bay, Broome	WA							A. Boyle
29	9	2000	1	Roebuck Bay, Broome	WA							A. Boyle
3	10	2000	1	Roebuck Bay, Broome	WA							A. Boyle
11	10	2000	1	Roebuck Bay, Broome	WA							A. Boyle
21	5	2000	2	80 Mile Beach	WA							C. Minton
11	11	1999	1	Salt Lake, Rottnest Island	WA							D. & P Agnew

29	1	2000	1	Lake Vincent, Rottnest Island	WA								C. Napier
30	1	2000	1	Lake Negri, Rottnest Island	WA								B. Newbourne & team
30	1	2000	2	Government House Lake Rottnest Is.	WA								M. Vaughan & team
27	9	2000	1	Serpentine R. Estuary, N. Peel Inlet.	WA								M. Singor
14	11	2000	1	Swan River, Perth	WA								C. Merriam
8	10	1998	1	Cairns Esplanade	QLD								I. Burrows
3	7	2000	1	Bowling Green Bay, Townsville	QLD								J. and P. Payet
7	10	2000	1	Luggage Point	QLD								G. Nye
20	11	2000	1	Fisherman Island, Moreton Bay	QLD								G. Goodyear
28	3	1999	1	Wollongong, Lake Illawarra.	NSW								B. Murphy
11	9	1999	1	Long Reef	NSW								J. Seale
10	3	2000	2	Lake Wollumboola, near Culburra	NSW								R. Boughton
18	3	2000	1	Lake Wollumboola, near Culburra	NSW								R. Boughton
17	8	2000	1	Wallaga Lake	NSW								P. Dowton
10	12	2000	1	Boat Harbour, Kurnell,	NSW								D. Hair
22	10	1995	1	Bird Lake, Port Augusta	SA								P. Langdon
5	8	1999	1	Head of Gulf St. Vincent	SA								P. Taylor
22	4	1999	1	Tolderol Game Reserve	SA								P. Waanders c/o J. Wilson
19	6	1999	1	Tolderol Game Reserve	SA								Via J. Wilson
13	10	1999	1	Tolderol Game Reserve	SA								D. Hansen
2	5	2000	1	Tolderol Game Reserve	SA								Via J. Wilson
21	5	2000	1	Tolderol Game Reserve	SA								K. and C. Gosbell
		1999	1	Younghusband Pen.	SA								M. Ziembicki
23	12	2000	1	Little Eyre Island, Western Eyre Pen.	SA	32	23	S	133	50	E		C. Rogers
19	1	2000	1	Penrice Saltfields	SA	34	43	S	138	30	E		J. Wilson & K. Gosbell
29	10	2000	1	Penrice St.Kilda Saltfields	SA								J.Hatch
25	1	2000	1	Redcliffe Point	SA	25	01	S	137	50	E		P.Collins
27	1	2000	1	Franklin Harbour	SA	33	46	S	136	51	E		P.Collins
8	3	2000	1	Brown Bay	SA								R. Jessop & P. Collins
10	3	2000	1	Beachport	SA								R. Jessop & P. Collins
9	5	1995	1	Pyramid Hill Saltworks	VIC	36	05	S	143	59	E		S. Star
29	3	1999	2	Pyramid Hill Saltworks	VIC	36	05	S	143	59	E		S. Star
-	10	1999	15	Lake Reeve, Lochsport	VIC								J. Matthew
24	8	1999	1	North of Bridport, Lades Beach	TAS								P. Duckworth
3	10	1999	1	Cape Portland	TAS								R. Cooper
9	1	2000	1	Pipe Clay Lagoon	TAS								T. Reid
16	9	2000	1	Shipwreck Point, Perkins Island	TAS								T. Reid
26	9	2000	1	Shipwreck Point, Perkins Island	TAS								T. Reid
21	10	2000	1	Cape Naturaliste	TAS								T. Reid
17	12	2000	2	Cemetary Point, Orielton Lagoon	TAS								T. Reid

The 154 Red-necked Stint sightings come from a wide selection of different countries and from throughout the continent of Australia indicating the ubiquitous nature of this species and its relatively broad front migration.

Of the 7 recoveries in Russia 6 were on the east coast- 3 on northward migration and 3 on southward migration. However one was far inland on the shores of Lake Baikal - a western route used on southward migration by some Red-necked Stints (and more Curlew Sandpipers).

The special wader expedition to Mongolia by a small German team produced an excellent crop of 16 orange flag sightings (plus one recapture of a Victorian banded bird and one sighting of a Red-necked Stint from NW Australia).

The sightings seem to relate to at least 7 individual birds. Clearly there is a significant overland migration towards the more westerly breeding grounds by birds which have earlier arrived on the southern half of the Chinese coast, including Hong Kong from which a further 11 sightings emanated.

Taiwan is also a significant stopover area with 16 sightings - a big increase thanks to the coordinating of reporting efforts of Woei Horng Fang, vice president of the Taiwan Wild Bird Federation. Unusually more were seen on southern (9) than on northern migration (7).

Flagged Red-necked Stints were also seen in South Korea for the first time - 3, all on southward migration. Flagged Red-necked Stints are now regularly seen in Japan - again all 13 were on southward migration. From these latitudes birds seem to fly mostly non-stop to the northern shores of Australia. Records in Sabah in late July and Sulawesi in late August are both unusual.

The 67 sightings in Australia outside Victoria relate to:
(a). Birds on migration through the northern parts of Australia, particularly NW Australia, on their way to/from Victoria.
(b). Birds which have changed their non-breeding area from Victoria (some even to western and northern WA).
(c). Birds seen in Tasmania which were probably on migration through Victoria when flagged.
(d). Immature birds moving within Australia during their first austral winter (when the adults are away in Siberia).

The reports from New Zealand (4) probably refer to the same bird which has returned there for the seventh consecutive year.

Fifteen sightings from within Victoria at Lake Reeve are included because this ephemeral wetland is more than 50 kms from the nearest flagging site (at Corner Inlet).

Sharp-tailed Sandpiper

1	5	1999	2	Asan Bay	Korea	36	54	N	126	54	E	Hie-Lim Kim
30	4	2000	1	Hanja-Ri, Haenam	Korea	34	33	N	126	27	E	Jeong-Sik Lee
16	5	1995	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	G. Carey
16	10	1994	1	Hays Landing, Wivenhoe Dam	QLD							J. Chamberlain & B. Darrant

It is nice to have three more overseas sightings to add to the previous very short list from Korea (1), Hong Kong (1) and Indonesia (1). All were on northward migration through Asia.

Curlew Sandpiper

13	5	2000	2	Tianjin coast	China	39	13	N	118	01	E	M. Barter
21	4	2000	1	Kang-Nan, Hsinchu City	Taiwan	24	48	N	120	55	E	Shih-Min Mao
31	7	2000	1	Fubou, Chang Hwa County	Taiwan	24	02	N	120	23	E	Wei-Ting Liu
22	4	2000	1	Peikang River Mouth, Chiayi County	Taiwan	23	32	N	120	07	E	Heng-Chia Chang
4	9	2000	1	Tseng-wen Estuary, Tainan County	Taiwan	23	06	N	120	03	E	Yuan-Tsau Fu
27	7	2000	1	Szu-Tsao, Tainan City	Taiwan	23	03	N	120	06	E	Yung-Tsang Fu
23	4	2000	1	Lin-Pien, Pingtung County	Taiwan	22	24	N	120	31	E	Lien-Chu Hsieh
25	3	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	G. Carey, P Leader
4	4	2000	2	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	G. Carey, P Leader
5	4	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	G. Carey, P Leader
6	4	2000	3	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	G. Carey, P Leader
7	4	2000	9	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	G. Carey, P

8	4	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
9	4	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
10	4	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
12	4	2000	2	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
16	4	2000	3	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
19	4	2000	2	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
23	4	2000	4	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
24	4	2000	2	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
25	4	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
27	4	2000	7	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
1	5	2000	1	Mai-Po Nature Park	Hong Kong	22	29	N	114	19	E	Leader G. Carey, P
Late	4	2000	1	?	S. Vietnam							N. Moores
16	8	1998	1	Roebuck Bay, Broome	WA							A. Boyle
28	8	1999	1	Roebuck Bay, Broome	WA							A. Boyle
18	9	1999	1	Roebuck Bay, Broome	WA							A. Boyle
27	9	1999	1	Roebuck Bay, Broome	WA							A. Boyle
2	10	1999	1	Roebuck Bay, Broome	WA							C. Hassell
15	12	1999	1	Roebuck Bay, Broome	WA							A. Boyle
10	2	2000	1	Roebuck Bay, Broome	WA							A. Boyle
12	3	2000	1	Roebuck Bay, Broome	WA							Jin-Young Park
3	6	2000	4	Roebuck Bay, Broome	WA							A. Boyle & P. Collins
30	8	2000	1	Roebuck Bay, Broome	WA							A. Boyle
2	9	2000	1	Roebuck Bay, Broome	WA							A. Boyle
6	9	2000	1	Roebuck Bay, Broome	WA							Broome BBO
25	9	2000	2	Roebuck Bay, Broome	WA							A. Boyle
31	10	2000	1	Roebuck Bay, Broome	WA							D. Rogers
1	11	2000	1	Roebuck Bay, Broome	WA							A. Boyle
23	12	2000	1	Roebuck Bay, Broome	WA							A. Boyle
25	12	2000	1	Roebuck Bay, Broome	WA							A. Boyle
8	9	2000	1	100 km N of Caernarvon	WA							S. Houghton
22	9	2000	1	Gascoyne River Estuary, Carnarvon	WA							C. Davis, T. Kirkby, M. Singor
18	9	2000	1	Karumba	QLD							I. Clayton, B. Hawthorn
3	9	2000	1	Thorneside	QLD							F. Armbrust
25	11	1995	1	Penrhyn Road Estuary, Botany Bay	NSW							J. Pegler
22	9	1999	1	Penrhyn Road Estuary, Botany Bay	NSW							K. Brandwood
17	8	2000	1	Wallagoot Lake, Bournda NP	NSW							P. Dowton
11	11	2000	1	Penrhyn Inlet, Botany Bay	NSW							G. Ross
27	12	2000	1	Lake Wollumboola, Nowra	NSW							E. Vella
16	10	1999	1	Birdlake, Port Augusta	SA							P. Langdon
27	1	2000	2	Franklin Harbour	SA	33	46	S	136	51	E	P. Collins

6	2	2000	1	Light River Mouth, Gulf St. Vincent	SA								M. Barter
21	5	2000	2	Tolderol Game Reserve	SA								K. Gosbell
3	11	2000	1	Toloderol Game Reserve	SA								J. Hatch
9	2	2000	1	Coorong	SA	35	35	S	138	59	E		P. Collins
10	2	2000	1	Coorong	SA	35	42	S	139	11	E		R. Schuckard
8	3	2000	1	Brown Bay	SA								R. Jessop & P. Collins
17	3	2000	1	George Town Reserve, Tamar Estuary	TAS								R. Cooper
26	9	2000	1	Cape Portland Lagoons	TAS								R. & B. Cooper

Hong Kong (41) yet again dominates the Curlew Sandpiper sightings (91 in total). Compared with most other species the absence of birds in Korea and Japan is notable. Curlew Sandpipers certainly have a more westerly migration route than many other species (except Greater Sand Plover), and even on the northern half of the Chinese coast they are not common, although there are 2 flag sightings there in May 2000. Taiwan is also on the migration route (7 sightings) and the report from Vietnam was the only bird from Victoria reported there in the last year and a half.

NW Australia (23 sightings) is clearly a main gateway to/from Victoria for many Curlew Sandpipers, especially during southward migration. Other reports from around Australia (SA 10. NSW 5, QLD 2, TAS 2) quite often refer to birds which appear to have changed their non-breeding areas. This seems to occur more frequently, in a range of species, than was previously thought. Such records are important in trying to quantify the extent of non-return to the banding areas - defections need to be allowed for in any analysis of retraps for survival rate estimates.

Grey Plover

22	4	1999	1	Yatsu Tidal Flats, Chiba	Japan	35	40	N	140	00	E		Yasuo Suzuki
30	4	1999	1	Yatsu Tidal Flats, Chiba	Japan	35	40	N	140	00	E		Yasuo Suzuki
20	5	1999	1	Yatsu Tidal Flats, Chiba	Japan	35	40	N	140	00	E		Yasuo Suzuki
9	5	2000	1	Yatsu Tidal Flats, Chiba	Japan	35	40	N	140	00	E		Nanae Kato
20	8	1999	1	Tokyo Bay Bird Sanctuary, Tokyo	Japan	35	31	N	139	51	E		Eiko Hayashi
26	8	1999	1	Mouth Tama R., Kawasaki, Kanagawa	Japan	35	32	N	139	45	E		Kazuyo Ishii & Akira Kanno
8	9	1999	1	Mouth Tama R., Kawasaki, Kanagawa	Japan	35	32	N	139	45	E		Akira Kanno
10	9	1999	1	Mouth Tama R., Kawasaki, Kanagawa	Korea	35	52	N	126	43	E		N. Moores

Another batch of sightings in Japan, again on both northward and southward migration, and the first Grey Plover reported from South Korea. These records and the 12 sightings in Japan listed in the last VWSG Bulletin are the only information that exists at present on the movements of Grey Plovers between Australia and the Siberian breeding grounds. There are still no recoveries where a bird has been caught etc. and its individual band number reported.

Red-capped Plover

25	11	2000	1	Reef Island, Westernport	VIC	P. Dann

The nearest place at which this bird could have been banded is Stockyard Point, some 15 kms to the north. It is thought that some of the Red-capped Plovers occurring in small flocks (up to 100) on the coast have come from breeding grounds much further away inland, but there is no proof of this yet from banding and flagging.

Double-banded Plover

20	12	1999	1	Upper Tekapo River	New Zealand	44	05	S	170	25	E	S. Butcher

This sighting is in the heart of the breeding area of birds that migrate to Victoria for the Austral winter. A flagged bird (possibly the same individual) was seen at the same location in the previous breeding season (see VWSG Bull 23, page 30).

Lesser Sand Plover

29	11	1998	1	Wynnum	QLD	A. Eacott

Moreton Bay seems to generate 1-3 sightings of Victorian flagged Lesser Sand Plovers each year. As speculated in previous VWSG Bulletins it is possible that at least some of these records refer to the same bird and that it has changed its non-breeding to there.

Greater Sand Plover

18	9	1999	1	Manly Boat Harbour, Moreton Bay	QLD	A. & S. Keates D. Edwards
16	10	1999	1	Manly Boat Harbour, Moreton Bay	QLD	A. & S. Keates
24	10	1999	1	Manly Boat Harbour, Moreton Bay	QLD	A. & S. Keates

The same comments apply as for Lesser Sand Plover. Even fewer Greater Sand Plovers have been flagged in Victoria (15 vs 56 to the end of 2000).

ACKNOWLEDGEMENTS

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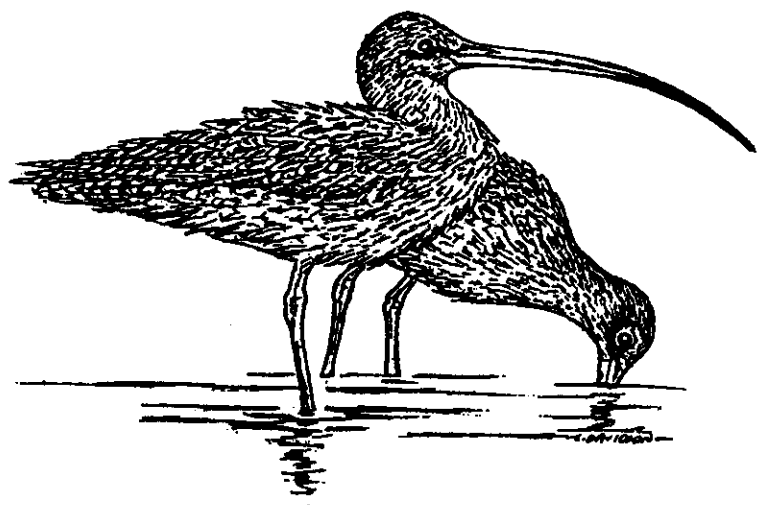

RAPTOR ATTACK METHODS AND THE RESPONSE OF LITTLE CURLEW *NUMENIUS MINUTUS* TO DISTURBANCE AT BROOME, NORTH-WESTERN AUSTRALIA

Rosalind Jessop[1] and Peter Collins[1]

Broome Bird Observatory, PO Box 1313, Broome WA 6725 AUSTRALIA

[1]*Current Address:* Phillip Island Nature Park, PO Box 97, Cowes Vic 3922 AUSTRALIA

INTRODUCTION

Large concentrations of waders may attract predators, especially raptors. Predation of waders by raptors has been identified as an important factor in winter mortality (Page & Whiteacre 1975, Bertochi *et al.* 1984, Whitfield 1985, Lane 1986, Buchanan *et al.* 1988, Decker 1988, Whitfield *et al.* 1988, Cresswell & Whitehead 1994). This short note describes the reactions of Little Curlew to predators and other disturbances at Broome, Western Australia.

STUDY SITE AND METHODS

The study was undertaken on the Broome Golf Course, Broome Water Treatment Plant (BWTP), open grazing land and saltmarsh near the town of Broome in the south-west Kimberley division of Western Australia (17° 58'S, 122° 14'E).

Little Curlew were observed with Leica 10x42 binoculars from a Toyota Landcruiser, which was used as a mobile hide. Observation time totalled 29 hours, with observation periods lasting from one to five hours, depending on how long the flock remained at the location. During hunting flights by raptors, we recorded the method of attack, location of the hunt, predator avoidance behaviour and the size of the flock being attacked. Observations were made between October and December 1995.

The number of days per month on which Whistling Kites *Haliastur sphenurus*, Brahminy Kites *H. indus*, White-bellied Sea-Eagles *Haliaeetus leucogaster* and Brown Goshawks *Accipiter fasciatus* were seen in Broome township were obtained from the Broome Bird Observatory daily bird unpublished data (BBO unpublished data) (March 1988 - March 1995).

RESULTS

The number of Little Curlew at the study sites varied from five to 143 during the study period. The number of days on which Whistling Kites, Brahminy Kites and White-bellied Sea-Eagles were seen was least during the wet season (December to March) (Fig. 1). Brown Goshawks were seen most often in May but were common throughout the

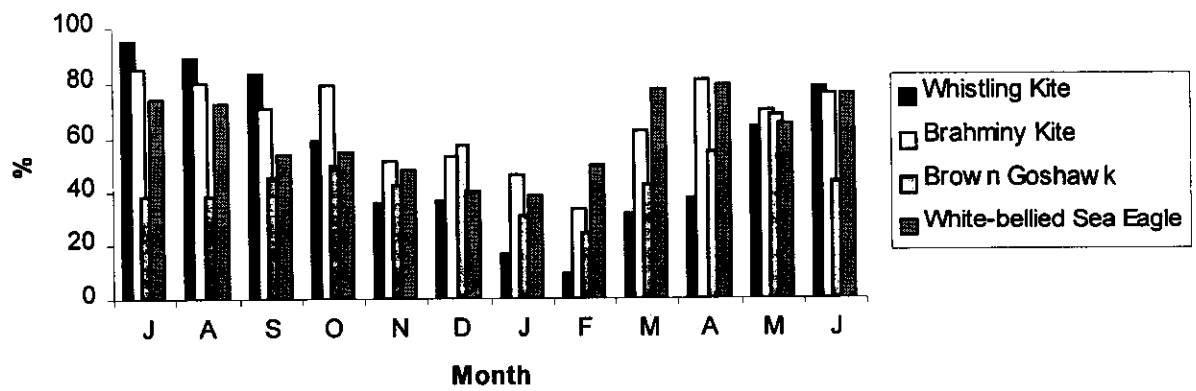

Figure 1. Percentage of days per month on which different raptor species were seen in Broom township (July to June).

year (Fig. 1).

Three levels of response to threats were observed, we have called these: alert display, crouching and freezing behaviour and flight.

Alert Display
Low level response or alert display involved birds ceasing feeding, assuming an upright posture and extending the neck so the head was fully raised to a horizontal position. This was either undertaken by individual birds or the whole flock. Flock response appeared to be triggered by an individual bird maintaining the alert position. The flock would remain motionless for a brief time after which they either walked away from the disturbance and resumed feeding or progressed to the second level or third level of response.

The alert display was elicited as an initial response to an outside stimulus either from members of the flock or by another species nearby. Examples were: other Little Curlew landing with the foraging flock; Black-faced Cuckoo Shrike *Coracina novaehollandiae* and Horsefield's Bronze Cuckoo *Chrysococcyx basalis* landing near the flock and warning calls of Masked Lapwing *Vanellus miles* in response to human disturbance or raptors.

Crouching and freezing behaviour
The second level response involved birds slowly lowering the body to a crouching position on the grass and cocking their heads to one side to look directly at the threat. They remained frozen in this position until the threat abated. Birds were difficult to see, even on the green grass of the golf course once they had assumed this posture.

This response was triggered by larger, less mobile raptors such as Whistling Kites, Brahminy Kites and Little Eagles *Hieraaetus morphnoides,* but not when human activity was involved. In the latter case the flock either ignored the potential threat or proceeded directly to the highest level of response.

Flight
The third level response was when birds flew away, with an increase in vocalisations. After the alert display birds began wing flexing if the threat was slow moving or visible from a distance and flew if it became more threatening. Alternatively the entire flock would suddenly take off as a single tight mass typical of many species of wader (Buchanan *et al.* 1988). If the disturbance did not persist the flock would settle back and, within a few minutes, resume feeding. Flight response outlined above was elicited by surprise attacks from raptors, including a Whistling Kite, and close human presence.

Raptor attack methods
Hunting of Little Curlew by raptors was only observed three times. Two methods of attack were used and these are outlined below:

Low level surprise attacks by Brown Goshawks were observed on the fairways of the Broome Golf Course. The attack was typically performed at high speed a few metres or less above the ground. The raptor appeared around the edge of the trees bordering the fairway and attempted to flush the Little Curlew. The two attempts observed were unsuccessful.

Co-operative hunting was observed on one occasion and involved three Whistling Kites. The attack lasted for over five minutes. The sequence for the hunt began when a single Whistling Kite, flushed a flock of 100 Little Curlew roosting at the Broome Water Treatment Plant by slowly flying 50 m above them. Once the tight flock was in the air another kite joined in flying beneath the flock driving them higher. The third kite, which was thermalling over the dune system, then flew above the flock splitting the flock into two, roughly a 70/30 split. The kites then pursued the smaller of the two groups while the larger flock after circling for a few minutes landed on the adjacent golf course. After five minutes the smaller flock was still being driven upward by one of the kites which made repeated attempts to single out an individual bird by stooping repeatedly at the flock. The other two kites left the attack and were lost to sight. The outcome of the attack is unknown as the flock and the raptor disappeared over the dune system at a height estimated to be over 200 m.

While in the air the flock twisted and turned in a cohesive spherical or elliptical flock. Their highly synchronised movements resulted in "flashing" when the bird's light coloured ventral and dark coloured dorsal areas were alternately exposed (as described by Buchanan *et al.* 1988).

DISCUSSION

Hunting of Little Curlew by raptors on the Broome Golf Course was infrequent. This may have been due to the presence of much greater densities of waders on the nearby beaches. Page & Whiteacre (1975) and Kus *et al.* (1984) found that as shorebirds decreased in number the success rate of attacks by Merlins also decreased. Hunting was generally directed at flocks of greater than 50 birds (Kus *et al.* 1984). Flocks of Little Curlew observed in this study ranged from five to 143. Interestingly, the number of days on which the most common raptor species of the Broome area were observed decreased during the wet season (December to March), the period when most waders are present on Roebuck Bay.

Although Masked Lapwing and an unidentified sandpiper have been recorded in the diet of Brown Goshawks, waders are not a common dietary item (Marchant & Higgins 1993). No waders were found in the diet of Brown Goshawks at Werribee, an important wader wintering area in Victoria (Baker -Gabb 1982). However, Lane (1986) reported a Brown Goshawk unsuccessfully hunting a Red-necked Stint at Roebuck Bay, Broome. Little Curlew at 300 to 470g (Higgins & Davies 1996) are within the weight range of prey items recorded by Baker-Gabb (1982, 1984) for this species. Rock Dove (295 g for males and 320 g for females) (Higgins & Davies 1996) was the most common bird prey item but White-faced Heron *Ardea novaehollandiae* (564 g) and Grey Teal *Anas gibberifrons* (494 g) were also taken at Werribee (Baker-Gabb 1982).

Whistling Kites commonly take birds, but Marchant & Higgins (1993) report only two incidences where waders were the prey - Red-necked Avocet (Sullivan 1988) and an unidentified sandpiper (Baker-Gabb 1982).

Whistling Kites usually hunt alone using high transect or contour hunting or soaring and prospecting (Marchant & Higgins 1993). However, Sullivan (1988) at Wentworth in NSW reported hunting behaviour involving more than one Whistling Kite. A single kite initiated the attack on a Red-necked Avocet but was unable to successfully lift the disabled bird from the water. A second kite then joined the hunt and they lifted the struggling Avocet in tandem. Once over dry land the second kite released it's grip and the first kite dropped to the ground with the bird. It later lifted the Avocet into a tree and ate it. An Avocet weighing 270 - 390g is about one third the weight of a Whistling Kite (650 - 1000g). In October, a Little Curlew would weigh 300 - 470g (Marchant & Higgins 1993, Higgins & Davies 1996), suggesting that Little Curlew may be too large a prey item for Whistling Kites. Co-operative hunting for waders similar to that reported here has been observed in Lanner Falcons (Bijlsma 1990).

Crouching behaviour in response to disturbance, like that observed in Little Curlew (Garnett & Minton 1985), has been recorded in other wader species that use open grassland. These include Tawny throated Dotterel *Oreopholus ruficollis* in Brazil (pers. obs.), Inland Dotterel *Charadrius australis* (Maclean 1976) and Dunlin *Calidris alpina* when feeding at night. However, it is otherwise uncommon in waders (Owens & Goss-Custard 1976, Myers 1980, Mouritsen 1992). Mouritsen (1992) attributes this to the visibility of Dunlin and other waders on the mudflats during the day. Little Curlew are well camouflaged when they crouch and freeze on grassland. Crouching instead of fleeing has energetic benefits (Mouritsen 1992) as birds remain in optimal feeding habitats, lose only little feeding time and save energy otherwise used by fleeing. Crouching and freezing behaviour has also been reported as a predator defence mechanism in Eastern Reef Herons which are often found in association with waders on mudflats (Recher 1972).

Little Curlew ignored Wedge-tailed Eagles *Aquila audax* even when they passed overhead. In their Siberian breeding grounds Little Curlew often nest in association with Golden Eagles *Aquila chrysaetos*, a very similar species (Labutin *et al.* 1982). Larger eagle species may have difficulty in out-manoeuvring and catching a healthy wader.

While crouching and freezing behaviour optimises foraging, fleeing behaviour optimises predator avoidance (Mouritsen 1992). Once a threat is sufficient to put Little Curlew to flight the primary defence mechanism appears to be flock cohesion as was found for Dunlin (Buchanan *et al.* 1988). The "flashing" behaviour described by Buchanan *et al.* (1988) was apparent during the Whistling Kite hunt.

Some degree of habituation to disturbance was evident as day to day work at the golf course such as mowing or adjusting the watering system simply caused the birds to walk away if it became too intrusive. Within the township of Broome, Little Curlew fed on garden lawns and roadside nature strips showing little reaction to regular human activities or heavy traffic nearby and could be approached to within 20 metres.

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SUMMARY OF A TRIP TO THE SEA OF OKHOTSK TO STUDY MIGRATING SHOREBIRDS: MAY 2000 ON SOUTHERN SAKHALIN ISLAND AND AUGUST 2000 ON WESTERN KAMCHATKA AND MAGADAN REGION

Falk Huettmann

Department of Biological Sciences,
8888 University Drive, Simon Fraser University,
Burnaby B.C. V5A 1S6 CANADA
Email: huettman@sfu.ca
Tel. +1 (604) 291 5618
Fax +1 (604) 291 3496

During 2000, we counted the migrating shorebirds on southern Sakhalin Island (spring migration), western Kamchatka and Magadan region (fall migration). We followed-up on work in the previous year on migration of shorebirds, particularly Bar-tailed Godwit (*Limosa lapponica*), Great Knot (*Calidris tenuirostris*) and Red Knot (*Calidris canutus*) in the Sea of Okhotsk region of the East-Asian Australian Flyway.

SHOREBIRD MIGRATION ON SAKHALIN ISLAND IN SPRING 27 APRIL – 25 MAY 2000

Our trip to Sakhalin Island (Fig. 1) started from St. Petersburg, where the University of St. Petersburg, the WWF office and the Zoological Museum were visited. The local shorebird collections and libraries were investigated and experts were met. During the following days, the Zoological Museum in Moscow was also examined for specimen collections of shorebirds, and literature searches in the library. In addition, experts on several issues, such as ornithology, conservation and wildlife research, were met.

Domestic planes and trains were used for all long-distance travel within Russia. Transport to all the sites mentioned below was done by truck, jeep, public bus or foot. For studies in mudflats and river deltas, we made extensive use of rubber boats, and hip waders.

After arriving in Yushno-Sakhalinsk via Khabarovsk, we started with a survey of Busse Lake (46° 2' N, 143° 6' E) on 11 May, 12 May and 19 May. In the Busse Lake region it was very windy, with ice just thawing and snow still laying on the shores. This lake has both fresh and brackish water, extends approximately 4 km inland and is connected to the Sea of Okhtosk through a narrow and shallow channel. We did not find many shorebirds in this region during our counts carried out at both low and high tide. A typical species mix seen at Busse Lake is shown in Table 1.

In addition, the shore of the Sea of Okhtosk was surveyed whenever possible. A typical result of a beach scan for marine wildlife in the Busse Lake region was 300 Common Gulls (*Larus canus*), 400 Laughing Gulls (*Larus ridibundus*), 40 Slaty-backed Gulls (*L. schistisagus*), 10 Black-tailed Gulls (*L. crassirostris*), 5 Wigeons (*A. penelope*), Scaups (*Aythia spp.*), 15 Common Teals, 90 White-winged (*Melanitta fusca*) and Surf Scoters (*M. perspicillata*, flying by), 1 Cormorant (likely Pelagic Cormorant *Phalacrocorax pelagicus*), 2 White-tailed Eagles (*Haliaeetus albicilla*) and 30 Crows (*Corvus corone*). Only very few seals and no other sea mammals were seen. Most gulls were seen near the mouth of the lake, where tidal currents and shallow sandbanks occur.

From May 13 – 22, we surveyed at the mouth of Aniva Bay (Salmon Bay; 46° 8' N, 142° 9' E), which lies about 150 km further north. This site was the main one that we intended visiting in this area. Table 2 shows a typical migrant bird species composition for the 2.5 km long shoreline of the muddy spit and its tidal mudflats that were counted.

Table 1. A typical range of species observed for Busse Lake, Sakhalin Island (2 km shoreline of Busse Lake on the sand spit towards Sea of Okhotsk)

Numbers observed	Species	Comments
250	Ducks	mostly Common Teal (*Anas crecca*), feeding on mudflats
120	Red-necked Stint (*Calidris ruficollis*)	only observed from second visit onwards
100	Dunlin (*Calidris alpina*)	
15	Yellow Wagtail (*Motacilla flava*)	
2	Black Kite (*Milvus migrans*)	

Figure 1: Map of Study Area, and sites mentioned in text

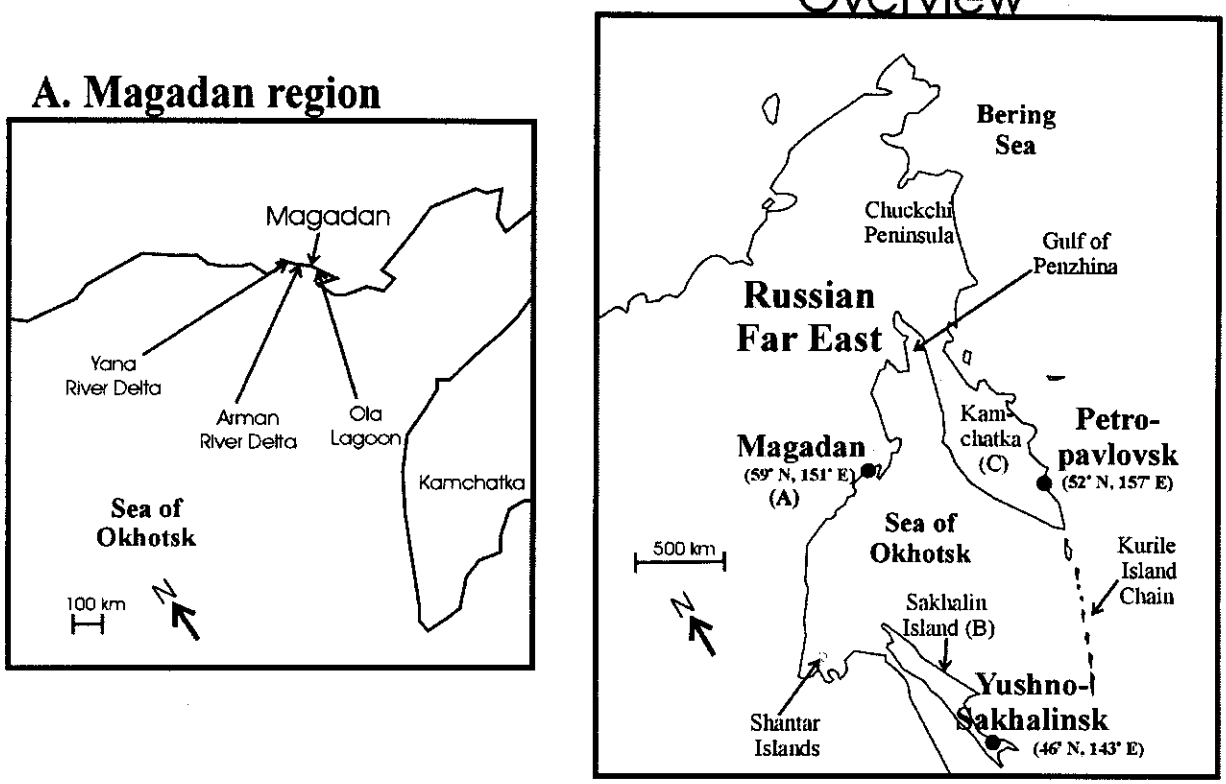

Table 2. Migrants and others observed at the approximately 2.5 km long shoreline of the muddy spit and its tidal mudflats in Aniva Bay.

Numbers observed	**Species**	Comments
1000	Common Terns (*Sterna hirundo)*	nesting on sandbanks
350	Dunlins	numbers increased to 2100 towards 20 May, which is likely the week of their first migration peak
300	Red-necked Stint	numbers increased to 2100 towards 20 May, which is likely the week of their first migration peak
40	Long-toed Stints (*C. subminuta)*	numbers were only slightly increasing towards 21 May
15	Lesser Sand Plover (*Charadrius mongolius)*	slight increase of birds observed during our stay
6	Ruddy Turnstones (*Arenaria interpres*)	
2	Common Sandpiper (*Actitis hypoleucos*)	
2	Common Oystercatcher (*Haematopus ostralegus*)	not always observed
2	Godwits (likely Bar-tailed)	resting far away in the mudflat
NA	Swans	max. observation of 80 individuals
NA	Whimbrels (*Numenius phaenopus*,	max. observation of 20 individuals, most were feeding
NA	Reed Buntings (*Emberiza schoenciculus)*	probably pre-breeding birds from the surrounding reed-beds.

Eastern Curlews (*N. madagascarensis*) were only seen occasionally and in pairs. We saw only 1 Great Knot; there was speculation about one Spotted Greenshank (*Tringa guttifer*) sighting (made from 15 m distance). However, it could not be confirmed or photographed, nor were any relevant sightings from this area known for this bird in recent years. Nevertheless, Aniva Bay is the area where the first historical breeding records of Spotted Greenshankwere reported, and typical nesting habitat is currently found there (larch tree *Larix dahurica*). In addition, the main area for Spotted Greenshanks north of Sakhalin Island was reported to be unusable by breeding birds due to ice coverage during our visit.

We saw between 2 and 4 White-tailed Eagle (likely breeding birds) every day, and on 21 May, one Peregrine Falcon (*Falco pregrinus*) was observed. The occurrence of such predators could potentially indicate peak of shorebird migration.

All shorebirds we observed were in breeding plumage already. The weather was often very foggy, and the spring sun had just started to warm up the bay. At both locations, Busse Lake and Aniva Bay, widespread and managed hunting activities for ducks were observed.

Besides shorebird counts, research on foraging paths of shorebirds in mudflats were also carried out. Droppings of Red-necked Stints were collected for future investigations, and five specimens were collected for morphometric studies and future stable isotope analysis by the author. Preliminary results indicate that for the time of study female Red-necked Stints differed from males in having no intense red breast and a white forehead. This topic needs future investigations.

Population counts were carried out along fixed units of shore and beach, but I also investigated different counting schemes for shorebirds (comparisons of point counts, line transects, scans and absolute counts). For each location visited, benthos samples were collected, and soil investigations were made. As mentioned already, scan counts were done at all of the locations possible for offshore wildlife. Few harbour seals were found, but no other sea mammals. Also the amount of beach debris recorded at these sites indicated small amount of waste, which normally came from local fishing and hunting activities. However, plastic parts were most dominant.

We saw few shorebirds while driving along the steep and rocky shore of Sea of Okhotsk between Aniva Bay and Busse Lake. A few swimming Harlequin Ducks (*Histrionicus histrionicus*, <20 birds) and some Scoters were all that were seen.

At each area of coastal forest at the study sites, distance transects were carried out to measure the abundance of forest birds in the coastal forests of the Sea of Okhotsk, a so far overlooked habitat type. Most of these forests consisted of *larix dahurica* trees, and the surveys were dominated by low numbers of Oriental Greenfinches (*Carduelis sinica*) sitting in trees, or flying by. When

resting Oriental Greenfinches were singing from treetops and were sometimes accompanied by tits (*Parus* spp.), Northern Winterwren (*Troglodytes troglodytes*) and other locals bird species. Red-flanked Bluetail (*Tarsiger cyanurus*), Siberian Rubythroat (*Luscinia calliope*), Pipits (*Anthus sp*) and displaying Lathams Snipe (*Gallinago hardwickki*) were observed, too. Jungle Crows (*Corvus macrorhynchus*) occurred mostly in association with human settlements.

A trip to the Sea of Okhotsk shore on southeastern Sakhalin Island on May 20 showed that the Sea of Ohkotsk still had ice cover and that these sections were hardly used by shorebirds. Except for few Red-necked Stints (20), Sanderlings (*C. alba*, 15), Dunlins (5) Mergansers (*Mergus serrator 2*) and gulls, no birds of interest were found during two hours of intense searching of the 3 km long sand beach. However, inshore lakes near by had large numbers (>5000 individuals) of waterfowl, mainly Scaups and Teals, and to a lesser degree Wigeons and Longtailed Ducks (*Clangula hyemalis*).

Typically, the grasslands of the coast of the Sea of Okhotsk harboured Stonechats (*Saxicola torquata*), Larks (e.g. Skylark *Alauda arvensis*), Wagtails (*M. alba, M. flava, M. lugens*), soaring Black Kites and few displaying snipes. Some of the coastal grasslands were traditionally burnt down to keep the vegetation short. Occasionally, Oriental Greenfinches were observed in small flocks migrating.

Despite intense surveying and scanning for shorebirds, we did not see any birds with leg flags, nor were any Spoon-billed Sandpipers (*Erynorhynchus pygmeus*) seen. As an interesting finding, mudflats in a forest near Aniva village contained 80 Wood Sandpiper (*Tringa glareola*), plus 50 Dunlin and 20 Red-necked Stint. At the sewage treatment plant of Yushno-Sakhalinsk, a larger concentration of Wood Sandpiper (about 400 birds) and Long-toed Stint (approx. 150) was found, probably on migration. These birds were very approachable and could present opportunities for further studying.

A larger section of the Kurile Island chain are administrated by the Sakhalin Island government, and thus would potentially qualify for further studies on shorebird migration, with Yushno and Sakhalin Island as expedition bases. However, most literature references do not suggest that shorebirds use these islands as a migration route in either northward or southward migration; although a few conflicting references exist.

STUDIES OF SHOREBIRD SOUTHWARD MIGRATION IN THE SOUTHWESTERN KAMCHATKA AND MAGADAN REGION DURING 29 JULY - 25 AUGUST 2000

During the southward migration of shorebirds in the year 2000, we were able to visit the Kamchatka and Magadan region. I stayed in Kamchatka from the 29 July – 13 August 2000. We were not able to visit the Gulf of Penzhina region. After a three day wait in Petropavlovsk for a helicopter flight to Sobolevo, we finally started by car to another river delta in southwestern Kamchatka on the Sea of Okhotsk called Ust Bolsheretsk (52° 30' N, 156° 2' E). Due to its long sandspit, approximately 20 km long, and a river delta that was 30 km across, this area was a typical habitat of this region. After a 3 h boat ride from the local fishing village downriver, we camped at three different sites near the river mouth and the Sea of Okhotsk. There, we surveyed different but small sections of the large mudflats, including some sections of the coastal tundra. At each site, mudflat benthos samples and wader droppings were collected. I also investigated foraging patterns of the few Red-necked Stint seen. Despite very large numbers of mosquitos in the tundra, the weather was cold, and it rained for 4 out of 6 days.

Table 3 shows a typical species count for the region (mudflat and shore of adjacent lake with brackish water). Almost all shorebirds encountered were in alternate plumage (towards breeding plumage). We also conducted tundra transects that were characterised by the following species: Siberian Rubythroat (adults and juveniles), Grashopper Warbler (*Locustella* spp., *L. ochotensis* and *L. lanceolata*), Yellow Wagtail, Whimbrel, Oriental Greenfinch, Pipit spp. (e.g. Pechora Pipit *A. gustavi*, Red-throated Pipit *A. cervina*), Reed Bunting and Lapland Bunting (*Calcarius lapponicus*). Strong evidence of the presence of Brown Bears was also found.

Table 4 presents birds observed in the river delta on our way back to the fishing village 3 h upriver by boat. A scan count of the narrow sand spit on the shore of the Sea of Okhotsk resulted in 500 Mew Gulls, 50 Slaty-backed Gulls and 1000 Black-headed Gulls; probably because of the intense fishing activities. A beach debris count was also carried out, resulting in smaller amounts of fishing related waste.

Later on, Whimbels were seen migrating up to 25 km away from the coast, supporting the idea that Whimbrels migrate in southwards along a relative broad flyway. This might have implications for the monitoring and population sizes for this species.

From a conservation aspect, I was overwhelmed by the intensity of the local salmon fishing activities (fishing mostly for Pink Salmon) in this region. Due to the latest governmental orders, it is apparently no longer allowed to

Table 3. A representative count of birds for the Ust Bolsheretsk region (mudflat and shore of adjacent lake with brackish water).

Numbers observed	Species	Comments
70	Whimbrel	flying in flocks, max. 300
40	Dunlin	360 max.
40	seals	colony
15	Red-necked Stint	60 max.
10	Raven (*Corvus corax*)	max. a flock of 60, all in wing moult
10	Common Tern	max 50, breeding, adult and juvenile
5	Black-headed Gull	mostly in moult
5	Oriental Greenfinch	
4	Slaty-backed Gull	15 max.
2	Aleutian Tern (*Sterna aleutica*)	
2	Bar-tailed Godwit	only observed 9 August
2	Common Snipe (*Gallinago gallinago*)	
2	Long-toed Stint	
2	Parasitic Jaeger	
1	Mew Gull	300 max, mostly in moult
1	Terek Sandpiper (*Xenus cinereus)*	observed only once

leave dead salmon meat behind after harvesting the fish eggs (Russian Ikra = salmon caviar).

After leaving Kamchatka via Vladivostok, I stayed in Magadan from 14 August – 27 August for a repeat of the shorebird survey sites examined the previous year. We were not able to visit additional areas this year.

The Ola Lagoon (59° 30' N 152 ° 0' E) was visited at low tides on 15, 17, 18 August (early morning and evening), 19 August (early morning and evening), 21 and 25 August. As in the previous year, we did not see shorebirds in the sky actually migrating. Species assemblages on the mudflats were similar to the ones seen in 1999, but many more Great Knots and some more Red Knots were found. This was likely due to the fact that we were able to survey this area two weeks earlier than last year. Another reason could be that the year 2000 was a better year for Great Knots breeding (Anadyr River region, Chukotka). However, at the Ola Lagoon the Great Knots and Red Knots were very accessible and allowed good study opportunities.

Benthos samples were taken and droppings of Great Knots were collected. Studies of Great Knot behaviour and pecking rates were examined throughout the tidal stages. Great Knots were observed feeding very intensely, with a small but increasing percentage of feather ruffling and bathing after high tide. Almost all Great Knots observed were identified as juveniles. For the areas surveyed, the Abdominal Profile Indexes (API) of Great Knot ranged between class 2 (5%), class 3 (30%), class 4 (35%), and class 5 (35%) with some fluctuations. Daily-observed Great Knot numbers varied between 600 and 1200 individuals, probably due to variable search effort and survey location.

Within Great Knot flocks we saw few Red Knots, with 40 individuals being the highest count. Although APIs changed, a high proportion of birds had an API of class 5. It is possible that fluctuations in APIs and observed bird numbers were caused by a fast turnover of birds. Getting estimates on turnover rates would deserve more attention in future studies.

Table 4. Birds observed in the river delta on way back to the fishing village Bolsheretsk upriver, 3 h by boat.

Numbers observed	Species	Comments
10000	Mew Gull	estimate
8000	Large dark Gulls undefined	likely juveniles
2000	Comon Terns	
2000	Slaty-backed Gull	adults
800	Slaty-backed Gull	juvenile plumage
80	Dunlin	feeding on rafts of floating seaweed
80	Common Greenshank (*T. nebularia*)	
50	Whimbrel	
40	Common Snadpiper	
15	Woodsandpiper	

Table 5. Shorebirds located approximately 2 km upriver on the Yana River.

Numbers observed	Species	Comments
30	Common Teal	Estimate of birds flying by
20	Great Knot	mostly juveniles
15	Red-necked Stint	
15	Godwit	mostly Bar-tailed Godwit
1	Terek Sandpiper	

In addition, similar species and numbers than last year were observed for the Ola Lagoon: Parasitic Jaeger (*Stercorarius parasiticus*), Glaucous Gull (*Larus hyperboreus*), Slaty-backed Gull, Common Tern, Grey-tailed Tattler (*Heteroscelus brevipes*), Common Greenshank, Sharp-tailed Sandpiper (*C. acuminuta*), Golden (*Pluvialis fulva*) and Grey Plover (*P. squatarola*).

On 22 August, we made a trip to the Yana River Delta (59° 30' N 148° 0' E) in order to compare our findings with last year. Due to heavy rainfall prior to our visit, the mudflats were mostly underwater. However, after some searching we found shorebirds about 2 km upriver (Table 5), at identical locations where we saw them last year during several surveys on exposed mudflats (all birds seen where feeding intensively).

The mouth of Yana river showed some migration of passerines, mostly pipits, larks and to a lesser degree *Locustella* warblers; ground squirrels were also observed. At high tide Great Knots we seen in three flocks (30+25+40) in the tundra habitat. We expect that these birds were feeding on berries or taking up small stones, which we found in stomachs of collected individuals. Previously, it was a mystery to us where these birds are located at high tides and when not found on the mudflats. Due to our finding of birds in the tundra, we think that the neighbouring tundra might present an important place for resting shorebirds while on southward migration. For future stable isotope analysis, morphometric and feeding studies, six Great Knots were collected; we also collected six Red-necked Stints, one Bar-tailed Godwit and four Black-tailed Godwits for the same purpose.

On our way to Yana River and back, we were not able to investigate other rivers since they mostly were flooded. But we observed at a small tidal mudflat of Siviky River a flock of shorebirds (Table 6). Close to a fishing village we found 200 seals on the shore, and a raft of 150 White-winged Scoters sitting on the sea.

For all locations visited in the Magadan region we did not locate any leg bands, nor were any Spoon-billed Sandpipers seen.

As a side aspect, we were able to forward to the Australian banding office two local band recoveries from the Magadan region of birds banded in Australia and given to A. Andreev by locals (C. Minton for further details).

CONCLUSION

Clearly, our counts and surveys cover only a small area and a short period of time; they are far from complete. However, for the focal species, Great Knot, Red Knot and Bar-tailed Godwit, they should contribute to a solid overview and identification of selected sites for these species. Our study allows to put the shorebird migration of the Sea of Okhotsk in a spatial, temporal and quantitative context to other East-Asian Australian Flyway studies.

For the sites visited, we did not locate any relevant numbers of Bar-tailed Godwit at all. Southern sections of Sakhalin Island had none of our three focal species during the time that northwards passage would be expected. During fall migration, Red Knot were only encountered in very small numbers at the Ola Lagoon, and juvenile Great Knot were found in the Magadan region in decent numbers, but not in Southwestern Kamchatka. Our findings are still consistent with the idea of a non-stop long-distance migration strategy for all three species in spring and fall migration. Major sections of the adult breeding population for each of the focal species during migration in the Sea of Okhotsk region still await discovery. The southern section of Sakhalin Island is either not on the major spring flyway for the focus species, or these species would fly over in a non-stop manner. For fall

Table 6. Birds observed at a small river and tidal mudflat draining directly into the northern shore of the Sea of Okhotsk.

Numbers observed	Species	Comments
20	Dunlin	
20	Grey-tailed Tattler	
15	Red-necked Stint	
10	Common Greenshank	
3	Wood Sandpiper	
2	Whimbrel	

migration, the same can be concluded for Bar-tailed Godwit in the southern Kamchatka and in the Magadan region. For Great Knot and Red Knot we conclude that the southeastern region of Sea of Okhotsk is not used as a resting or stopover site during fall migration. But according to our findings, to local observation reports and to published information, the northern sections of the Sea of Okhotsk, and also the Amur River appear to be relevant. Alternatively, a non-stop long-distance migration for parts of the population of this species could also explain our findings, and birds leaving certain breeding grounds, or concentrating in the northern sections of the Sea of Okhotsk, would need more investigation in order to address this question.

As pointed out in last year's studies, we suggest that likely higher numbers of shorebirds can be found northwest of Sakhalin Island, northwest of Kamchatka, westwards and eastwards of Magadan, Gulf of Penzhina, and in the Amur river delta. These areas await further investigations to complement andr improve the picture we currently have on shorebird migration in the Sea of Okhotsk region along the East-Asian Australian Flyway.

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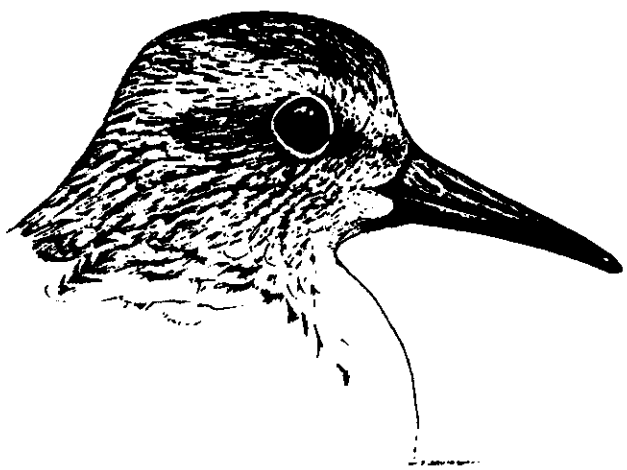

BOOK REVIEW

H. Hötker, E. Lebedeva, P.S. Tomkovich, J. Gromadza, N.C. Davidson, J.Evans, D.A. Stroud & R.B. West (eds). Migration and International Conservation of Waders: Research and conservation on north Asian, African and European Flyways. International Wader Studies 10, September 1998. A4, soft cover, 500 pages.

Every now and then, those people shrewd enough to be members of the Wader Study Group (and regular recipients of the WSG Bulletin) receive a free new book from the International Wader Studies series. This hefty tome is one of these works, and it should do a grand job in convincing WSG members that they are getting their money's worth.

The book is based on a WSG conference held in Odessa in 1992, with the theme of migration and international conservation of waders. It was an important event, resulting among other things in the Odessa Protocol on international conservation of migratory flyway research and conservation (which has provided a framework for much of the subsequent activity of the WSG). This book is actually more than a simple set of proceedings, as it contains many contributions from workers who were not able to attend the event. With 54 papers and 22 abstracts, the chances are that every reader will find something in here to keep them interested.

The papers are arranged in six categories, not including the forewords (there are several) which include a history of the development of wader studies in the former Soviet Union by Pavel Tomkovich. The first section presents the Odessa Protocol and describes the flyway concept. The second section, on current approaches to wader conservation, presents 12 papers or abstracts, mostly on conservation strategies and management practices.

The rest of the book (some 400 pages) is devoted to research papers. The section "Flyway-scale migration research" has five brief papers, including reports on banding studies of Dunlins, and a report that the wings of juvenile waders appear to be slightly more pointed than those of adults (possibly to allow juveniles to fly more efficiently, and potentially of practical use in ageing).

The longest section in the book, "Wader research in arctic and subarctic regions", has 22 papers, many of particular interest to Australasian readers. Nine of them deal with lemming cycles and their effects on wader breeding success and abundance; they include reviews of wader breeding conditions across the Russian tundras from each of the years from 1988 to 1994. Attempting to match those up with numbers of juvenile waders reaching Australasia will be an entertaining task for someone. Four papers report on waders staging at sites off Sakhalin and Kamchatka, likely to be extremely important areas for birds bound for Australia. Also noteworthy is a detailed review of Dunlin breeding distribution across Russia.

The section "Wader research in boreal, temperate and steppe regions: breeding" is not of such direct relevance to most readers of *The Stilt*, though a paper on the population and breeding range fluctuations of Asian Dowitchers will catch the eye of many Australasians – the species shows intriguing changes in breeding range when droughts occur, mirroring in a way the unpredictable breeding ranges of the far less strongly migratory shorebirds of inland Australia. The remaining 26 papers of the section will be of greater interest to readers from Europe and Russia, and include some fairly disturbing studies or reviews of the conservation status of birds breeding in Southern Russia and the Ukraine; some species, especially the Sociable Plover, have undergone alarming declines. The associated section "Wader research in boreal, temperate and steppe regions: migration and wintering" has 14 papers, many dealing with wader status at sites in Eastern Europe and the west of what used to be the USSR. Finally, there is a short (3 paper) section on migratory waders in Africa.

The book is attractively presented, and holds much of use to Australasian researchers. Perhaps its best feature though, is that it brings together so much material from countries that were once part of the Soviet Union; much of this information was previously only available in Russian publications that were difficult to access and translate. Now at last it is available to Western readers in a convenient form.

Danny Rogers, 13 Feb. 2001

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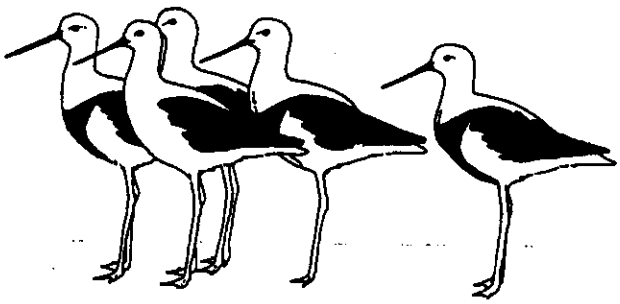
Deadlines:

The closing dates for submission of material have been revised. They are **1 March** and **1 September** for the April and October editions respectively. **Extensions to these dates must be discussed with the Editor.** 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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