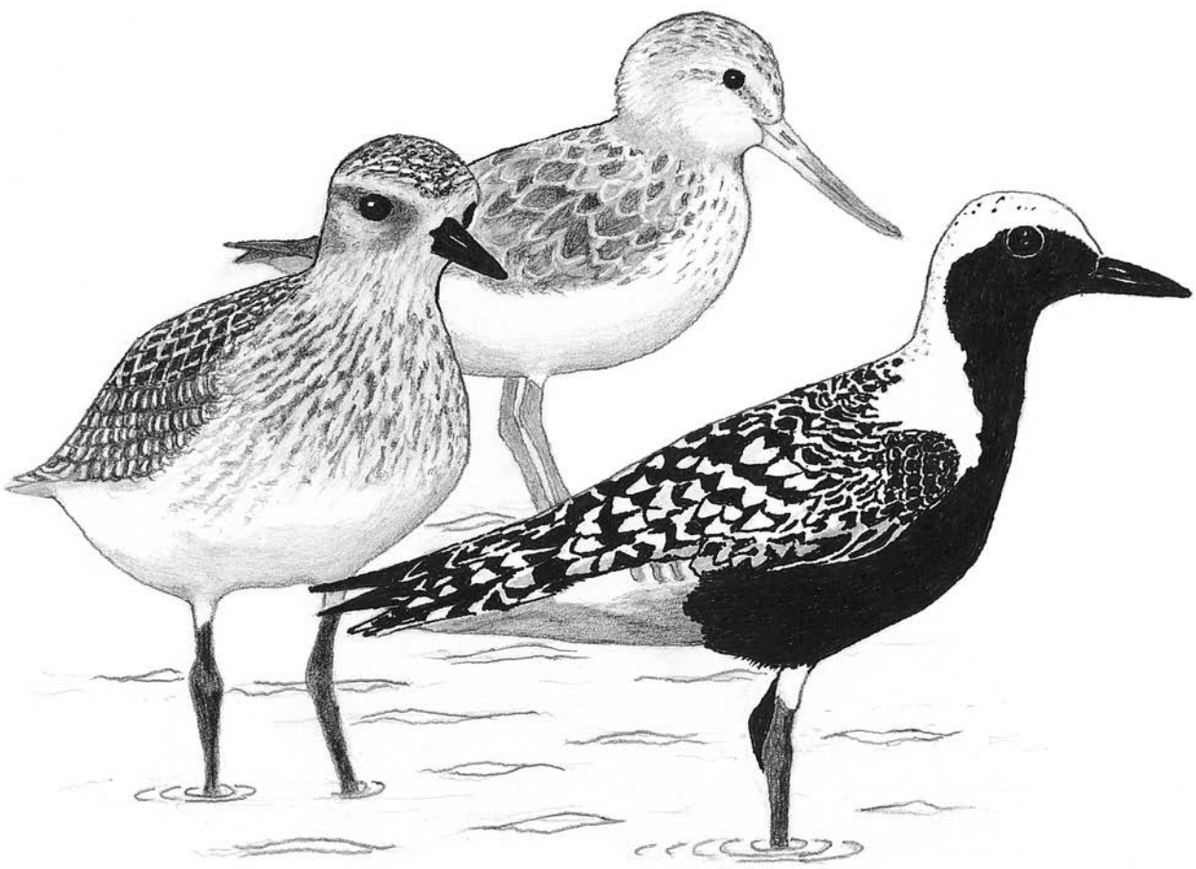
Stilt

The Journal for the East Asian-Australasian Flyway



AWSG
Australasian Wader Studies Group

Number 55 • April 2009

Stilt

ISSN 0726-1888

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 *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 *Stilt*, and the quarterly newsletter *The Tattler*. Please direct all membership enquiries to the Membership Manager at Birds Australia (RAOU) National Office, Suite 2-05, 60 Leicester St, Carlton Vic 3053, AUSTRALIA.
Ph: 1300 730 075, fax: (03) 9347 9323.
Email: membership@birdsaustralia.com.au

Annual Subscriptions:	Australia & New Zealand	A$35.00
	Overseas	A$40.00
	Institutions	A$45.00

AWSG WEB SITE: awsg.org.au

Cover Illustration: Annie Rogers.

A NOTE FROM THE CHAIRMAN

Members will be aware of the important Ramsar CoP meeting in Korea late last year under the theme "Healthy Wetlands, Healthy People" at which governments made commitments to a range of initiatives. Several of these commitments were directed to the protection of flyways and habitat for migratory waterbirds around the world. In particular, Resolution 22 'Promoting International Cooperation on Waterbird Flyways' is relevant to shorebird conservation as it strongly encourages parties and other governments to actively support and participate in relevant international plans and programmes for the conservation of shared migratory waterbirds and their habitats and urged parties to urgently enhance their efforts to address the root causes of the continuing decline in waterbird status. It also urged governing bodies to share knowledge and expertise on best practices in the development and implementation of flyway-scale waterbird conservation policies and practices

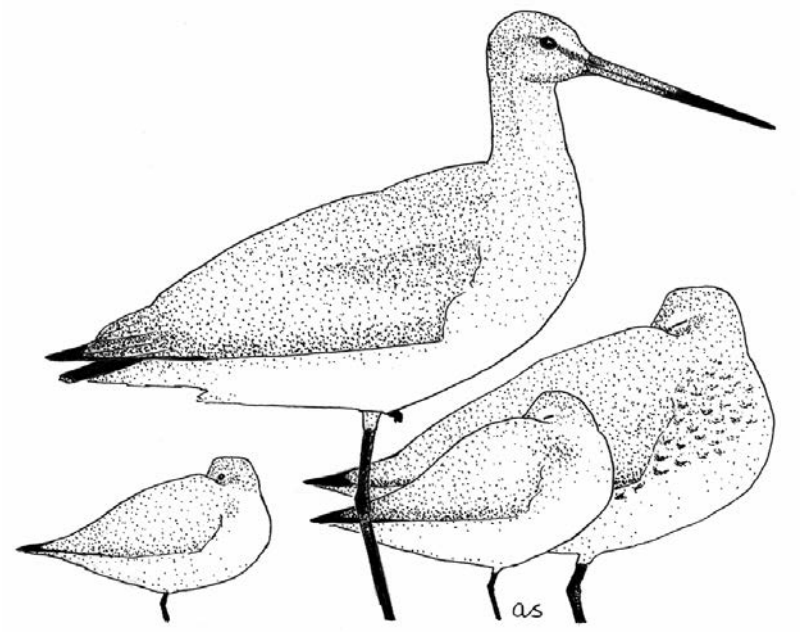
The question now is how do we maintain the momentum generated at this meeting and keep participating governments up to the commitments they made in Korea. Already we are seeing a dilution of some of these commitments in some areas and there are some who question the worth of such agreements. However, these are a starting point and provide a framework in which government and NGO's such as the AWSG can work. A forum of even more relevance to our Flyway is the East Asian -Australasian Flyway Partnership which provides another opportunity to have dialogue and exchange information between a number of government and NGO Partners in our Flyway. Launched in November 2006, the Partnership is an informal and voluntary initiative, aimed at protecting migratory waterbirds, their habitat and the livelihoods of people dependent upon them. The Partnership provides a framework for developing strategies for managing tidal flat resources aimed at balance between development and preservation of important areas for waterbirds including shorebirds.

The effectiveness of these forums depends to a large extent on the information that is available; without sound scientific information we cannot expect appropriate decisions or strategies to be formulated. The relative success that was achieved at the CoP10 meeting in regard to tidal flat protection hinged to a large extent on the excellent SSMP study carried out by Birds Korea and AWSG from 2006 to 2008 and the complementary study of MYSMA (Monitoring Yellow Sea Migrants in Australia) carried out in Northwest Australia and Queensland.

The AWSG plays an essential role in collecting a range of scientific information including banding, movements and population data which, when analysed, provides an important resource in the context of the international forums mentioned above. In this issue of Stilt you will find some of this work reported; including the NWA banding expedition and reports on counts. In order that the data collected in Australia can be effectively utilized throughout the flyway it needs to be analysed and published in journals such as Stilt.

The next Australian Shorebird Conference will be held in Hobart in September and I encourage as many of you as possible to present oral or poster presentations of your work. I look forward to seeing you there.

Ken Gosbell
Chairman



TREASURER'S REPORT FOR 2008

Total payments exceeded receipts by $28,964 during 2008, however this included an excess of contracted expenditure over contract income of $30,356 due to contracts in progress at the start of the year. The balance of $82,322 carried forward at 31st December 2008 includes commitments for future expenditure on contracts of $57,725. General (non-contract) accumulated funds were $24,597 an increase of $1,392 during the year.

Australasian Wader Studies Group
Receipts and Payments
1 January 2008 - 31 December 2008

RECEIPTS			PAYMENTS		
Item	**2008 $**	**2007 $**	**Item**	**2008 $**	**2007 $**
Balance brought forward	111,286.95	101,041.26	Stationery/Printing	6,117.32	13,139.81
			Advertising & promotion	309.40	150.00
Subscriptions	9,176.41	8,202.25	Postage/Courier	3,467.78	8,131.60
Contracts - Federal Govt.	20,000.00	72,000.00	Consultants/Contracts	88,606.33	63,381.22
Contracts - State Govts.	42,272.73	0.00	Field expenses	1,000.00	626.36
Contracts - Other	45,036.52	47,069.44	Conferences/Meetings	601.95	8,679.54
Sales	216.87	0.00	Phone/Fax	38.71	57.27
Conferences	0.00	11,577.25	Equipment (consumable)	154.57	305.45
Grants and Donations	2,993.00	9,161.00	Travel & accommodation	47,363.83	42,293.00
			Admin fee (BA)	1,000.00	1,000.00
			Depreciation	0.00	0.00
Total income	119,695.53	148,009.94	Total expenses	148,659.89	137,764.25
			Balance carried forward	**82,322.59**	**111,286.95**
	230,982.48	**249,051.20**		**230,982.48**	**249,051.20**

Membership Statistics for 2008:

The membership at the end of the year was:	2008	2007
Australia/New Zealand	233	213
Overseas (excl. NZ)	29	33
Institutions	15	15
Complimentary	57	58
Total	**334**	**319**

This summary of receipts and payments for the past year is not an audited statement. It has been prepared for the information of AWSG members from records of transactions provided by Birds Australia which relate to the Australasian Wader Studies Group.

The AWSG is a Special Interest Group of Birds Australia and members who wish to see the audited accounts of Birds Australia should refer to the Concise Financial Report included in the Birds Australia Annual Report 2008.

Brian Speechley, Treasurer.

DECLINE IN WADER NUMBERS ON THE SWAN RIVER, WESTERN AUSTRALIA BETWEEN 1981 AND 2009

MARCUS J.C. SINGOR
149A Bishopsgate Street, Carlisle 6101 WA, AUSTRALIA
msingor@iprimus.com.au

Alfred Cove is the last remaining significant wader site along the Swan River. This article provides an update on the status of the wader population at Alfred Cove. Observations were made from 2006 to 2009 and compared with data from 20 years ago. The only species to increase in number were Pied Oystercatchers which were not recorded between 1981 and 1985. Maximum counts of other species declined by 48 and 99 percent, the greatest declines were recorded for Red-necked Stints and Curlew Sandpipers.

INTRODUCTION

The Swan River Estuary, Perth, Western Australia is a site of international significance for Red-necked Stint *Calidris ruficollis* (Bamford *et al.* 2008). The Swan River system occurs in wide channels and extensive flood plains with low relief and is part of the Avon and Swan Coastal Plain drainage system in Western Australia. Large tracks of the Swan River wetlands have been reclaimed since settlement and are highly urbanised. One of the major roosts is found at Alfred Cove which is nine kilometers from the centre of Western Australia's biggest city, Perth, and forms part of the Swan Estuary Marine Park. Alfred Cove together with the other two reserves, Milyu and Pelican Point, which form the park, are separate estuarine lands and waters within the Swan River. Pelican Point and Alfred Cove are four kilometres apart and Pelican Point is on the opposite side of the Swan River. Waders move between the three sites on a daily basis (Bamford 1999). Alfred Cove consists of a stretch of intertidal mudflats bordered by a chain of off shore sandbanks. There is an adjacent area of salt marsh and low samphire wetlands interspersed with shallow tidal pools (Figure 1). Together with the other reserves it provides the main feeding and resting areas for trans-equatorial migratory waders in the Swan Estuary. The reserves and water are managed by the Western Australian, Department of Environment and Conservation.

Limited research into the movement of waders on the Swan Estuary has been undertaken. Bamford (1999) notes that as the tide rose and covered the mudflats, waders moved to the higher sandbanks.

"The smaller waders such Red-necked Stint moved first

Figure 1 Map of Alfred Cove, Swan River, Western Australia.

from the sandbars to Milyu. They remained there till just on sunset and then left en masse in a westerly direction. There is some speculation about their ultimate roosting destination. Rottnest Island was one consideration. Curlew Sandpiper and Sharp-tailed Sandpiper were observed exhibiting the same behaviour at Alfred Cove where they departed in a westerly direction in the evening. As the tide continued to rise and flooded the sand banks the larger waders moved the samphire flats of Alfred Cove or across the river to Pelican Point". (Bamford,1999).

METHODS

Data obtained during the "Waterbirds in Nature Reserves" surveys conducted from 1981-1985, provide a good insight into the wader populations that were present at Alfred Cove in the early 1980's (Jaensch 1988). The number of surveys conducted during 1981-1985 was 218. These surveys have been used for comparative purposes.

Wader counts conducted in 1987 and 1988 by Peel Howden and Jack Hunt are presented to provide a comparison with current survey data.

In this study a total of 48 surveys were conducted from October 2006 till February 2009 to assess the number and species of waders frequenting the Alfred Cove mud flats. The surveys were held at high and low tides.

RESULTS

Historical and current data is presented in tables 1 and 2. Changes in wader numbers between 1981-85 and 2006-2009 are shown in Table 3. Overall numbers of birds decreased over the study period. Only Pied Oystercatcher increased in number.

The reduction in wader numbers at Alfred Cove corresponds with the findings made at Pelican Point (Creed 1998). A similar decline has been reported at that site. Ad hoc counts of waders in Alfred Cove have also been made. Higher wader counts made outside the official survey periods include; Whimbrel (3) on 22 December 1991, Ruddy Turnstone (6) on 4 November 1991, Greater Sand Plover (3)

Table 1. Wader counts made at Alfred Cove in 1987 and 1988 by Peel Howden (PH) and Jack Hunt (JH).

		Year	1987	1987	1987	1988	1988	1988	1988	1988	1988	1988	1988
		Date	1-Dec	18-Dec	29-Dec	17-Jan	11-Feb	20-Feb	1-Mar	19-Mar	14-Apr	6-May	5-Jun
	Observer		PH	PH	PH	PH	JH	PH	JH	PH	PH	PH	PH
Species													
Haematopodidae													
Australian Pied Oystercatcher	*Haematopus longirostris*		4		3	8		11	12		3	6	
Recurvirostridae													
Black-winged Stilt	*Himantopus himantopus*		10	15	15	3	23	11	3	35	15	30	
Red-necked Avocet	*Recurvirostra novaehollandiae*				17								
Charadriidae													
Grey Plover	*Pluvialis squatarola*		20	41	60	1	72	21	12	15	7	30	2
Red-capped Plover	*Charadrius ruficapillus*		20	17		2	15						
Scolopacidae													
Black-tailed Godwit	*Limosa limosa*									1		2	
Bar-tailed Godwit	*Limosa lapponica*		3	14	13	2	41	30	6	3		20	7
Common Sandpiper	*Actitis hypoleucos*		1	2	2		1	2		2	2		
Terek Sandpiper	*Xenus cinereus*			1									
Common Greenshank	*Tringa nebularia*		3	6	14	2	18	5	5	5	8	10	
Great Knot	*Calidris tenuirostris*		50	30	13	143	340	96	110	1	34	50	
Red Knot	*Calidris canutus*			3		2	30	6	10				
Red-necked Stint	*Calidris ruficollis*		11	90		112	6	34	350	4			
Sharp-tailed Sandpiper	*Calidris acuminata*				4		11		2				
Curlew Sandpiper	*Calidris ferruginea*		4	1	2	2	50	6	100		8		
TOTAL			**126**	**220**	**143**	**277**	**607**	**222**	**610**	**66**	**77**	**148**	**9**

on 2.11.1988 and Broad-billed Sandpiper (2) on 8 November 1993. Other species that have been observed at Alfred Cove are Sooty Oystercatcher (1) on 25 October 1993, Inland Dotterel (1) on 28 February 1991 and Lesser Sand Plover (2) on 7 November 1993.

Species accounts

Red-necked Stint *Calidris ruficollis*
The Red-necked Stint was very common on the Swan River in years gone by. In the early eighties a sighting of up to 10.000 birds was recorded. In the late nineties a flock of around 3000 was still reported. Red-necked Stint were virtually absent during the current survey period 2006-2009 and this represents a dramatic reduction on past numbers of over 99%. Some Red-necked Stint have been leg-flagged on the Swan River in order to track their movements. The results indicate the population moves around the Swan coastal plain. Leg-flagged Red-necked Stint have also been sighted on Rottnest Island and in the Peel Inlet to the south of Perth.

Black-winged Stilt *Himantopus himantopus*
The wetland survey of 1981-1985 reports that ten to 15 pairs bred each year in the flooded samphire at Alfred Cove, with eggs as early as June and as late as December. The number of breeding Black-winged Stilt has since declined. Black-winged Stilt were observed breeding in 2007 and 2008 on small islands in the samphire foreshore however these attempts had a low success rate. Observations indicate that several pairs still attempt to breed each year. Field notes recall a nest with two eggs on 11 September 2007 and a nest with two eggs on 7 October 2008. Three juvenile were observed on 13 December 2008. Black-winged Stilt were present all year round.

Grey Plover *Pluvialis squatarola*
The call of the Grey Plover is still commonly heard over the mudflats at Alfred Cove. The visiting population of Grey Plover has declined in relation to past records. Past records note 60 Grey Plover on 29 December 1987 and 72 on 11 February 1988. The Grey Plover still maintains a population of around 20 birds at Alfred Cove during the summer months. They roost close together along the edge of the samphire at high tide.

Pied Oystercatcher *Haematopus longirostris.*
The large influx of Pied Oystercatchers over the summer months is a fairly recent phenomenon. Pied Oystercatchers were not mentioned at all in the 1981-1985 wetland surveys. The report first mentions a sighting of 12 Pied Oystercatchers in January 1987. Since then the number of Pied Oystercatchers has increased. For example; 55 Pied Oystercatcher on 1 January 1992, 83 on 9 February 2003 and up to a hundred Pied Oystercatchers were sighted in March 2002. High numbers were present during the study period (Table 2). Their dispersal pattern at high tide in unknown but is likely to be to other sites along the Swan River. The sandbar at Point Walter is one site they move to.

Table 2. Wader counts made at Alfred Cove from 2006-2009.

Species	Date	Year	13-Oct	10-Dec	18-Feb	8-Mar	9-Aug	21-Aug	3-Sep	11-Sep	17-Sep	3-Oct	16-Oct	1-Nov	11-Nov	24-Nov	3-Dec	10-Dec	25-Dec	20-Jan	29-Jan	17-Feb	24-Feb	15-Mar	30-Mar	11-Apr	29-Apr	21-Jun	6-Jul	6-Aug	15-Aug	23-Aug	3-Sep	9-Sep	16-Sep	23-Sep	7-Oct	12-Oct	25-Oct	2-Nov	23-Nov	6-Dec	13-Dec	27-Dec	3-Jan	11-Jan	18-Jan	26-Jan	4-Feb	15-Feb	25-Feb	6-Mar	14-Mar
Haematopodidae																																																				
Australian Pied Oystercatcher	*Haematopus longirostris*		P	P	70			7	15		8	8	17	25	26	37	49	45	49	79	57	62	50						1	7	4	19	1	31	28	16	4	8	20	34	62	9	57	79	28	55	48	5	73	51
Recurvirostridae																																																					
Black-winged Stilt	*Himantopus himantopus*				P	20	31	29	27	33	27	13	10	22	>24	39	33	34	53	28	32	27	35	48	23	12	14	25	27	1	4	14	12	11	4	1	7	14	14	61	55	42	36	32	27	16	31	18	13	4			
Red-necked Avocet	*Recurvirostra novaehollandiae*						41	28	20	24	11	19	28	10	19	9	34	25						15										1						13					10	3								
Banded Stilt	*Cladorhynchus leucocephalus*													5																																						
Charadriidae																																																				
Pacific Golden Plover	*Pluvialis fulva*		1	1	1	1						1	1				1	1	1	1	1	1	1		1												1																
Grey Plover	*Pluvialis squatarola*		27	23	17	10						6	16	17	19	16	18	17	13	23	22	17	21	22	18	3		3			1		4	10	9	15	13	13	14	8	16	19	11	16	10	13	12	13	12	15
Red-capped Plover	*Charadrius ruficapillus*											3	15	34	19	23	11	19	1	12																						3		2									
Scolopacidae																																																				
Black-tailed Godwit	*Limosa limosa*																																																			
Bar-tailed Godwit	*Limosa lapponica*		1	1	2						1	1	3	4	7	9	8	10	10	6	10	8	7	7												4				2		2	3	1	4	3	4	3	3		
Whimbrel	*Numenius phaeopus*		1	1	1	1											1	1	1			1	1	1																												
Terek Sandpiper	*Xenus cinereus*													1																																						
Grey-tailed Tattler	*Tringa brevipes*																2	2																		3																
Common Greenshank	*Tringa nebularia*				2	P	2		1	1	4	10	17	9	20	9	8	15	12	15	4	5	4	4	1					1	3	2	3	6	9	10	8	8	7	10	18	18	5	19	8	8	7	2			
Ruddy Turnstone	*Arenaria interpres*										1																																								
Great Knot	*Calidris tenuirostris*		7	3									3				2	2	2	1	1													1	2	1	3	3	4	6	6	7	5	8	8	6	2	2	2		
Red Knot	*Calidris canutus*													32	5	10	7	5	5	1																															
Red-necked Stint	*Calidris ruficollis*											3	8		9		11	8	79				1													1						1									
Sharp-tailed Sandpiper	*Calidris acuminata*																16																																		
Curlew Sandpiper	*Calidris ferruginea*												3				4																																		
Unidentified waders												2																																							
P=present																																																			
Total			**37**	**31**	**91**	**34**	**72**	**64**	**63**	**58**	**58**	**72**	**118**	**132**	**115**	**183**	**192**	**198**	**157**	**249**	**132**	**124**	**121**	**97**	**51**	**22**	**14**	**28**	**27**	**2**	**4**	**23**	**19**	**36**	**19**	**60**	**65**	**51**	**45**	**48**	**96**	**101**	**120**	**147**	**68**	**133**	**135**	**84**	**100**	**82**	**27**	**93**	**71**

the smaller wader species could access this location and be

Table 3. Comparison between the highest wader counts of 1981-1985 and 2006-2009.

Species		1981-1985	2006-2009	% decrease since 1981-85 (counts over 50)
Haematopodidae				
Australian Pied Oystercatcher	*Haematopus longirostris*	0	79	increased
Recurvirostridae				
Black-winged Stilt	*Himantopus himantopus*	146	61	42
Red-necked Avocet	*Recurvirostra novaehollandiae*	187	41	22
Banded Stilt	*Cladorhynchus leucocephalus*	16	5	
Charadriidae				
Pacific Golden Plover	*Pluvialis fulva*	2	1	
Grey Plover	*Pluvialis squatarola*	101	27	27
Red-capped Plover	*Charadrius ruficapillus*	250	34	14
Greater Sand Plover	*Charadrius leschenaultii*	1	0	
Black-fronted Dotterel	*Elseyornis melanops*	1	0	
Hooded Plover	*Thinornis rubricollis*	1	0	
Red-kneed Dotterel	*Erythrogonys cinctus*	30	0	
Banded Lapwing	*Vanellus tricolor*	2	0	
Scolopacidae				
Black-tailed Godwit	*Limosa limosa*	2	0	
Bar-tailed Godwit	*Limosa lapponica*	80	10	13
Whimbrel	*Numenius phaeopus*	0	1	
Eastern Curlew	*Numenius madagascariensis*	2	0	
Common Sandpiper	*Actitis hypoleucos*	6	0	
Terek Sandpiper	*Xenus cinereus*	2	1	
Grey -tailed Tattler	*Tringa brevipes*	2	3	
Common Greenshank	*Tringa nebularia*	19	20	
Marsh Sandpiper	*Tringa stagnatilis*	3	0	
Wood Sandpiper	*Tringa glareola*	4	0	
Ruddy Turnstone	*Arenaria interpres*	1	1	
Great Knot	*Calidris tenuirostris*	120	8	7
Red Knot	*Calidris canutus*	200	32	16
Sanderling	*Calidris alba*	1	0	0
Red-necked Stint	*Calidris ruficollis*	10000	79	1
Long-toed Stint	*Calidris subminuta*	1	0	0
Pectoral Sandpiper	*Calidris melanotos*	2	0	0
Sharp-tailed Sandpiper	*Calidris acuminata*	100	16	16
Curlew Sandpiper	*Calidris ferruginea*	1078	4	0
Broad-billed Sandpiper	*Limicola falcinellus*	1	0	0
Ruff	*Philomachus pugnax*	1	0	0

1981-1985 from Jaensch 1988.

DISCUSSION

The mudflats at Alfred Cove are still the most important wader site on the Swan River. Instead of hosting thousands of waders as in the past, these days the numbers are more likely to be less than 200. Furthermore a large percentage of the waders are endemic not migratory. This reflects a dramatic reduction in numbers over the past 20 years.

Over summer the water levels in the river drop due to a reduced inflow of water from the catchment areas and the mud flats become exposed at low tide. The increased availability of mud flats over the summer months coincides with the arrival and presence of migratory waders. It was only at low tides when the mud flats were fully exposed that counted. At high tide when the off shore islands were either partially or totally under water most medium and large size waders moved into the samphire wetlands to feed and roost. These were Whimbrel, Bar-tailed Godwit, Great Knot, Pacific Golden Plover, Grey Plover, Common Greenshank, Black-winged Stilt and Red-necked Avocet. The functionality of the mud flats differed between wader species in that for some it provided a permanent site throughout summer and for others it acted merely as a transitional stopover.

There are a number of factors that could have contributed to the decline in wader numbers. The health of the Swan River is under considerable pressure. The middle and upper basins of the river repeatedly fail to meet targets for

dissolved oxygen and Chlorophyll-a. These are key indicators for the health of a river system.

The Swan River is a shallow river system and has to contend with an inflow of fertilizer run-off which were blamed for the widespread algal blooms. More recently the blooms have been attributed to climate change. (West Australian 2008). The river does not get flushed out frequently enough to disperse the accumulation of nutrients due to reduced rainfall.

Acid sulfate is a natural but deadly part of the soil along the Swan River and is released when the ground close to the river is disturbed through residential and other developments. Acid sulfate leaches into the Swan River system and kills fish and prawn stocks. The once common bottom dwelling Western School Prawn *Metapenaeus dalli* have largely disappeared as have some fish species like Cobbler, *Cnigoglonis macrocephalus*.

How these factors impact on the health of the river's invertebrate population is unknown but it could well be a contributing factor that has resulted in reduced wader numbers. The soil substrate in the intertidal zone is the habitat for benthic fauna that are an important food source for waders.

Even when the mud flats were fully exposed and presented the best feeding opportunities for waders the numbers observed were low.

The management plan for the "Swan Estuary Marine Park and Adjacent Nature Reserves" 1999-2009 mentions damage done to the larger benthic fauna as a possible reason for the decline in waders. This may occur as a result of people trampling through the mud and sand flats. No groups of people were observed on the mudflats during the surveys.

Recreational pressures on the reserve caused by activities such as yachting, fishing, wind surfing, canoeing which often transgress the boundaries of the reserve could be a contributing factor. The installation of a low barrier fence to separate pedestrians and dogs from the roosting and feeding sites at Alfred Cove has proven most effective.

ACKNOWLEDGEMENTS

The late Peel Howden for his surveys in the eighties.

REFERENCES

Bamford, M. 1999. Movements of waders on the Swan Estuary. Western Australian Bird Notes. No. 89. March 1999, page 10–11.

Creed, K.E. & M. Bailey. 1998. Decline in migratory waders at Pelican Point, Swan River, Western Australia. Stilt 33: 10–14

Jaensch, R, Vervest, R, and M. Hewish 1988; Waterbirds in Nature Reserves of South-Western Australia 1981–1985: Reserve accounts. RAOU report No. 30.

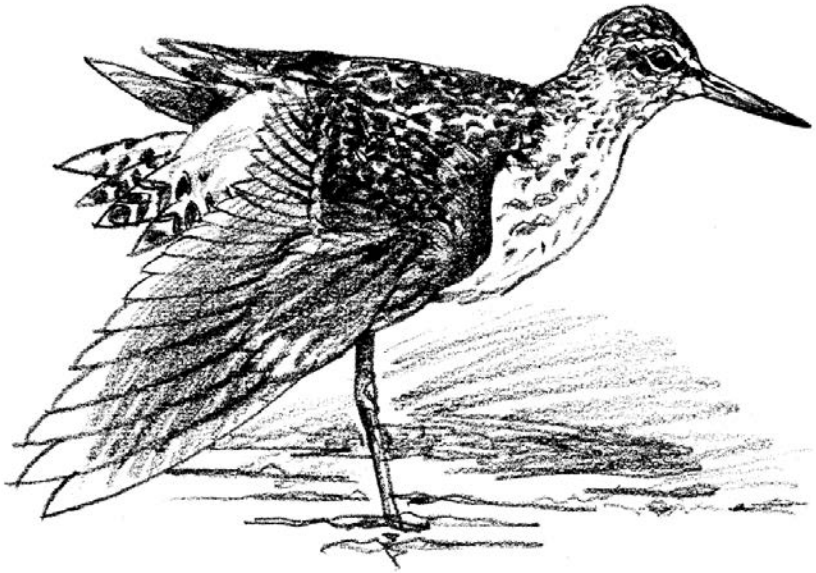
Keeling, S. 1982. A study of the Point Waylen – Alfred Cove Area. Western Australian Bird Notes No 23. September 1982

Keeling, S. 1987. Alfred Cove five years on. Western Australian Bird Notes No 43. September 1987 page 1–2.

Swan Estuary Marine Park and Adjacent Nature Reserves. Management Plan 1999–2009. No 41.

Department of Conservation and Land Management Perth. Western Australia, 1999.

West Australian Newspaper. 13 December 2008, Page 9. "Experts call on State to save ailing Swan River".



THE COASTAL ZONE OF ASAHAN REGENCY: AN AREA OF INTERNATIONAL IMPORTANCE FOR MIGRATORY WADERS IN NORTH SUMATRA PROVINCE, INDONESIA

ANDREW C CROSSLAND[1], SULE A. SINAMBELA[2], ANDY S. SITORUS[3] & ARI W. SITORUS[4]

[1]46 Frensham Crescent, Woolston, Christchurch 8023, New Zealand; Andrew.Crossland@ccc.govt.nz. [2] Jalan. Mual Nauli IV, No.16 Siopat Suhu, Pemantang Siantar, Sumatera Utara 21115, Indonesia. [3,4] Universitas Teknologi Yogyakarta, D.I. Yogyakarta, Java, Indonesia.

INTRODUCTION

The eastern coastline of Sumatra, Indonesia is known to support large concentrations of migratory waders (Van Marle & Voous 1988; MacKinnon & Phillipps 1993; Crossland *et al.* 2007). However, survey effort to date has been patchy - focusing mainly on the southern provinces of Riau, South Sumatra, Jambi and Lampung (Silvius 1986, 1988; Danielsen & Skov 1989: Verheught *et al.* 1990, 1993), with very limited coverage north of the equator (Crossland 2000; Crossland & Sinambela 2005; Crossland *et al.* 2007). This paper attempts to fill part of the gap by reporting on several exploratory wader surveys carried out between 1995 and 2006 in the Asahan Regency, North Sumatra Province.

STUDY AREA AND METHODS

The Asahan Regency (pop. c.940,000) has a land area of 4581 km² and is located in the central part of the east coast of North Sumatra Province (see Figure 1). The district is largely rural with the principal land uses being oil palm and rubber plantations inland, with coconut groves and aquaculture ponds near the sea. The main population centres are the small cities of Kisaran (the administrative centre) and Tanjung Balai Asahan (the principal port) with several large towns, including the river mouth fishing ports of Bagan Asahan, Tanjung Tiram, Labuhan Ruku and Kuala Tanjung.
At the start of our observations in 1995, much of the Asahan Regency's coastline length of approximately 120 km was characterised by wide areas of mangrove forest or nipah palm swampland (Whitten *et al.* 2000), bordered by an almost continuous band of inter-tidal mudflats (from 20m to 1000+m in width). By 2006, the recent construction of aquaculture ponds (where all but a narrow band of mangrove or coastal swampland is removed) occupied c.37 km (or 30.8%) of the district's shoreline (as measured from satellite imagery made available on Google earth). Areas where extensive mangrove or nipah swampland still remain, and where disturbance and hunting impacts on coastal wetland birds are still relatively low, include a large area around the Sungai Padang river delta (3° 28' N, 99° 17'E); the area around the Sungai Gambus river mouth (3° 19'N, 99° 29' E); and extensive areas east and west of the Sungai Asahan river mouth (3°01'N, 99° 52'E).

Access to much of the Asahan coastline is difficult, requiring use of a boat or the crossing of private land and hazardous navigation on foot through the mangrove forest and/or nipah swamp zones. However at several localities access to the shore is possible from harbour facilities, roads or public recreation lands. We were able to undertake wader surveys from land and from boats at four coastal sites (Sungai Asahan river mouth, West Pantai Sejara, Pantai Sejara and West Tanjung Tiram), covering in total about 16 km of shoreline; at a river confluence (Sungai Asahan/Sungai Silau) c.14 km upstream of the sea; and at a marshland/rice paddy area (Batu Lima) c.13 km inland from the coast. Survey methods follow those recommended in Howes & Bakewell (1989). Wader and tern counts were carefully made with 25x60 spotting scope and 10x binoculars. Where possible, birds were counted individually, but large flocks were block counted in multiples of 10. Flocks observed at a distance were block-counted in multiples of 50.

RESULTS

Sungai Asahan River Mouth (3°01'N, 99°52'E)

This site was visited 6 times between December 1995 and September 2006. Waders and terns were counted along 1 km of shoreline on the western side of the river mouth and c.3 km on the eastern. Most surveys were made from the wharf at Bagan Asahan on the western side where birds feeding or roosting on the opposite shore (1 - 3 km distant) could be block counted en masse but not identified to individual species. Surveys on 19 December 1995 and 25 September 2005 were made on the eastern side (after crossing the river mouth by boat), enabling accurate counts of many species.

Counts in September 2005 and 2006 (southward migration period) found 6500 to 8200 waders and up to 1380 terns (see Table 1). Numbers observed on other dates were much lower with 716+ waders recorded in December 1995, 505+ in March 2002, and none in late April 2001. Although no species was recorded in numbers of international importance, counts of 160 Asian Dowitcher and 405 Whimbrel on 25 September 2005 are notable concentrations of these species for Sumatra (Crossland *et al.* 2006).

West Pantai Sejara (3° 17'N, 99° 30'E), **Pantai Sejara** (3° 15'N, 99° 32'E) and **West Tanjung Tiram** (3°14'N, 99°33')

These sites comprise three shorebird roosting areas along c.12 km of coastline, and were surveyed on 28 March 2002. The roosts were spaced along a continuous band of inter-tidal mudflats ranging in width from 30m to 200m at low tide. The mudflats were backed by mangroves in places and elsewhere by a narrow sandy beach with groves of coconut palms or casuarina pines behind. The roost at Pantai Sejara was located amongst mangroves at the western end of a public recreation beach. The roost at West Pantai Sejara was located at the second small river mouth (name unknown)

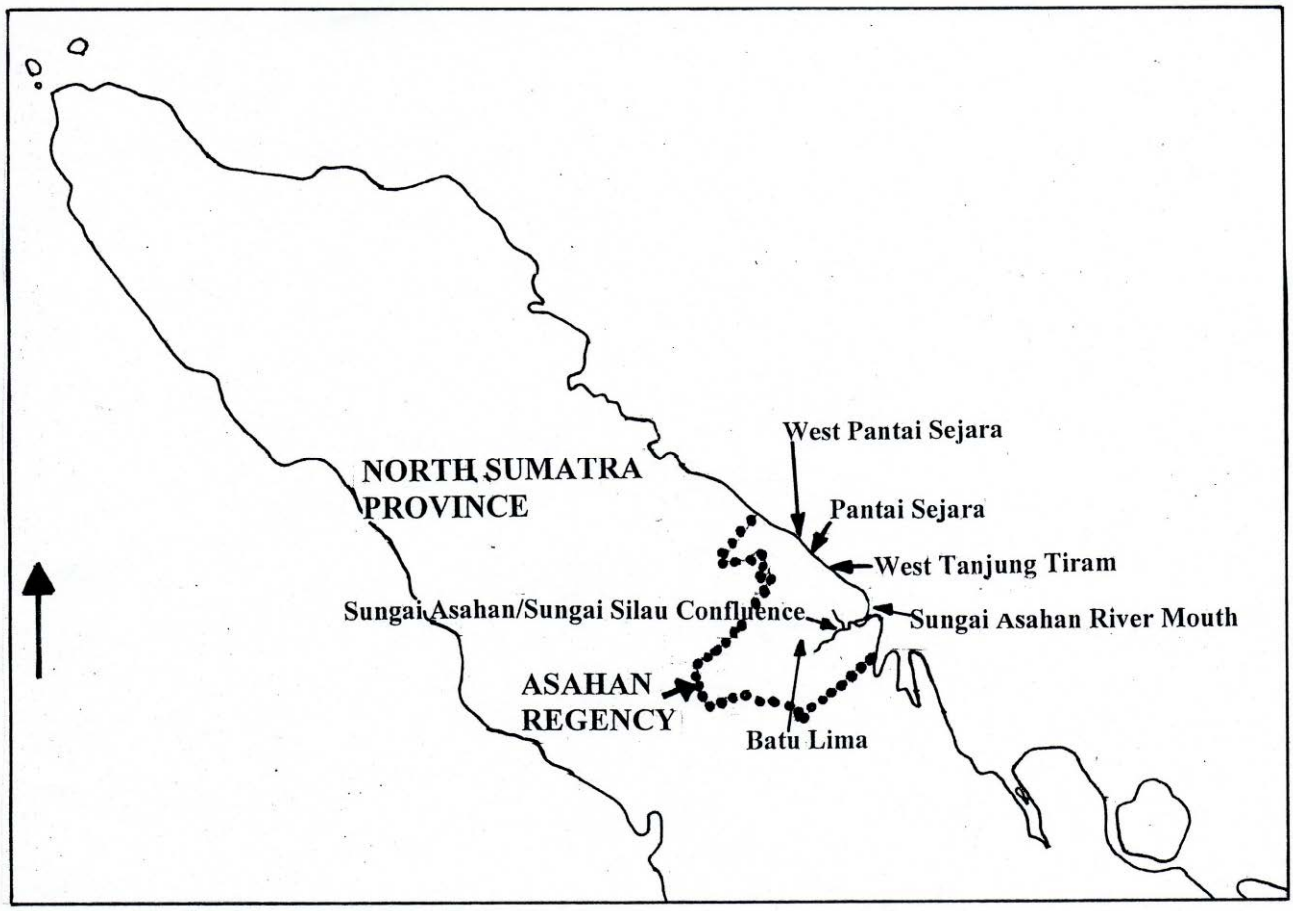


Figure 1. Map of Sumatra showing Asahan Regency and sites mentioned in text

north-west of Pantai Sejara and south-east of the mouth of the larger Sungai Gambus River. Birds at West Tanjung Tiram congregated on the upper beach for most of the incoming tide before being forced inland when the roost became awash at the top of high tide.

Wader flocks at the three sites were derived from low tide feeding congregations adjacent to and within about 3 km of each roost. No interchange of birds was observed between roosts over the high tide period. More than two hours were spent over the latter stages of the incoming tide at Pantai Sejara, carefully counting and re-counting roosting flocks until the addition of late arrivals ceased. One hour was spent counting birds at West Tanjung Tiram as the tide peaked and forced birds off the beach and into aquaculture ponds a short distance inland. Full counts were made at Pantai Sejara and West Tanjung Tiram, while numbers at West Pantai Sejara were estimated through spotting scope at a distance of c.3 km.

A minimum of 22,421 waders were recorded at these three sites, including 15,229 birds at Pantai Sejara, 2192 at West Tanjung Tiram and an estimated 5000+ at West Pantai Sejara (see Table 2). Very large numbers of Asian Dowitcher (7957+) were recorded, as well as notable concentrations of Black-tailed Godwit (4469+), Common Redshank (1256+), Lesser Sand Plover (1520+) and Curlew Sandpiper (546+). Given the presumed small global population of Asian Dowitcher and the international conservation interest in this species (Silvius 1988; Milton 2003; Wetlands International 2006), the two large roosting flocks were meticulously counted from a distance of 40m to confirm numbers. The roost of 6970 Asian Dowitcher at Pantai Sejara is one the largest flocks recorded to date - second only to a flock of 12,000 recorded near Teluk Gelas, South Sumatra Province on 1 November 1988 (Verheught *et al.* 1993).

Sungai Asahan/Sungai Silau Confluence (2°58'N, 99°48'E)

Small sand bars at the confluence of the Asahan and Silau rivers (adjacent to the city of Tanjung Balai Asahan) held a small assemblage of migratory waders and terns on 13 December 1995 (see Table 3). Several years later the confluence was dredged with a considerable volume of river sand taken for nearby land reclamation. Subsequent visits in September 2005 and September 2006 found that the original sand bars had almost completely disappeared and no waders or terns present.

Batu Lima (2°56'N, 99°45'E)

In March 2002 the Batu Lima area, c.13 km inland on the outskirts of Tanjung Balai Asahan, comprised 400+ ha of wet rice paddy and freshwater marshland. The area was said by locals to support hundreds of Lesser Whistling-duck *Dendrocygna javanica*, which arrive to feed at dusk, as well as egrets, bitterns, rails and storks. The area was found to also hold waders, notably snipe (see Table 4). Within a

Table 1. Counts of migratory waders and terns at Sungai Asahan River mouth

Species		**19/12/95**	**21/04/01**	**28/3/02**	**16/9/05**	**25/9/05**	**2/9/06**
Lesser Sand Plover	*Charadrius mongolus*					480	
Black-tailed Godwit	*Limosa limosa*					2	
Bar-tailed Godwit	*Limosa lapponica*					125	
Whimbrel	*Numenius phaeopus*	2				405	
Eurasian Curlew	*Numenius arquata*	56		2		117	40
Eastern Curlew	*Numenius madagascariensis*	2				2	
Terek Sandpiper	*Xenus cincereus*	12					
Common Sandpiper	*Actitis hypoleucos*	40		3		1	
Common Greenshank	*Tringa nebularia*	8					
Common Redshank	*Tringa tetanus*	170				220	
Asian Dowitcher	*Limnodromus semipalmatus*					160	
Great Knot	*Calidris tenuirostris*	20				2	
unidentified waders		400+		500+	8200+	5000+	7300+
Total Waders		**716+**	**0**	**505+**	**8200+**	**6514+**	**7340+**
Gull-billed Tern	*Sterna nilotica*	6					
Common Tern	*S. hirundo*					7	
Little Tern	*S. albifrons*		1			407	
Whiskered Tern	*Childonias hybrida*					322	
White-winged Tern	*C. leucopterus*		4			646	
combined terns		520					
Total terns		**526**	**5**	**nc**	**nc**	**1382**	**nc**

Table 2. Counts of migratory waders and terns at West Pantai Sejara, Pantai Sejara and West Tanjung Tiram, 28 March 2002.

Species		**W. Pantai Sejara**	**Pantai Sejara**	**W. Tanjung Tiram**	**Total**
Grey Plover	*Pluvialis squatarola*		79	16	163
Lesser Sand Plover	*Charadrius mongolus*		1340	180	1520
Greater Sand Plover	*C. leschenaultii*		87	-	87
Black-tailed Godwit	*Limosa limosa*		3780	689	4469
Bar-tailed Godwit	*L. lapponica*		7	11	18
Whimbrel	*Numenius phaeopus*		2	3	5
Eurasian Curlew	*N. arquata*		16	20	36
Eastern Curlew	*N. madagascariensis*			1	1
Terek Sandpiper	*Xenus cincereus*		192	62	254
Common Sandpiper	*Actitis hypoleucos*		2	3	5
Common Greenshank	*T. nebularia*		3	2	5
Marsh Sandpiper	*T. stagnatilis*		236		236
Common Redshank	*Tringa tetanus*		1210	46	1256
Ruddy Turnstone	*Arenaria interpres*		167	57	224
Asian Dowitcher	*Limnodromus semipalmatus*		6970	987	7957
Great Knot	*Calidris tenuirostris*		380		380
Red-necked Stint	*C. ruficollis*		325		325
Curlew Sandpiper	*C. ferruginea*		432	114	546
Unidentified waders		5000+			5000+
Total waders		**5000+**	**15229**	**2192**	**22421+**
Little Tern	*Sternula albifrons*		46	7	53
Gull-billed Tern	*Gelochelidon nilotica*		34	30	64
Whiskered Tern	*Chlidonias hybrida*		27	2	29
White-winged Black Tern	*Chlidonias leucopterus*		166	134	300
Total terns		**NC**	**273**	**173**	**446**

sampled area of c.50 ha, some 20 birds were flushed or observed feeding on the edge of open muddy areas in the rice paddies; six were seen at the marshy edge of a pond (along with a single Asian Painted-snipe); and 24 were foraging in rice nursery areas, characterised by open muddy patches between dense stands of young rice plants. During the late afternoon snipe were constantly seen on the wing, moving from one habitat patch to another. If snipe densities across the whole 400+ ha of wetland/ricefield habitat were similar to the area sampled, it is likely that the site held upwards of 160 birds.

More than 20 birds were seen closely under good light conditions. Although Pintail Snipe *Gallinago stenura* and Swinhoe's Snipe *Gallinago megala* are said to be indistinguishable in the field (Leader & Carey 2003), the direct comparison of body size, head shape, bill-length, relative length of tail and closed wing, extent of leg projection beyond the tail in flight, head markings and flight

Table 3. Counts of migratory waders and terns at Sungai Asahan/Sungai Silau Confluence

Species		**13/12/95**
Lesser Sand Plover	*Charadrius mongolus*	13
Common Sandpiper	*Actitis hypoleucos*	37
total waders		**50**
White-winged Black Tern	*Chlidonias leucopterus*	22

Table 4. Counts of migratory waders at Batu Lima

Species		**27/3/02**	**16/9/05**
Pintail/Swinhoe's Snipe	*Gallinago sp*	50+	
Common Sandpiper	*Actitis hypoleucos*	2	0
Asian Painted-snipe	*Rostratula benghalensis*	1	0
Total waders		**53+**	**0**

calls, strongly suggest that both species were present. Pintail Snipe is the common migratory snipe of Sumatra, with Swinhoe's not previously recorded, although Van Marle & Voous (1988) suggested that it has probably been overlooked. No birds identifiable as Common Snipe *Gallinago gallinago* were seen, although the range of this species also includes Sumatra (McKinnon & Phillipps 1993) and all three species can occur side by side in nearby Singapore (AC pers. obs.).

A second visit to Batu Lima on 16 September 2005 took place during a period of dry weather. In contrast to March 2002 the site was very dry and many former muddy or rice cultivated patches were overgrown with tall grass. No waders were seen.

DISCUSSION

With c.22,400 waders and c.450 terns recorded from the Pantai Sejara, West Pantai Sejara and West Tanjung Tiram area, and up 8200 waders and c.1380 terns at the Sungai Asahan river mouth, the Asahan Regency clearly supports a large and diverse shorebird population. The 16 km of coastal habitats surveyed held upwards of 32,000 birds yet represents less than 14% of the district's coastline. Given that much of the remaining un-surveyed area also comprises inter-tidal mudflats and coastal wetlands, we predict that during peak migration periods the entire Asahan coastline is likely to support upwards of 100,000 waders and terns. Formal surveys with better logistical support (boats and ideally, aircraft) would be necessary to confirm this.

Currently our survey data show that 4 migratory wader species (Lesser Sand Plover, Asian Dowitcher, Black-tailed Godwit and Common Redshank) occur in concentrations exceeding 1% of the estimated East Asian -Australasian Flyway populations (Bamford *et al.* 2008) (see Table 5). When further counts are made and the composition of shorebird flocks at West Pantai Sejara, Sungai Asahan and other sites yet to be surveyed become known, it is likely that additional species will be added to the list. Likely candidates include Pintail Snipe and Ruddy Turnstone which are both already close to the 1% threshold levels.

The large numbers of Asian Dowitcher counted (7957 at Pantai Sejara and West Tanjung Tiram on 28 March 2002 and 160 at Sungai Asahan river mouth on 25 September 2005) account for about a third of the current estimated flyway and global population (Wetlands International 2006; Bamford *et al.* 2008). We note however, that the global population estimates were made prior to notification of the flocks reported in this paper, so the true significance of these newly discovered concentrations are somewhat less than the current percentage figure would suggest. A reassessment of the flyway and global populations of Asian Dowitcher in light of recent survey activity in Sumatra and elsewhere is now needed.

Besides large numbers of migratory shorebirds, the Asahan coastal zone also supports sizeable populations of egrets as well as small numbers of the globally threatened Milky Stork *Mycteria cinerea* and Lesser Adjutant *Leptoptilos javanicus*. Unfortunately, none of the sites covered in this paper fall within currently protected areas and the ecological values of the Asahan Regency coastline remain poorly known. Hopefully this paper will stimulate further research which may in turn act as a catalyst for the eventual establishment of a reserve network to protect key shorebird roosting and feeding areas in the area.

ACKNOWLEDGEMENTS

We wish to offer sincere thanks to Pieter Momor (TNI-AL) who gave permission for our boat survey at the Sungai Asahan river mouth in December 1995, and to Alam Ros (KPLP) for arrangement of a boat and who accompanied us in the same area in September 2005. We also thank the village heads in Batu Lima and Pantai Sejara for permission to visit their local areas and undertake the very strange activity of counting birds!

REFERENCES

Bamford, M., D. Watkins, W. Bancroft, G. Tischler, & J. Wahl. 2008. Migratory Shorebirds of the East Asian-Australasian Flyway: Population Estimates and Internationally Important Sites. Wetlands International – Oceania.

Bishop, K.D. 2006. Shorebirds in New Guinea: Their status, conservation and distribution. Stilt 50: 103–134.

Crossland, A.C. 2000. Notes on the waders wintering at three sites at the north-western tip of Sumatra, Indonesia. Stilt 36: 4–6.

Table 5. Wader species occurring in numbers of International Significance on the coastal zone of Asahan Regency

Species		**count**	**1% of flyway**	**% of flyway criterion**	**Site pop present**
Lesser Sand Plover	*Charadrius mongolus*	1520	1400	1.09	Pantai Sejara-West Tg. Tiram
Black-tailed Godwit	*Limosa limosa*	4469	1600	2.8	Pantai Sejara-West Tg. Tiram
Common Redshank	*Tringa tetanus*	1256	750	1.7	Pantai Sejara-West Tg. Tiram
Asian Dowitcher	*Limnodromus semipalmatus*	7957	240	33.2	Pantai Sejara-West Tg. Tiram

Crossland, A.C. & S.A. Sinambela. 2005. An initial assessment of the migratory wader community found on Batam Island, Riau Archipelago, Western Indonesia. Stilt 48: 19–21.

Crossland, A.C., S.A. Sinambela, A.S. Sitorus & A.W. Sitorus. 2007. An overview of the status and abundance of migratory waders in Sumatra, Indonesia. The 50: 90–95.

Danielsen, F. & H. Skov. 1989. The Importance of south-east Sumatra as a summering area for non-breeding waders, especially the Bar-tailed Godwit Limosa Lapponica. Stilt 14: 40–42.

Delaney, S. & D. Scott. 2006. Waterbird Population Estimates – Fourth Edition. Wetlands International, Wageningen, The Netherlands.

Howes, J. & D. Bakewell. 1989. Shorebird Studies Manual. Asian Wetland Bureau Publication No.55, Kuala Lumpur.

Leader, P.J. & G.J. Carey. 2003. Identification of Pintail Snipe and Swinhoe's Snipe. British Birds 96: 178–198.

McKinnon, J. & K. Phillipps. 1993. A Field Guide To The Birds of Borneo, Sumatra, Java, and Bali: The Greater Sunda Islands. Oxford University Press. Oxford.

Milton, D. 2003. Threatened shorebird species of the East Asian-Australasian Flyway: significance for Australian wader study groups. Wader Study Group Bulletin 100: 105–110.

Silvius, M.J. 1986. Survey of Coastal Wetlands in Sumatra Selantan and Jambi, Indonesia. PHPA-INTERWADER Report No.1, Kuala Lumpur.

Silvius, M.J. 1988. On the importance of Sumatra's east coast for waterbirds with notes on the Asian Dowitcher Limnodromus semipalmatus. Kukila 3: 117–137.

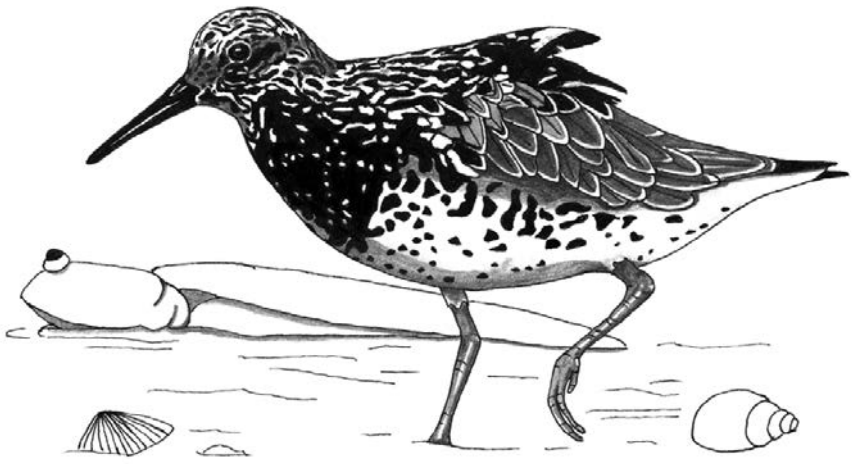
Van Marle, J.C. & K.H. Voous 1988. The birds of Sumatra: an annotated checklist. B.O.U. Checklist No.10. British Ornithologist's Union, Tring.

Verheught, W.J.M., F. Danielsen, H. Skov, A. Purwoko, R. Kadarisman & U. Suwarman. 1990. Seasonal variations in the wader populations of the Banyuasin Delta, South Sumatra, Indonesia. Wader Study Group Bull. 58: 28–35.

Verheught, W.J.M., Skov, H. & F. Danielseon. 1993. Notes on the birds of the tidal lowlands and floodplains of South Sumatra Province, Indonesia. Kukila 6: 53–84.

Wetlands International. 2006. Waterbird Population Estimates - fourth edition. Wetlands International, Wageningen, The Netherlands.

Whitten, T., S.J. Damanik, J. Anwar & N. Hisyam. 2000. The Ecology of Sumatra. Periplus Editions, Singapore.



PASSAGE OF RED KNOT *CALIDRIS CANUTUS* THROUGH NORTH SUMATRA PROVINCE, INDONESIA

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

[1] 46 Frensham Crescent, Woolston, Christchurch 8023, New Zealand, Andrew.Crossland@ccc.govt.nz; [2] Jalan. Mual Nauli IV, No.16 Siopat Suhu, Pemantang Siantar, Sumatera Utara 21115, Indonesia.

INTRODUCTION

Within the East Asian-Australasian Flyway the Red Knot Calidris cautus is a long distant migrant with an estimated population of 220 000 birds. Two races occur with C. c. piersma breeding in the New Siberian Archipelago and wintering mainly in eastern Australia and New Zealand; and C. c. rogersi breeding in the Chukotsky Peninsula of north-eastern Siberia and wintering in New Guinea, Australia and New Zealand (Delaney & Scott 2006). During the non-breeding period some 93% of the combined flyway population are thought to occur in Australia (135,000 birds) and New Zealand (68,000 birds) with much smaller numbers elsewhere, including an estimated 5000 birds in Indonesia (Bamford et al. 2008).

Lane (1987) reasoned that the Red Knot's general rarity in East Asia suggests that it has few stopover sites in the region and that most of these were yet to be found. Subsequent studies discovered that the southward and northward migration routes are substantially different - the southbound route passing over the western Pacific Ocean while the northbound route apparently passes along the East Asian coastline (Higgins & Davies 1996, Bamford et al. 2008).

Unlike neighbouring countries such as Australia, Malaysia and Thailand, knowledge of shorebird distribution in Indonesia remains piecemeal with large areas of potentially suitable coastal habitat still to be surveyed (Crossland & Sinambela 2005, Crossland et al. 2006). The distribution of Red Knot is poorly understood and important sites may yet be found, but current information suggests that the species is a very scarce but widely occurring passage migrant in much of the archipelago (MacKinnon & Phillipps 1993, Jepson & Ounsted 1997, Strange 2001). Based on current knowledge, the only region of Indonesia where large numbers of Red Knot are likely to occur is West Papua (formerly known as Irian Jaya). Although rare in most of Papua New Guinea (Bishop 2006), sizeable flocks have been reported from the Trans-Fly region in the south-west (adjacent to West Papua), particularly during the northern migration period (Hoogerwerf 1964).

Van Marle and Voous (1988) in their checklist of Sumatran birds classified Red Knot as an uncommon winter visitor or non-breeding summer visitor on the strength of three documented records prior to the mid 1980s. Subsequent reports of Red Knot in Sumatra are scarce but include 5 birds in the Sungai Apung - Sungai Dinding area, Riau Province in 1985 (Silvius 1986); totals of 299 in Jambi and 5 in South Sumatra amongst 150,000 waders counted along the shorelines of three south-eastern provinces in March-April 1986 with no records on the same coastline in October-November 1984 or July-August 1985 (Silvius 1988); and 70 birds in August 1988 at the Banyuasin Delta, South Sumatra Province (Verheught et al. 1990). This latter record was the only observation of Red Knot in 13 months of surveys (August 1988 to August 1989) which recorded up to 78,500 shorebirds along a 50 km stretch of coastline.

METHODS

Between 1995 and 2006 we made many visits to coastal shorebird habitats along the eastern coastline of North Sumatra Province, principally in the c.180 km stretch of coastline between Belawan in the north and the Asahan Rivermouth in the south. We made observations of shorebird flocks in all months of the year except June and July, and here we publish our observations of Red Knot on passage through the region during both northward and southward migration.

RESULTS

Tens of thousands of migratory waders of 26 species were observed on the coastline of North Sumatra (Crossland et al. in prep.). Most species occurred throughout the southward (August-October) and northward (March-May) migration periods as well as during the Northern Hemisphere winter (November-February). Red Knot were not recorded during any winter month. Of 20+ sites visited during migration periods, Red Knots were observed at three - Bagan Percut, Bagan Serdang and Pantai Labu.

Bagan Percut (3°43'N, 98°47'E)

No Red Knot were observed in November or December 1995. During five months of observations in 1997, none were seen between late January and mid March, but an influx occurred shortly after 25 March with 281 counted on 31 March. Most were in full breeding plumage and all fed busily over an extended part of the tidal cycle, long after most other wader species had ceased feeding and gathered at staging roosts. They were clearly new arrivals. Red Knot numbers increased through April 1997 to peak at 400+ birds on 14 April. Numbers then dropped quickly and all had gone by 12 May.

13 Red Knot were observed on 27 September 2005. None were observed on 8 October 2005.

Bagan Serdang (3° 42'N, 98° 50'E)

This site is located 6.5 km south-east of Bagan Percut and is the principal roost for a separate population of waders that feed to the south. We observed 120+ Red Knot here on 23

April 1997 and consider these to be different birds to those seen at Bagan Percut during the same period.

Pantai Labu (3°40'N, 98°54'E)

This site is 7.5 km south-east of Bagan Serdang. We counted 58 Red Knot at Pantai Labu on 2 October 2005. None were recorded on a subsequent visit on 7 September 2006.

DISCUSSION

Red Knot on northward passage

Our counts from the Bagan Percut/Bagan Serdang area suggest that high hundreds of Red Knot passed through this section of coastline between late March and early May 1997. This is the same time of year as the only other sizeable flock reported from Sumatra (299 in Jambi in March-April 1986) and is consistent with the northbound migration route through East Asia as described by Higgins & Davies (1996) and Bamford et al. (2008). This congregation of Red Knot in North Sumatra is much larger than has been hitherto reported from Sumatra and is comparable to the 600-800 national population for the whole of nearby Malaysia (Li et al. 2006; Li et al. 2007).

Red Knot on southward passage

The date of our autumn sightings of Red Knot at Bagan Percut (27 September) and Pantai Labu (2 October) and the 1988 Banyuasin Delta record (1 August) indicate that Red Knot also pass through Sumatra during the southward migration period - although apparently in much smaller numbers than occur on northward passage. This seems to be a similar pattern to that observed across the Straits of Malacca in Malaysia, where 348 were counted on national shorebird surveys in the northward migration period of March to May 2005, but none were recorded during the southward migration from August to October in the same year (Li et al. 2007). Many Red Knot are thought to make a non-stop migration from the Sea of Okhotsk to the coasts of northern Australia (Minton et al. 2006). This would explain their rarity on southern migration in Sumatra and nearby Peninsula Malaysia.

Red Knot over-wintering

We have not observed Red Knot during winter in North Sumatra Province and we are not aware of any published records of the species over-wintering elsewhere on the island. On the basis of current knowledge, it seems the Red Knots transit through Sumatra but do not winter there.

Where do Sumatran Knots spend the Northern winter?

With the current absence of band resightings we can only speculate, but the most logical winter destination for Red Knot transiting through Sumatra would seem to be Australia. There are no known wintering concentrations in Sumatra (Crossland et al. 2006) and the species is a rare passage migrant or vagrant in other regions of Indonesia (MacKinnon 1990; Strange 2001; Jepson & Ounsted 1997). The nearest sizeable winter concentrations occur in North-West Australia – at Roebuck Bay and 90 Mile Beach (both c.3540 km SE of our study area).

We offer the hypothesis that some Red Knot flying from Australia to the Yellow Sea fall out of migration and divert to the rich feeding grounds of north-eastern Sumatra for a brief refuel before continuing northwards. A “boomerang route” from NW Australia to the Yellow Sea via NE Sumatra totals c.7920 km, about 1600 km longer than the direct route. Although a much greater distance, this route may enable birds in less than peak condition or birds that encounter adverse weather to make the journey in two manageable stages – an initial flight of c.3540 km (NW Australia to NE Sumatra) and a subsequent flight of c.4380 km (NE Sumatra to the major Red Knot staging area at Bo Hai Wan in the northern Yellow Sea).

ACKNOWLEDGEMENTS

We would like to thank Phil Battley and Scott Butcher for comments and suggested improvements to earlier drafts of this paper.

REFERENCES

Bamford, M., D. Watkins, W. Bancroft, G. Tischler, & J. Wahl. 2008. Migratory Shorebirds of the East Asian-Australasian Flyway: Population Estimates and Internationally Important Sites. Wetlands International – Oceania.

Bishop, K.D. 2006. Shorebirds in New Guinea: Their status, conservation and distribution. Stilt 50: 103–134.

Crossland, A.C. & S.A. Sinambela. 2005. An initial assessment of the migratory wader community found on Batam Island, Riau Archipelago, Western Indonesia. Stilt 48: 19–21.

Crossland, A.C. & S.A. Sinambela, A.S. Sitorus, & A.W. Sitorus. 2006. An overview of the status and abundance of migratory waders in Sumatra, Indonesia. Stilt 50: 90–95.

Delaney, S. & D. Scott. 2006. Waterbird Population Estimates - Fourth Edition. Wetlands International, Wageningen, The Netherlands.

Higgins, P.J. & S.J.J.F. Davies (Eds.). 1996. Handbook of Australian, New Zealand and Antarctic Birds. Volume 3: Snipe to Pigeons. Oxford University Press, Melbourne.

Hoogerwerf, A. 1964. On birds new for New Guinea or with a larger range than previously known. Bull. Br. Orn. Club. 84: 70–77, 94–96, 118–124, 142–148, 153–161.

Jepson, P. & R. Ounsted. 1997. Birding Indonesia: A Bird-watcher's Guide to the World's Largest Archipelago. Periplus Editions, Singapore.

Lane, B. 1987. Shorebirds in Australia. RAOU. Nelson Publishers, Melbourne.

Li, Z.W.D., C.A. Yeap, K.C. Lim, K. Kumar, A.T. Lim, C. Yang & W.M. Choy. 2006. Shorebird surveys of the Malaysian coast November 2004–April 2005. Stilt 49: 7–18.

Li, Z.W.D., C.K. Yeap & K. Kumar. 2007. Surveys of coastal waterbirds and wetlands in Malaysia, 2004–2006. In: Li, Z.W.D and Ounsted, R. (eds.). 2007. The status of Coastal Waterbirds and Wetlands in Southeast Asia: Results of Waterbird Surveys in Malaysia (2004–2006) and Thailand and Myanmar (2006). pp. 1–40. Wetlands International, Kuala Lumpur, Malaysia.

MacKinnon, J. 1990. Panduan Lapangan Pengenalan Burung-burung di Jawa dan Bali. Gadjah Mada University Press, Yogyakarta.

MacKinnon, J. & K. Phillipps. 1993. A Field Guide to the Birds of Borneo, Sumatra, Java and Bali. Oxford University Press, London.

Minton, C., J. Wahl, R. Jessop, C. Hassell, P. Collins & H. Gibbs. 2006. Migration routes of waders which spend the non-breeding season in Australia. Stilt 50: 135–157.

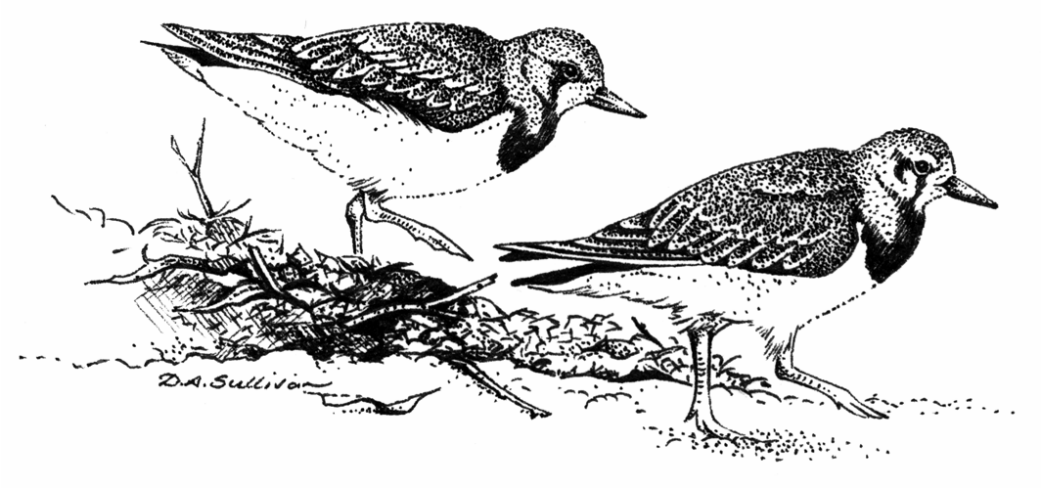
Silvius, M.J. 1986. Survey of coastal wetlands in Sumatra Selatan and Jambi. PHPA Interwader Report No.1. Kuala Lumpur.

Silvius, M.J. 1988. On the importance of Sumatra's east coast for waterbirds with notes on the Asian Dowitcher Limnodromus semipalmatus. Kukila 3: 117–137.

Strange, M. 2001. A Photographic Guide to the Birds of Indonesia . Periplus Editions, Singapore.

Van Marle, J.C., & K.H. Voous. 1988. The birds of Sumatra: an annotated checklist. B.O.U. Checklist No.10. British Ornithologist's Union, Tring.

Verheught, W.J.M., F. Danielsen, H. Skov, A. Purwoko, R. Kadarisman & U. Suwarman. 1990. Seasonal variations in the wader populations of the Banyuasin Delta, South Sumatra, Indonesia. Wader Study Group Bull. 58: 28–35.



MONTHLY ABUNDANCE OF EASTERN BAR-TAILED GODWIT *LIMOSA LAPPONICA BAUERI* IN CENTRAL CANTERBURY, SOUTH ISLAND, NEW ZEALAND

ANDREW C. CROSSLAND

Regional Parks Team, Transport & Greenspace Unit, City Environment Group, Christchurch City Council, P.O. Box 237, Christchurch, New Zealand, Andrew.crossland@ccc.govt.nz

INTRODUCTION

The Eastern Bar-tailed Godwit *Limosa lapponica baueri* breeds in Alaska and migrates mainly to New Zealand and eastern Australia where it spends the austral summer on inter-tidal mudflats and coastal wetlands. Recent satellite-tracking studies have confirmed that the Eastern Bar-tailed Godwit is arguably the World's greatest migratory shorebird in terms of endurance flight, flying a round-trip migration of around 30,000 km, including an 11,000+ km non-stop flight across the Pacific, performed in as little as 8 days (Gill *et al.* 2008).

The islands of New Zealand form part of the southern terminus for the migrations of the Eastern Bar-tailed Godwit and several other shorebird species using the East Asian-Australasian Flyway (Melville & Battley 2006). Regular counts of shorebirds in terminus areas are the most practical way of monitoring the health of flyway populations (Wilson 2001; Gosbell & Clemens 2006; Melville & Battley 2006). In New Zealand a structured monitoring programme was set up in 1983 with the advent of the "National Wader Count", a nation-wide census carried out by members of the Ornithological Society of New Zealand (OSNZ). This usually takes place in June-July (winter) and November - early December (spring) each year, although over the last three years, an additional February (late summer) census has been trialled. The results of counts from the period 1983 to 1994 were published in Sagar *et al.* (1999), while a report on more recent counts is due for publication shortly (Southey in prep.).

Recently there has been some debate amongst New Zealand shorebird experts as to whether November is the best month for the spring national wader count. This month was chosen in the early 1980s, based on a series of counts at two major sites in the Auckland Region, North Island. These counts indicated that numbers at these two sites were most stable during November. After more than 20 years of monitoring it now seems clear that not all regions experience peaks in November and there is a suspicion that some inbound migrants transit through Australia and may be arriving in New Zealand during December or later (Riegen 2000; Minton *et al.* 2006), and are therefore missed by the November counts. Besides these technical issues there is also the "synchrony problem" of New Zealand's national shorebird census not currently aligning with those of other countries on the Flyway. Australia's summer census is conducted in January and February (Gosbell & Clemens 2006), while most other countries undertake shorebird counts in mid January as part of the Asian Waterbird Census, co-ordinated by Wetlands International (Li & Mundkur 2004).

The purpose of this paper is to cast some constructive light on the relative abundance of Bar-tailed Godwits throughout the course of the year by focusing on a discrete region within New Zealand, monitoring local distribution and distinguishing the intra-regional circulation of birds from genuine inward and outward movements.

STUDY AREA

The Central Canterbury region, located on the east coast of the South Island between latitudes 43° 15' and 43° 51' S, forms one of about ten core areas for migratory shorebirds in New Zealand. This area comprises approximately 15 coastal shorebird habitats, of which 6 (Ashley-Saltwater Creek Estuary, Brooklands Lagoon, Avon-Heathcote Estuary, Upper Lyttelton Harbour, Lake Forsyth and Lake Ellesmere) regularly hold Bar-tailed Godwits (see Figure 1).

The Central Canterbury region constitutes a "closed system" as defined by Wilson (2001) and consists of a cluster of godwit wintering sites, isolated from other populations by long sections of unfavourable coastline. North of the study area the nearest godwit populations occur on coastal lagoons in Marlborough (206 km, NE) and estuaries in Tasman Bay, Nelson (218 km, NNE). To the south the nearest sites with sizeable annual godwit flocks are the North Otago estuaries, the closest being Shag River Estuary (219 km, SW).

METHODS

A full census of Eastern Bar-tailed Godwits was made at each site within Central Canterbury once per month from May 1992 to July 1993. Site counts were usually undertaken between the 11th and 30th of the month, with all sites covered within the space of 3-7 days. Two censuses were made in November 1992 (the current spring census month) to see if there was any difference in godwit numbers between early and later in the month.

Godwits were counted at high tide roosts at Brooklands Lagoon, Avon-Heathcote Estuary and Upper Lyttelton Harbour, by mid-tide scanning of mudflats at Ashley-Saltwater Creek Estuary and by scanning exposed lake edge habitats at Lakes Forsyth and Ellesmere. All counts were made by the same author using 25x60 spotting scope and 10x50 binoculars.

RESULTS

Bar-tailed Godwits were recorded in Central Canterbury in every month of the year with total numbers ranging from winter lows of 198 in May and June 1992 to a summer peak of 2798 in January 1993, followed by a subsequent winter low of 246 in June 1993 (see Table 1). The number of non-breeding birds (assumed to be juveniles and sub-adult birds)

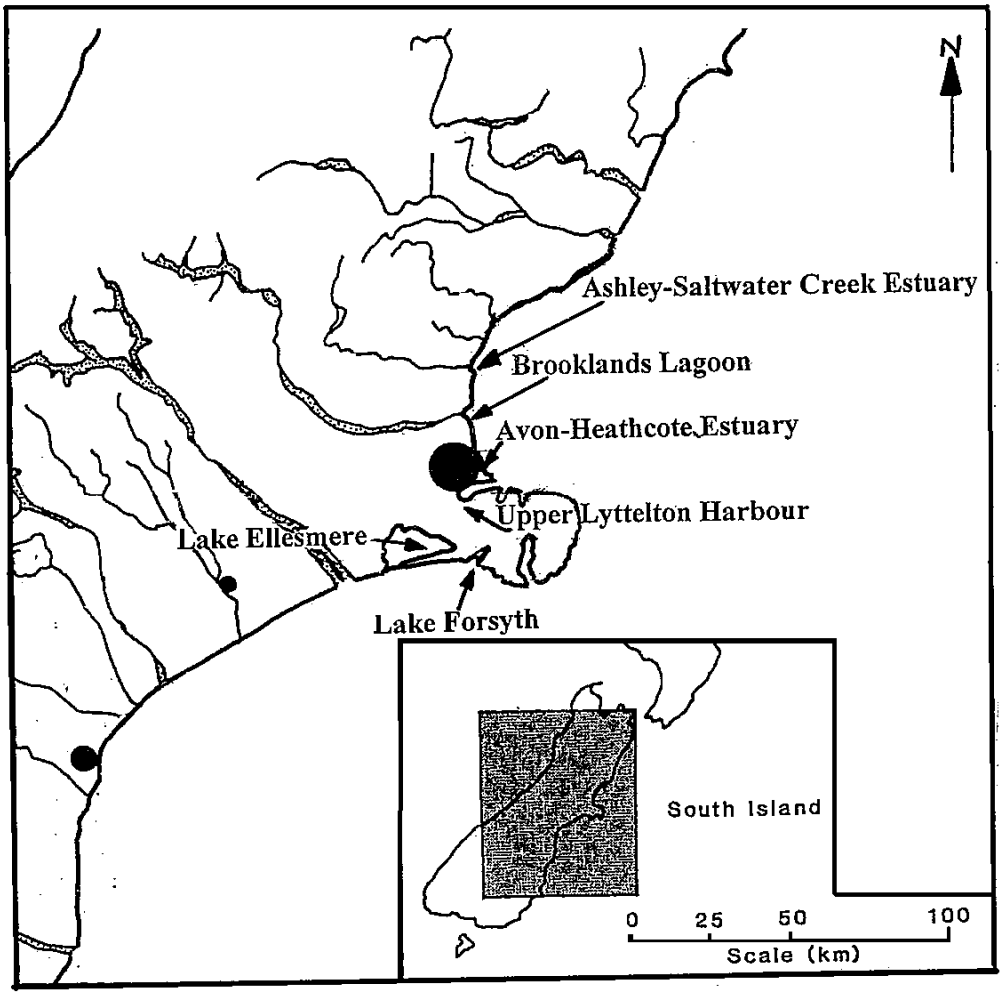


Figure 1. Map of South Island, New Zealand showing Central Canterbury study sites

in winter 1993 was 8.8% of the peak population in the preceding summer.

National Wader Count totals for June 1992 (11,733 Bar-tailed Godwits), November 1992 (86,138) and June 1993 (14,000) (Sagar *et al.* 1999) indicate that the Central Canterbury Region supported 1.69%, 3.0% and 1.76% of Bar-tailed Godwits counted in New Zealand over these respective census periods.

Within Central Canterbury, highest annual numbers were recorded at different sites at different times. Three sites held highest numbers during September and October (the migrant arrival period); two sites in December (summer) and one site in February (just prior to the migrant departure period). Peak godwit numbers for the region as a whole occurred in January – a month interestingly when no one site recorded its highest count.

Regionally, periods of population stability were the winter months of May-June 1992 and May-June-July 1993, as well as October-November-December 1992. The fact that the population was so stable from late October to late December indicates that although there was internal trading between sites, there was no apparent movement of Bar-tailed

Table 1. Bar-tailed Godwit counted in Central Canterbury per month May 1992 – July 1993. Peak counts are shaded. Ash = Ashley-saltwarer Creek Estuary; Brk = Brooklands lagoon; A-H = Avon-Heathcote Estuary; Lyt = Upper Lyttelton Harbour; For = Lake Forsyth; Ell = Lake Ellesmere.

Site	May	Jun	Jul	Aug	Sep	Oct	Nov early	Nov late	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Ash	25	22	22	21	135	119	119	119	118	118	106	47	4	0	0	0
Brk	3	3	0	0	36	169	168	168	158	148	126	23	19	13	0	0
A-H	148	173	181	186	986	2052	1979	1902	1708	1944	1466	195	212	235	246	249
Lyt	22	0	0	0	122	188	274	348	489	465	398	60	24	0	0	0
For	0	0	0	0	0	0	0	0	0	30	139	20	0	0	0	0
Ell	0	0	0	0	80	56	33	53	105	93	66	0	0	0	0	0
Total	198	198	203	207	1359	2584	2573	2590	2578	2798	2301	345	259	248	246	249

Godwits in or out of the Central Canterbury region over the late spring-early summer period.

The influx of newly arriving international migrants started between 17 and 21 September 1992 (see table 2). Peak numbers at Ashley-Saltwater Estuary, Brooklands Lagoon and Avon-Heathcote Estuary all occurred during the migrant arrival period. Godwit numbers at the first two sites dropped slowly through the rest of summer, while numbers on the Avon-Heathcote Estuary declined through November and December, but increased again (by an influx of c.240 birds) during January 1993 (table 2).

Numbers on Upper Lyttelton Harbour followed a pattern consistently observed at that site throughout 20+ years of regular monitoring (1986 to 2008) (Crossland in prep.), with numbers increasing progressively each month from September through to December or January, then either a slight decline (as occurred in 1993) or stable numbers through to the departure period.

Bar-tailed Godwit numbers on Lake Ellesmere fluctuated monthly with the highest counts recorded in December and January (summer). Lake Forsyth only held godwits during the period January to March (the pre-departure period).

Between the January and February 1993 counts, the Central Canterbury godwit population decreased by 497 birds, including an exodus of 460 birds from the Avon-Heathcote Estuary between 21 January and 12 February (table 2). These dates seem too early for a migration departure and are likely to have been a movement of birds to other parts of New Zealand.

In 1993 the genuine departure of migrating godwits commenced some time between 27 February and 15 March. All migrants had left by 29 March, leaving residual flocks of presumed non-breeding birds at 4 sites. By May 1993 all godwits remaining in Central Canterbury had consolidated into a core wintering flock on the Avon-Heathcote Estuary. This has been the normal pattern over many years of observation (Crossland 1993, AC pers. obs. 1984-2009) but unusually in 1992, a small flock of c.22 birds remained on the Ashley-Saltwater Creek Estuary right through the winter months.

Table 2. Counts of Eastern Bar-tailed Godwit at the Avon-Heathcote Estuary: May 1992 to July 1993

Date	Count
12-May-92	148
29-May	173
11-June	173
2-July	173
6-July	173
23-July	181
6-Aug	188
19-Aug	188
31-Aug	186
12-Sept	174
17-Sept	176
21-Sept	420
27-Sept	986
2-Oct	1266
5-Oct	1510
10-Oct	1870
15-Oct	2032
27-Oct	2052
4-Nov	2020
14-Nov	1979
23-Nov	1902
22-Dec	1708
13-Jan-93	1926
21-Jan	1944
12-Feb	1484
27-Feb	1466
15-Mar	1160
29-Mar	195
16-Apr	212
4-May	231
29-May	235
26-June	246
26-July	249

DISCUSSION

Synchronised monitoring of Bar-tailed Godwits within Central Canterbury has provided a much clearer picture of regional distribution and monthly abundance than was previously available from the twice-yearly National Wader Counts and from casual shorebird surveys at individual sites. We now have greater clarity as to when and where Godwits arrive in spring; how numbers build up; when population stability occurs and for how long this lasts; when and how numbers decrease in autumn; and where non-migrating birds congregate over winter.

Peak regional abundance in relation to the timing of the National Wader Count

During this study, the month with highest numbers was January 1993, when 2798 Bar-tailed Godwit were counted in Central Canterbury.

November is the established summer wader census period for New Zealand. A comparison of godwit numbers between early November and late November 1992 showed very little difference at the regional level (2573 v 2590), but there was some variation within individual sites. Godwit numbers in November were similar to numbers recorded in October (2584) and December (2578), but approximately 8% lower than the peak month of January.

Godwit numbers recorded in February 1993 were 17.8% lower than those recorded in January 1993 and 11.2% lower than numbers in late November 1992. The count data and observations confirming that birds did not relocate to other local wetlands (AC pers obs.*)* show that a portion of the Central Canterbury population moved out of the region during late January-early February, the early timing of which suggests movement to another part of New Zealand rather than international migration. This would be consistent with past observations by Hawkins (1980) of substantial, but brief influxes of Bar-tailed Godwit in Nelson Haven (c.227 km NNE of Central Canterbury) in early March 1978 and late February 1979, although there was little evidence from a

recent colour-banding study conducted by OSNZ supporting such movements (Battley *et al.* in press).

Differences in seasonal abundance patterns amongst sites

The Avon-Heathcote Estuary is clearly the core site for Bar-tailed Godwit in Central Canterbury, supporting 64-100% of the regional population. This site had peaks during the migrant arrival and departure periods and hosted the consolidated regional winter flock.

The Ashley-Saltwater Creek Estuary and Brooklands Lagoon appear to be independent sites that receive birds from direct migration. Both sites received their full complements of godwits during the migrant arrival period and were not augmented by birds from elsewhere later in the season. Count data in the 1992-93 study period suggest that there was little, if any, interchange of birds between the Ashley-Saltwater Creek Estuary or Brooklands Lagoon and other localities. Confirmation that this pattern is consistent in all years could potentially come from banding data. From 2004 onwards, over 80 Bar-tailed Godwits have been colour-banded by OSNZ on the Avon-Heathcote Estuary, but resightings to date on the Ashley-Saltwater Creek Estuary and Brooklands Lagoon have been too few to provide definitive conclusions. Hopefully these will come in the next few years.

Upper Lyttelton Harbour appears to receive direct migrants as well as collect additional birds as summer progresses. This probably involves a combination of Avon-Heathcote birds transferring to Lyttelton, as well as possibly "homeless" birds moving southwards along the South Island's east coast and collecting at the head of this north-eastward orientated harbour.

There is some evidence from count data that Upper Lyttelton Harbour and Lake Ellesmere receive at least some of their Bar-tailed Godwits from the Avon- Heathcote Estuary. For example, between late November and December 1992 the regional population was relatively stable (2590 v 2578) but 194 birds left the Avon-Heathcote while 141 and 52 birds (= 193) arrived at Lyttelton and Ellesmere respectively

Lakes Forsyth and Ellesmere are non tidal and lack polychaete worms, shellfish and crab food resources for Bar-tailed Godwits, but provide a seasonal abundance of midges (*Chironomus* sp.) and lake flies (*Ephydra* sp.). Availability of shorebird feeding habitat depends a great deal on water levels and whether the lake outlets are open to the sea or closed. Consequently, Godwit occurrence on these sites tends to be more sporadic than on the tidal estuaries.

Lake Forsyth is orientated south-westward and confined by hills (up to 800 m high) on three sides. Godwits were not recorded during the migrant arrival period or early summer, but did occur during January, February and March (the pre-departure period). Mobile godwits from further south following the coastline northwards may be drawn into the narrow funnel of Lake Forsyth and fly the 6.7 km to the head of the lake. Another possibility is that godwits visiting Lake Forsyth come from other sites in Central Canterbury, although that would mean a flight over several ranges of hills from all sites other than Lake Ellesmere.

In Conclusion, this study has shown the value of undertaking synchronised counts across all key sites in a region to gain a much better understanding of the seasonal abundance and distribution patterns of a species. Hopefully similar projects will eventually be undertaken in other parts of New Zealand, building up our knowledge of both migratory shorebirds and also the many native waterbird species that reside on New Zealand's coastal wetlands and estuaries.

ACKNOWLEDGEMENTS

Dedicated to the late Jenny Hawkins and Barrie Heather, two great wader-counting mentors who encouraged me back in the late 1980s to undertake this study. I'm sure they're now smiling down from the great shell bank in the sky, pleased that after so long, this work has finally been written up! Thanks also to Dr Phil Battley, Rod Schuckard, Paul Sagar, Scott Butcher and Phil Crutchley for constructive comments and suggestions on the manuscript.

REFERENCES

Battley, P.F., R. Schuckard & D.S. Melville. 2009. Movements of bar-tailed godwits and red knots within New Zealand. Science for Conservation report. New Zealand Department of Conservation. *In press*.

Melville, D.S. & P.F. Battley. 2006. Shorebirds in New Zealand. Stilt 50: 295-303..

Crossland, A.C. 1993. Birdlife of the Avon-Heathcote Estuary and Rivers, and their margins. Canterbury Conservancy Technical Report Series No.6. Department of Conservation, Christchurch.

Gill, R.E., T.L. Tibbitts, D.C. Douglas, C.M. Handel, D.M. Mulcahy, J.C. Gottschalck, N. Warnock, B.J. McCaffery, P.F. Battley & T. Piersma. 2009. Extreme endurance flights by landbirds crossing the Pacific Ocean: ecological corridor rather than barrier? Proc. R. Soc. B 276: 447-457.

Gosbell, K. & R. Clemens. 2006. Population monitoring in Australia: Some insights after 25 years and future directions. Stilt 50: 162-175.

Hawkins, J.M. 1980. Seasonal fluctuations in the numbers of Bar-tailed Godwits on Nelson Haven. Notornis 27: 88-90.

Li, Z.W.D & T. Mundkur. 2004. Numbers and distribution of waterbirds and wetlands in the Asia-Pacific region. Results of the Asian Waterbird Census: 1997-2001. Wetlands International, Kuala Lumpur, Malaysia.

Minton, C., J. Wahl, R. Jessop, C. Hassell, P. Collins & H. Gibbs. 2006. Migration routes of waders which spend the non-breeding season in Australia. Stilt 50: 135-157.

Melville, D.S. & P.F. Battley. 2006. Shorebirds in New Zealand. Stilt 50: 295-303.

Riegen, A.C. 2000. Migration routes and migration strategy of Bar-tailed Godwits, *Limosa lapponica*, and Red Knots, *Calidris canutus*, which spend the non-breeding season in New Zealand. Stilt 37: 51.

Sagar, P.M., U. Shankar & S. Brown. 1999. Distribution and numbers of waders in New Zealand, 1983-1994. Notornis 46, 1-43.

Wilson, J.R. 2001. The Australasian Wader Studies Group Population Monitoring Project: Where to now? Perspectives from the chair. Stilt 39: 13-26.

SUMMERING OF WHIMBREL IN SOUTHERN SUMATRA, INDONESIA

MUHAMMAD IQBAL[1] AND AHMAD RIDWAN[1]

[1]*KPB-SOS, Jalan Tanjung api-api km 9 Komplek P & K Blok E 1 Palembang 30152, Indonesia; kpbsos26@yahoo.com.*

During June-July 2008, flocks of Whimbrel were consistently observed in three survey sites when most shorebirds are absent from the mudflats of Southern Sumatra (from Pasir River in the south to Banyuasin Peninsula in the north). Most of birds were identified as the race *Numenius phaeopus variegatus*, but some birds resembling the Western Palearctic type *Numenius phaeopus phaeopus* were also observed. Although further study is needed, it is tentatively suggested that the recent trend of Whimbrel in Southern Sumatra is for high numbers in summer and low numbers during northward migration. This phenomenon contrasts with previous counts of Whimbrel during 1984-1986 which showed highest numbers during northward migration and lowest numbers in summer; and during 1988-1989 when highest number were present in winter and lowest numbers in summer.

INTRODUCTION

The Whimbrel *Numenius phaeopus* is one of the most widespread sandpipers, with a discontinuous breeding distribution around the Arctic and a non-breeding distribution that takes in central and South America, Africa, central and south-eastern Asia and Australasia (Bamford *et al.* 2008). Of the four races, two *N. phaeopus phaeopus* and *N. phaeopus variegatus* are predicted to move to South-east Asia and Greater Sunda during the non-breeding period (Mackinnon *et al.* 1998, Robson 2005). In Sumatra, race *variegatus* (some may approach *phaeopus*) is a winter visitor from Palearctic Asia, recorded throughout the year (Marle & Voous 1988).

During June-July 2008, a survey of waterbirds was conducted in the east coastal area of South Sumatra Province. In this survey, most shorebirds were absent from the mudflats of Southern Sumatra (from Pasir River in the south to Banyuasin Peninsula in the north), but some flocks of Whimbrel were consistently observed at three survey sites. Most of the birds could be identified as the race *N. phaeopus variegatus*, but some birds resembling the Western Palearctic race *N. phaeopus phaeopus*, which usually winters only as far east as India and the Malagasy region were observed.

The observation of Whimbrel during summer period 2008 in the east coastal of Southern Sumatra is interesting. This report discusses the summering of Whimbrel recorded in Southern Sumatra and possible records of *phaeopus* in this area.

RESULTS

Summer records of Whimbrel

Observations during June-July 2008 in the east coastal area of Southern Sumatra, found a total of 530 Whimbrel at three sites. The birds seen were as listed below:

DATE	NUMBER	LOCATION
17 June 2008	200	Kumpai lake
06 July 2008	300	Pasir river
12 July 2008	30	Banyuasin Peninsular

Geographically the locations were Kumpai Lake $02^0$26’01 7” S and $105^0$34’52 8” E, Pasir River $03^0$35’29 9” S and $105^0$49’14 2” E, Banyuasin Peninsular $02^0$08’31 2” S and $104^0$58’05 4” E (Figure1).

Previous surveys in the east coastal area of South Sumatra Province in March 2008 recorded *N. madagascariensis* and *N. arquata*, but no observations of Whimbrels were made (Iqbal 2008, *Personal observation*).

In Pasir River, all Whimbrels observed were seen after 17.00hrs. Similar observations were made by Harrison (1996) in Cairns, Australia who reported an influx of Whimbrel after 17.00hrs from surrounding areas to roost near the esplanade. These birds were not seen during counts on early morning tides.

Notes about the races

The bird from Banyuasin Peninsular showed the plumage pattern of *variegatus* (Figure 2), but some birds in the Pasir River and Kumpai Lake areas showed a plumage pattern similar to *phaeopus*.

The birds were identified to race on lower back and rump colour only. The birds identified as *phaeopus* show the lower back and rump as white with no obvious barring (Figures 3 & 4). However, the under-wing of these birds shows some dark barring, intermediate between *variegatus* and *phaeopus* as depicted in Marchant *et al.* (1986) although they may be a variable feature.

DISCUSSION

Summer records of Whimbrel

The occurrence of 530 birds in Southern Sumatra during summer 2008 supports previously reported summer records of Whimbrels in this area. There are 37 species of migratory wader recorded in Sumatra (Crossland *et al.* 2006) and the Whimbrel is a widespread and common migrant in north and south Sumatra with flocks of up to 400 recorded. About 3000 Whimbrel were counted along the coastlines of Jambi and South Sumatra Provinces during July-August 1985 indicating the importance of the south-east Sumatra as an over-summering area for non-breeders (Silvius 1988, Crosland *et al.* 2006).

Many non-breeding Whimbrel remain in the same winter quarters all year, and all one-year-olds probably do so (Hayman *et al.* 1986; van Gills & Wiersma 1996). In Sumatra, records from June-July indicate non-breeding

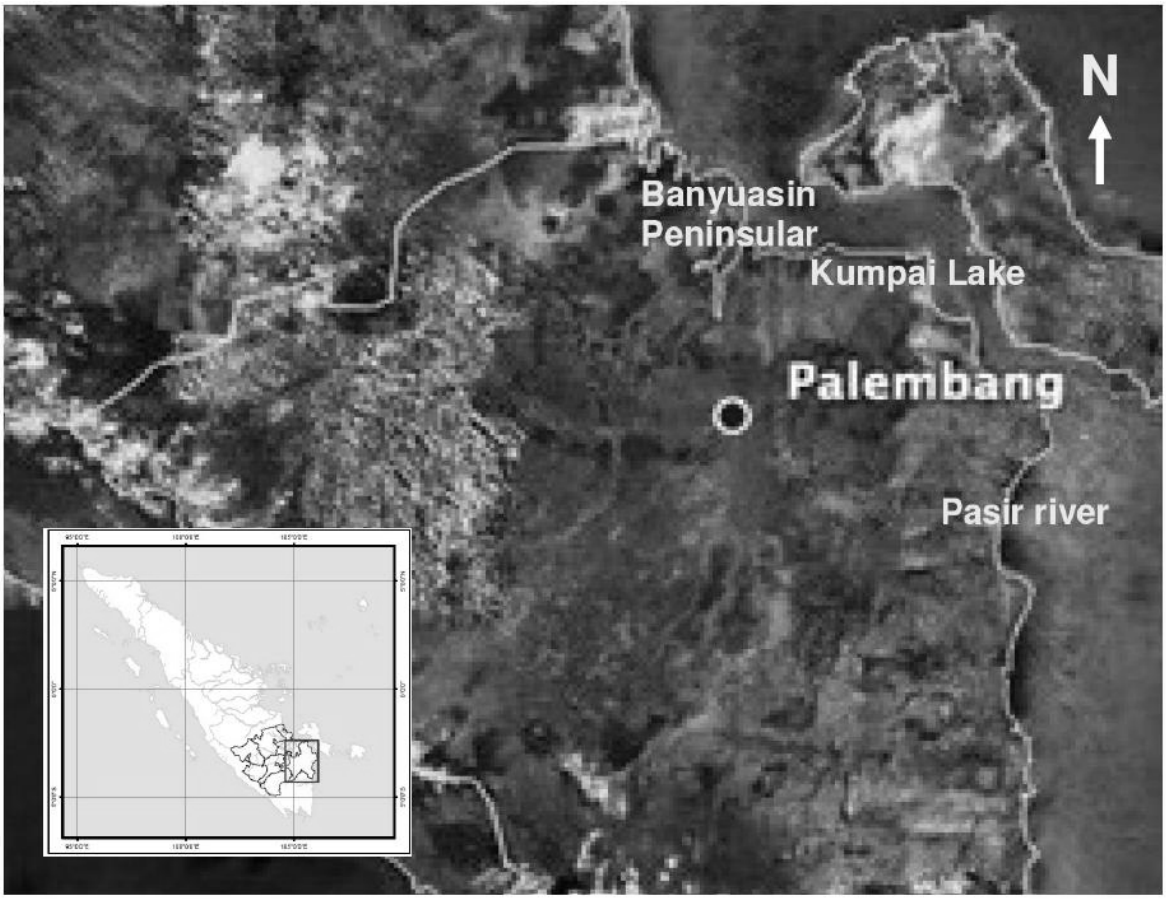


Figure 1. Summering sites of Whimbrel observed in Southern Sumatra in 2008.

Figure 2. The type of *variegatus* in Kumpai Lake

summering (Marle & Voous 1988). On the basis available data for Whimbrel on the Banyuasin Peninsular (northern part of east coastal of South Sumatra province), the trend of number of Whimbrel have changed during 1984-2008.

Detail records of Whimbrels in Banyuasin (1984-2008) are listed below:

- 865 birds on Oct-Nov 1984 (Silvius 1988)
- 700 birds on July-August 1985 (Silvius 1988; Danielsen & Skov 1989)
- 430 birds on March 1986 (Silvius 1987)
- 975 birds on March-April 1986 (Silvius 1988)
- 560 birds on August 1988 (Verheugt *et al.* 1990)
- 62 birds on September 1988 (Verheugt *et al.* 1990)
- 66 birds on October 1988 (Verheugt *et al.* 1990)

Figure 3. The type of *phaeopus* with white rump in Kumpai lake

Figure 4. The type of *phaeopus* with white lower back and rump in Pasir river

- 150 birds on November 1988 (Verheugt *et al.* 1990)
- 110 birds on December 1988 (Verheugt *et al.* 1990)
- 750 birds on January 1989 (Verheugt *et al.* 1990)
- 33 birds on February 1989 (Verheugt *et al.* 1990)
- 250 birds on March 1989 (Verheugt *et al.* 1990)
- 61 birds on April 1989 (Verheugt *et al.* 1990)
- 2 birds on May 1989 (Verheugt *et al.* 1990)
- 60 birds on June 1989 (Verheugt *et al.* 1990)
- 130 birds on July 1989 (Verheugt *et al.* 1990)
- 500 birds on August 1989 (Verheugt *et al.* 1990)
- 9 birds on July 2001 (Goenner & Hasudungan 2001)
- 21 birds on November 2001 (Hasudungan & Sutaryo 2001)
- 2 birds on October 2002 (Hasudungan & Wardoyo 2002)
- 0 bird on April 2003 (Hasudungan 2003)
- 300 birds on 31 July 2003 (Iqbal 2003)
- 0 bird on March 2008 (Iqbal 2008, Pers. Obs).

Counts during 1984-1986 showed that highest numbers were observed during northward migration (975 birds on March-April 1986) and lowest number in summer (700 birds in July-August 1985). In the 1988-1989 period, highest numbers were seen in winter (750 birds in January 1989 with

1043 counted during November 1989 – February 1989) and lowest numbers in summer (two birds in May 1989 and a total of 192 birds from May-July 1989). The trend of counts during 2001-2008 showed that highest numbers were in summer (300 birds in July 2003) and lowest during northward migration (no bird observed in April 2003 and March 2008).

Although there is a need for further study, the count of 530 Whimbrel in Southern Sumatra during June-July (summer period) and the absence of birds in the March-April migration period (northward) supports the trend observed on the Banyuasin peninsular. It is tentatively concluded that there has been a shift to high counts of Whimbrel in summer and low counts during northward migration. This phenomenon is contrary to previous counts of Whimbrel during 1984-1986 that showed highest number during northward migration and lowest numbers in summer; and during 1988-1989 period that found highest number in winter and lowest numbers in summer.

In Australia, Higgins and Davies (1996) in Bamford *et al.* (2008) report that in parts of northern Australia, large numbers of Whimbrel occurred throughout the breeding period and numbers are stable. Chatto (2003) *in* Bamford (2008) found that numbers in the Northern Territory (Australia) were lowest in the non-breeding period, high through the breeding period and peaked early during southward migration, presumably as birds passed through to sites in eastern and south-eastern Australia.

Note for the races

The bird from Banyuasin Peninsular showed the plumage pattern of *variegatus*, but some birds in Pasir River and Kumpai Lake showed the pattern of *phaeopus*. Grantham (2000) reported that the plumage pattern of birds observed in Alas Purwo National Park, were also *phaeopus.* In these birds the lower back and rump was white with no obvious barring, but the under-wings of showed some dark barring, intermediate between *variegatus* and *phaeopus* as depicted in Marchant *et al.* (1986) though this may be variable feature.

In Sumatra, *variegatus* race (some may approach *phaeopus*) is a winter visitor from Palearctic Asia, recorded throughout the year (Marle & Voous 1988). Mackinnon *et al.* (1998) also state that for some Whimbrel observed in the Greater Sundas "some individuals with white rump and underwing approach the form of the nominate race *phaeopus*". On the Malay Peninsula, west coast birds typically show white on back rump (suggesting *phaeopus*), whereas east cost bird are presumed to both *phaeopus* and *variegatus* (Wells 1999).

ACKNOWLEGMENTS

This field work is a part of Milky stork *Mycteria cinerea* population assessment in South Sumatra, supported by WCS RFP (Wildlife Conservation Society Research Felowship Programme), Rufford Small Grant (RSG) and Idea Wild. We wish to thank Dr. Mike Crosby, Dr. Christian Gonner, Yus Rusila Noor, Dr. Dewi Prawiradilaga, Dr. Nick Brickle, William Banham, Ph.D., Kate Mastro, Lynn Duda, Jane Rufford, Josh Rufford, Dr. Wally van Sickle, Henry Stephen, Anne Marie, Sean Kelly who made this work is possible. We would like to thank Pak Sumantri (head of Sembilang National Park office) for facilitating to entering the park, Pak Ajit (formerly head of Sungai Batang village), Qodir and Pak Reli's family in Sungai Batang and Pak Murod's family in Pasir river.

REFERENCES

Crossland, A.C., Sinambela, S.A., Sitorus, A.S. & A.W. Sitorus. 2006. An overview of the status and abundance of migratory waders in Sumatra, Indonesia. *Stilt* 50: 90-95.

Bamford, M, D., Watkins, W. Bancroft, G. Tischler and J. Wahl. 2008. *Migratory Shorebirds of the East Asian - Australasian Flyway; Population Estimates and Internationally Important Sites.* Wetlands International-Oceania. Canberra, Australia.

Danielsen, F. & H. Skov. 1989. The importance of South-east Sumatra as a summering area for non-breeding waders, especially the bar-tailed godwit Limosa lapponica. *Stilt* 14: 40-42.

van Gills, J. & P. Wiersma. 1996. Family Scolopacidae (Sandpipers, Snipes and Phalaropes). Pp 444-533 *in* J. del Hoyo., A. Elliot. & J. Sargatal (eds). *Handbook of the birds of the world.* Vol 3. Hoatzin to Auk. Lynx Editions, Barcelona.

Goenner, C. & F. Hasudungan. 2001. *Sembilang Monitoring report No. 1. July/August 2001. Technical Report Project Document No. 18.* Wetland International Asia Pacific Indonesia Programme.

Grantham, M. 2000. A note on the passage of variegatus and phaeopus type whimbrels through Alas Purwo National Park, East Java. *Kukila* 11: 133-135.

Harrison, F. 1996. A Whimbrel *Numenius phaeopus* phenomenon in Cairns, Australia. *The Stilt* 29: 38.

Hasudungan, F. 2003. *Pelatihan survey Hidupan liar di CTN Sembilang, 8-13 April 2003. Laporan Teknis No. 72. Proyek Konservasi Terpadu Lahan Basah Pesisir Berbak Sembilang.* Wetland International Asia Pacific Indonesia Programme.

Hasudungan, F. & D. Sutaryo. 2002. *Pemantauan kawasan Sembilang No. 2, November 2001. Laporan Teknis No. 32.* Proyek Konservasi Terpadu Lahan Basah Pesisir Berbak Sembilang.

Hasudungan, F. & S.A Wardoyo. 2002. *Pemantauan kawasan Sembilang No. 5, Oktober 2002. Laporan Teknis No. 62.* Proyek Konservasi Terpadu Lahan Basah Pesisir Berbak Sembilang.

Hayman, P., J. Marchant & T. Prater. 1986. *Shorebirds - an identification guide to the waders of the world.* Houghton Mifflin Company. USA.

Holmes, D. 1986. Sumatra Bird Report. *Kukila* 8: 9-56.

Iqbal, M. 2003. *Pemantauan kawasan Sembilang No. 8, Oktober 2003. Laporan Teknis No. 76.* Proyek Konservasi Terpadu Lahan Basah Pesisir Berbak Sembilang.

Mackinnon, J., K. Phillips. & B.V. Balen. 1998. *Burung-burung di Sumatera, Kalimantan, Jawa dan Bali.* Birdlife International Indonesia. Programme/ Puslitbang Biologi LIPI. Bogor.

Marle, J.G. Van. & K.H Voous. 1988. *The Birds of Sumatra : An Annotated Checlist.* BOU Checklist No. 10. Tring, UK.

Robson, C. 2005. *Birds of South-east Asia*. New Holland Publisher. UK.

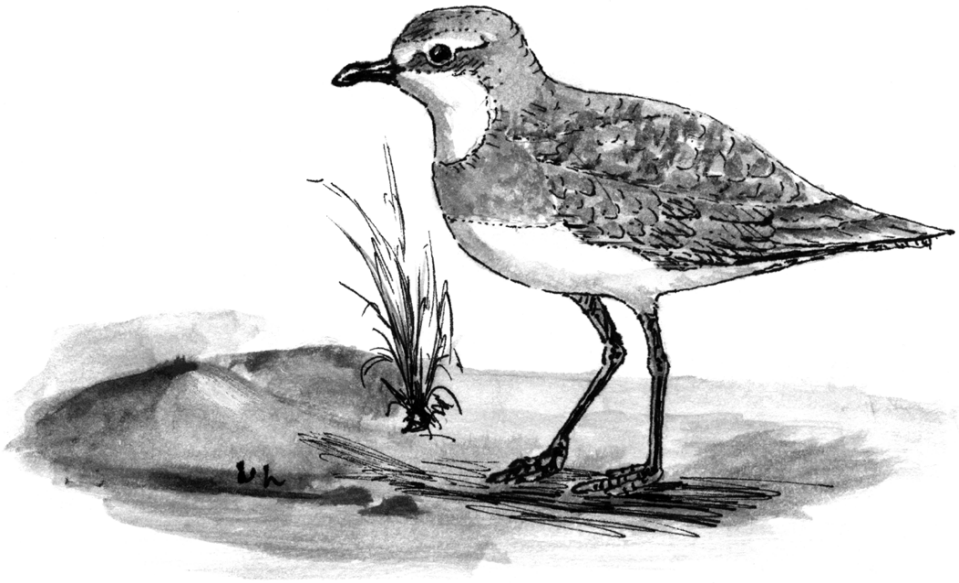
Silvius, M. 1987. Northward wader migration along the East coast of Sumatra: joint PHPA/Interwader Study. *Stilt* 10: 31-35.

Silvius, M. 1988. On the importance of Sumatra's East coast for waterbirds, with notes on the Asian Dowitcher Limnodromus semipalmatus. *Kukila* 3 (3-4):117-137.

Sonobe, K. & S. Usui. (editors). 1993. *A field guide to the waterbirds of Asia.* Wild Bird Society of Japan. Tokyo.

Verheugt, W.J.M., F. Danielsen, H. Skov, A. Purwoko, R. Kadarisman & R. Suwarman. 1990. Seasonal variations in the wader populations of the Banyuasin Delta, South Sumatra, Indonesia. *Wader Study Group Bulletin* 58: 28-35.

Wells, D.R. 1999. *The birds of the Thai-Malay Peninsula volume 1.* Academic Press. San Diego and London



INLAND MOVEMENTS OF THE HOODED PLOVER *THINORNIS RUBRICOLLIS TREGELLASI* IN WESTERN AUSTRALIA

MARCUS SINGOR

149A Bishopsgate Street, Carlisle, Western Australia, 6101, AUSTRALIA, msingor@iprimus.com.au

Birds Australia - Western Australia has been conducting research into the distribution and movement of the Hooded Plover *Thinornis rubricollis tregellasi* population that resides in Yalgorup National Park north of Perth (Figure 1). One of the research objectives was to investigate the movement of Hooded Plover outside the National Park. Thirty three Hooded Plover have been colour banded since February 2002 to allow tracking of their movements both within and outside the Park. Sightings of the birds within the park over the last seven years have been successful in monitoring their use of the Park however reports from outside the Park are few.

To date there have only been two sightings of colour banded birds outside Yalgorup National Park. The first was made by David Secomb on 27 January 2007 at Lake Norring one of a chain of salt lakes SSW of Wagin. Lake Norring (Lat 33° 26' 52 S, Long 117°17' 45 W, Figure 1) is about 16km from Wagin. The distance covered from Yalgorup National Park to Lake Norring is around 160 km. Lake Norring at the time of the sighting was about half full of water. Only four lakes in the locality had enough water to attract birds, the others were dry or almost so. The colour banded Hooded Plover was still present at Lake Norring on Sunday 18 February 2007 and was sighted back in Yalgorup National Park on 28 March 2007. This Hooded Plover was banded on 3 February 2002 at Boundary Lake within the Park and would have been at least five years old.

The second observation was made by David Secomb on 3 January 2009 at Flagstaff Lake (Lat 33°30' 38 S, Long 117°15' 26 W) 25km SSW of Wagin and is the next lake south from Lake Norring. This bird was banded on 17 February 2008 at Martins Tank in Yalgorup National Park. It was last seen in Yalgorup National Park on 27 September 2008. The bird was nearly one year old, in adult plumage and in a flock of adult and immature birds when sighted at Flagstaff Lake. A further survey conducted on 17 January 2009 at Flagstaff Lake failed to locate the bird. Water levels of all the lakes near Wagin had dropped significantly over

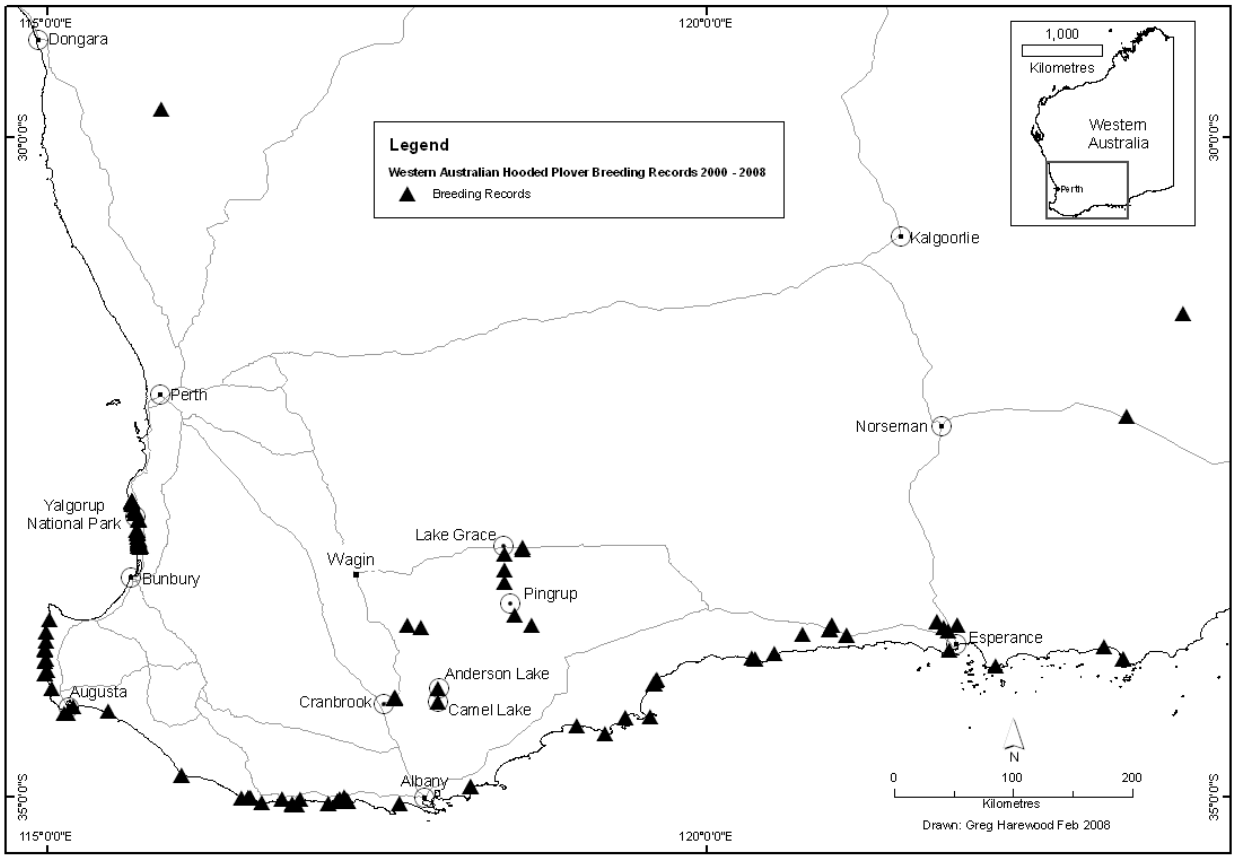


Figure 1. Map showing the location of Yalgorup National Park and Wagin (reproduced from Elson and Singor 2008).

the intervening period.

Both inland sightings were made in the summer months and both were in small flocks of Hooded Plover along with other waders in good wader numbers. Neither location was identified as a breeding location in surveys between 2006 and 2008 (Elson & Singor 2008).

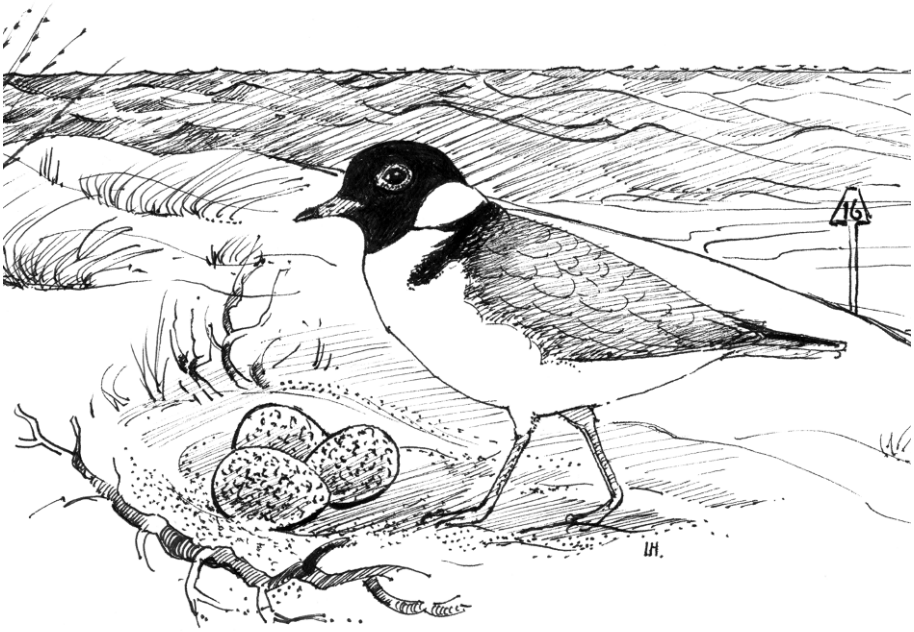
These sightings confirm the migration of Hooded Plover from Yalgorup National Park inland to salt lakes to the south of Wagin. Do young birds learn this route by following older birds?

ACKNOWLEDGEMENTS

The Hooded Plover research in Yalgorup National Park is funded by the Peel Development Commission and Peel Waterways Centre, Department of Water and their support is acknowledged.

REFERENCES

Elson, S. J. & M.J.C Singor. 2008. Hooded Plover *Thinornis rubricollis tregellasi* breeding data from Western Australia. Silt 53: 6-12.



SANDWICH TERN *STERNA SANDVICENSIS* OCCURRENCE AND MOVEMENTS – A SOUTHERN AFRICAN PERSPECTIVE.

A. J. TREE
Research Associate, Department of Zoology, Nelson Mandela Metropole University, Box 77000, Port Elizabeth, South Africa, 6031.
tonytree@zeane.com

INTRODUCTION

The Sandwich Tern *Sterna (Thalasseus) sandvicensis* is a fairly common non-breeding visitor from Europe and is found along the coasts of southern Africa from Namibia through to southern Mozambique although tending to concentrate along selected stretches of coastline. Small numbers overwinter, mainly along the west coast. (Tree 2005). There is only one record from an inland station, a bird feeding on a farm dam near Tulbagh, some 80 km from the coast, from 13-25 March 1995 (Hofmeyer & Krone 1995), although birds regularly penetrate for a few kilometres up broader estuaries when feeding (pers obs) or visit coastal lakes (Cyrus & Robson 1980). The large majority come from colonies on the west European Atlantic seaboard and the Baltic Sea with fewer birds from the Mediterranean and, rarely, from the Black and Caspian seas (Underhill *et al.* 1999, Safring databank). The southern African austral summer population has been roughly estimated at 10 000 to 30 000 birds (Underhill *et al.* 1999). The number of terns spending the summer along different sectors of the coastline may vary considerably from year to year, this probably dictated by suitable prey availability, which in turn, is governed by a complex pattern of annual oceanic events. The factors governing the availability of prey is beyond the scope of this paper. The Sandwich Tern is essentially an inshore feeder, feeding mainly within two kilometres of the coastline or in the mouths of larger estuaries (Tree 2005). Few appear to reach the offshore islands although some may fly out to join nocturnal roosting assemblages of other tern species, especially with the Swift Tern *Sterna (Thalasseus) bergii*. Earlier analyses of Sandwich Tern recoveries in the sub-region have appeared in Elliott (1971),Vandewalle (1988) and Underhill *et al.* (1999) but the larger dataset now gathered allows for a more detailed analysis than formerly. Comparison is also made with a detailed earlier study on the migration of Sandwich Tern from a European perspective (Møller 1981).

METHODS

Observations and counts were made with the aid of binoculars and telescope, the latter a necessity when counting tightly packed flocks of mixed tern species. Counts were made at a variety of sites in the Eastern Cape since 1995 by the author and a team of observers, while on the west coast of the Western Cape Keith Harrison has carried out regular counts at several sites since June 2003. Peripatetic counts were made at a variety of other sites, mainly in the south-western and southern Western Cape Province and Namibia. Recourse was also made to the Co-ordinated Wildfowl Count (CWAC) data stored at the Avian Demographic Unit of the University of Cape Town and to the equivalent scheme based in Namibia and stored at the Ministry of Environment and Tourism in Windhoek. Some information was obtained from the literature for KwaZulu-Natal and Mozambique regions for which limited data is available. Trapping was with the aid of mist-nets set over water or wet sand, on a concrete harbour pier, or along the dividing banks between saltworks ponds and in both tidal and non-tidal environments.

Band recovery detail was obtained from the Safring databank with an additional search made of overseas banding schemes to fill in missing information. This latter is incomplete as one scheme failed to respond but as it has a small dataset it may well be complete in Safring records. The records missing from the Safring database were largely from earlier years. Most recoveries were made from birds found dead or dying, usually by members of the public, but small numbers were controlled by bird-banders, either through mist-netting or by reading band numbers in the field with the aid of a telescope. The coast has been subdivided into Zones, to enable closer analysis of the recoveries, following Underhill *et al.* (1999). These are Namibia (Zone 1), Orange River mouth to Cape Agulhas (Zone 2), Cape Agulhas to Cape St Francis (Zone 3), Cape St Francis to the KwaZulu-Natal border (Zone 4), KwaZulu-Natal and Mozambique (Zones 5/6). Zones 1 and 2 lie alongside the cold Benguela current while the remainder fall along the coastline warmed by the Mozambique current, with its cooler inshore counter-current running along the south coast. The term 'recovery' is used to include birds controlled except where otherwise stated.

Ageing was made using South African criteria. A first year bird (1y) was that occurring from date of hatching until 30 June of the following calendar year. A second year bird (2y) from 1 July of 2nd calendar year to 30 June of the 3rd calendar year, provided they could still be recognised later in the season, otherwise treated as immature or adult. The majority of older birds were considered as adult as differentiation from immatures of varying years is very difficult in winter quarters although a portion may be aged using primary wing moult.

RESULTS

A map of southern Africa showing zones and major sites mentioned in the text appears as Figure 1.

Counts

The co-ordinated waterfowl counts from South Africa and Namibia are made principally in January/February and July

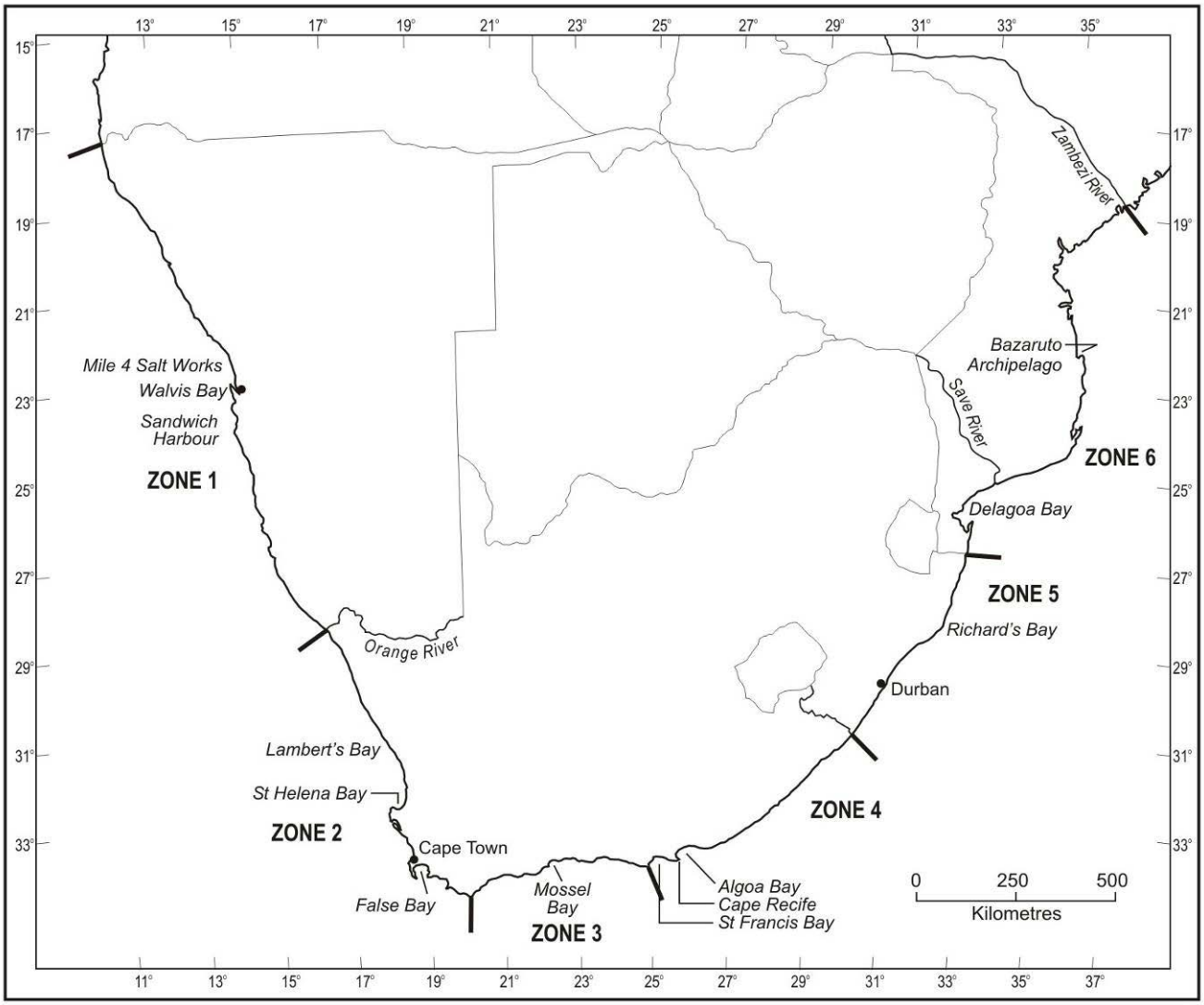


Figure 1. A map of southern Africa showing zones and major sites mentioned in the text.

but in some cases in other months of the year. In Namibia tern expeditions were carried out from late January to early March 1998 (Tree 1998), February/March 1999 (Tree 1999) and late October to early December 2005 (Tree & Boorman 2006). The distribution of peak monthly counts for each zone is shown in the Addendum. Each month or group of months is given a count limit within each Zone over which all available counts have been shown. This appears in some detail for the better-covered areas and also gives some indication of how numbers at any one site may vary enormously between years with sites appearing for some years and yet absent in others.

Band recoveries

A total of 326 band recoveries to southern Africa are available for analysis. The banding schemes involved were those of the United Kingdom and Ireland (170), The Netherlands (43), both the Helgoland (west) and Hiddensee (east) schemes of Germany (36 & 8 respectively), Denmark (30), Sweden (10), Belgium (9), Italy (8), Estonia and France (5 each) and Russia (Crimea and Turkmenistan - 1 each). Many of these were physically controlled or by reading the band numbers with the aid of a telescope. Data from four banding schemes for Angola are included for comparison: 226 BTO (Britain 180, Ireland 46), 56 Danish, 42 Helgoland and six Swedish birds. However, 46 of the BTO recoveries could not be used for ageing purposes, as at least six dates appeared to be those of mass reporting rather than dates of recovery. In several more instances where reporting was on those six dates and where it was obvious that a bird could only have been in its first year then these records were utilised. It is possible that this also applied to other British as well as some Danish and Helgoland records as there were several duplications of recovery dates but these were not so obvious. Fewer than 400 birds have been banded under the Safring scheme, giving rise to eleven overseas: The Netherlands (4), Denmark (2), France, Belgium, England, Ireland and Sweden (1 each), and three local recoveries. Distribution of band recoveries by Zone and month within southern Africa is shown in Figure 2, longevity in southern Africa in Figure 3 and form of recovery in Figure 4. The distribution of age groups in each coastal zone is shown in Table 1. Table 2 indicates the percentage recovery in southern Africa of different age classes banded as pulli or

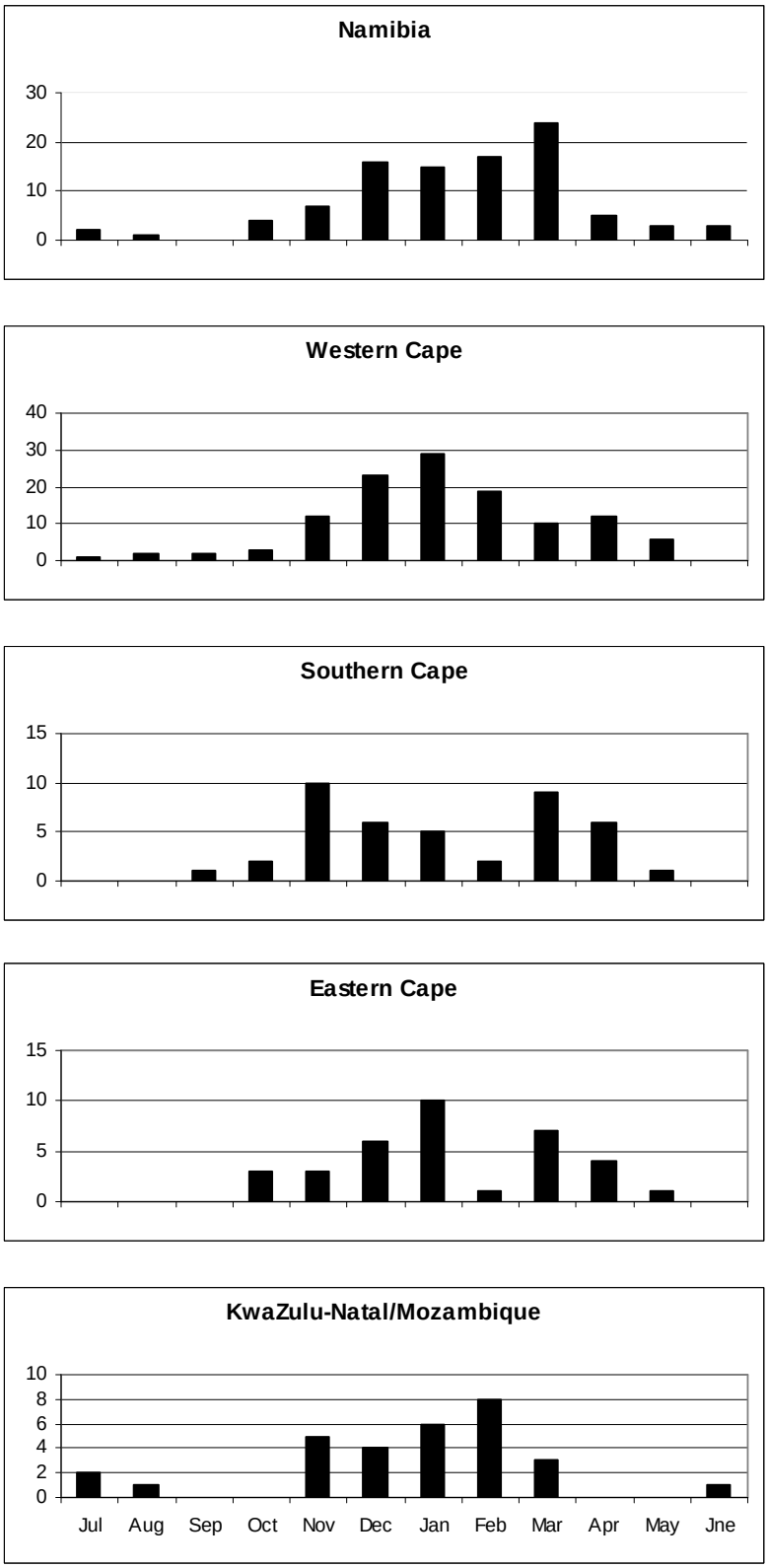


Figure 2. Distribution of band recoveries by zone and month within southern Africa.

newly fledged young and showing the source country while Table 3 the source country of recoveries found in each Zone. Long distance movements within southern Africa are shown in Table 4.

DISCUSSION

Numbers and occurrence

Major concentrations of Sandwich Tern occur within the more sheltered bays such as Walvis Bay and Sandwich

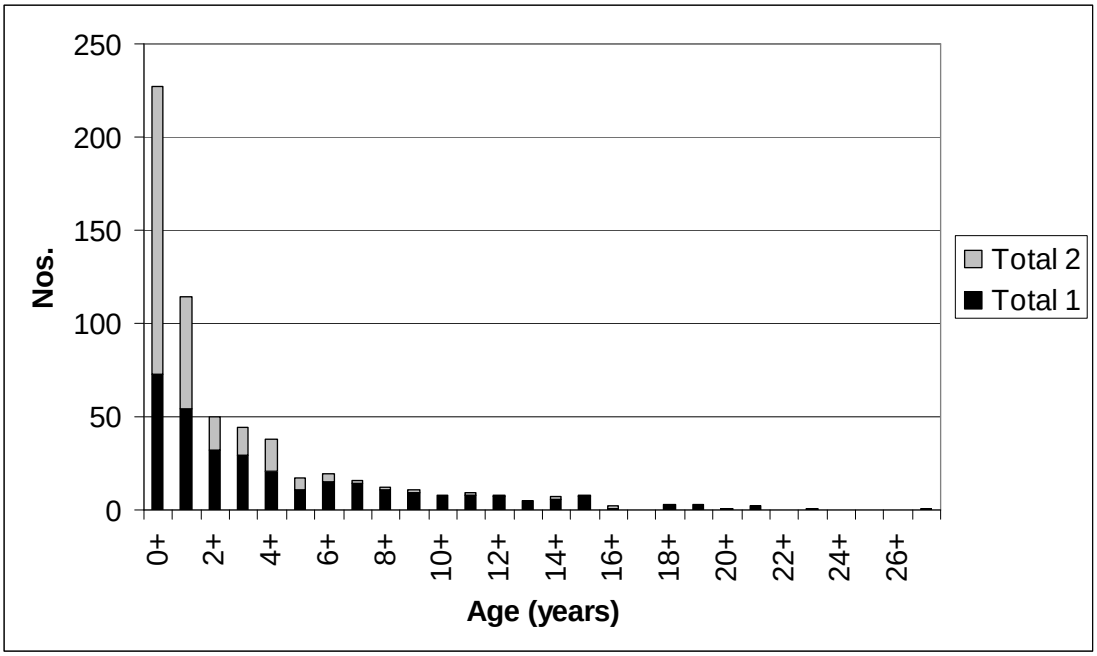


Figure 3. Sandwich Tern longevity based on birds ringed in their first year and prior to their first migration south. Total 1 indicates records from southern Africa and Total 2 records from Angola, where available.

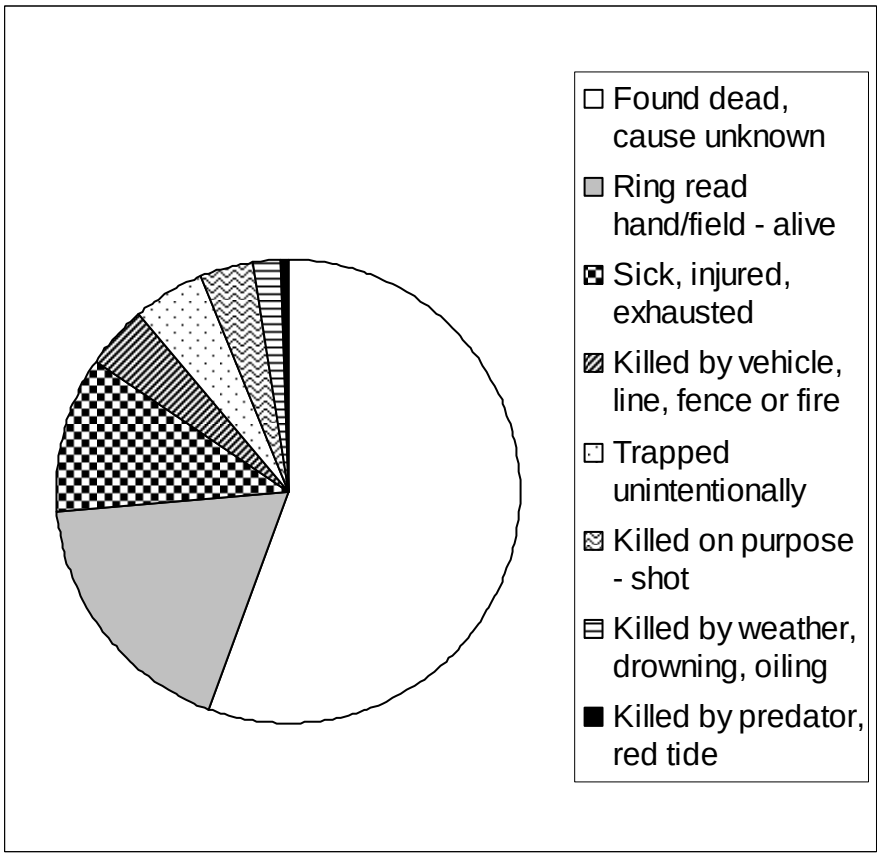


Figure 4. Sandwich Tern - form of recovery

Harbour (Namibia), St Helena, Saldanha and False bays (Western Cape Province), St Francis and Algoa bays (Eastern Cape Province), Richards Bay (KwaZulu-Natal), Delagoa Bay (Mozambique) or at the favoured coastal saltworks, Mile 4, outside Swakopmund, but may be found anywhere especially when in transit. Intermediate concentration points are mostly at river mouths and suitable rocky points. Feeding is mainly inshore and diurnal hence the low numbers recorded from offshore islands during the day (pers. obs.). Birds spread out along the coastline to feed

Table 1. Age groups of Sandwich Tern by coastal zone

Age	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
0-1 year	(29) 30.2%)	(16) 13.5%	(11) 26.2%	(10) 28.6%	(7) 23.3%
1-2 year	(14) 14.6%	(19) 16.0%	(4) 9.5%	(8) 22.9%	(9) 30.0%
2-3 year	(8) 8.3%	(18) 15.1%)	(1) 2.4%	(3) 8.6%	(2) 6.7%
3+ years	(45) 46.9%	(66) 55.5%	(26) 61.9%	(14) 40.0%	(12) 40.0%

Table 2. Percentage recovery at different ages of Sandwich Tern ringed as pulli or newly fledged young and recovered in southern Africa (or north thereof where indicated) and showing source country.

Country/region	Total	0-1 year	1-2 years	2-3 years	3+ years	Oldest (years)
Britain	101	(13) 12.9%	(18) 17.8%	(12) 11.9%	(58) 57.4%	27+
Ireland	68	(16) 23.5%	(14) 20.6%	(6) 8.8%	(32) 47.1%	19+
Belgium	9	(5) 55.6%	(1) 11.11	-	(3) 33.3%	7+
Helgoland	36	(14) 38.9%	(4) 11.1%	(3) 8.3%	(15) 41.7%	14+
Netherlands	41	(4) 9.8%	(4) 9.8%	(5) 12.2%	(28) 68.3%	21+
Denmark	30	(9) 30.0%	(7) 23.3%	(2) 6.7%	(12) 40.0%	21+
Sweden	10	(2) 20.0%	(3) 30.0%	(2) 20.0%	(3) 30.0%	8+
Hiddensee	8	(2) 25.0%	-	(1) 12.5%	(5) 62.5%	10+
Estonia	5	(1) 20	-	(1) 20	(3) 60	13+
France	5	(3) 60	(1) 20	-	(1) 20	6+
Italy	8	(4) 50%	(2) 25%	-	(2) 25%	6+
Crimea	1	(1) 100				0+
Turkmenistan	1				(1) 100	3+
BTO to Angola	226	(121) 53.5	(33) 14.6	(15) 6.6	(14) 6.2	16+
Helgoland to Angola	42	(18) 42.9	(8) 16.7	(5) 11.9	(11) 28.6	6+
Denmark to Gabon - Angola	69	(36) 62.1	(16) 23.2	(3) 4.4	(14) 20.3	8+
Sweden to Angola	6	(2) 33.3	(2) 33.3	(1) 16.7	(1) 16.7	4+
Hiddensee to Angola	0	-	-	-	-	-
to the 21/06/2007						

although gatherings may occur at river mouths when large concentrations of fish fry are found. Nocturnal feeding does occur but the evidence is slim. For instance, on one occasion in February 1998 at Mile 4 saltworks both Sandwich and Swift *S. bergii* terns left their diurnal roost site in the evening and were still feeding until no longer visible at nightfall. It is likely that when feeding conditions are good further offshore the Sandwich Tern will accompany the commoner species, Swift and Common *S. hirundo* terns, when nocturnal feeding may also take place. This was suspected at St Francis Bay in February 2004 when the mixed diurnal tern roost headed out to sea late in the day and on one evening a few days later considerable numbers were reported by a fisherman, settling on the water some 40 km off Cape St Francis (Tree 2005). Unfortunately no record of the species present was made. Return to their diurnal loafing sites by all species was noted for two to three hours after sunrise but some birds may have slipped in earlier. However, there may also be considerable movement from diurnal roost sites to those used nocturnally therefore we were unsure whether the Sandwich Tern had merely moved out to a nocturnal roost site or had gone to feed.

Even at highly favoured sites abundance varies both within season and between seasons, this being evident from the counts appearing in the Addendum. Owing to the very limited information available in the literature considerable detail is given to indicate this potential variability but for reasons of space a greater range of counts and the extremes cannot be shown; for instance the Orange River mouth may have negative or very low mid-summer counts in some years.

The largest concentrations were recorded in both Namibia and the Western Cape but only in certain years. In Namibia nearly 3800 were recorded on 24 January 2004 at Sandwich Harbour, when there was a further 567 at Walvis Bay, with corresponding figures of 5400 and 1807 end January/beginning February 2005. In marked contrast in 2003 there were only 55 and 263, respectively, at these two sites in mid-January. The highest counts in the south-western Cape were made much earlier at Strandfontein sewage ponds with 3027 on 15 December 1986, 2620 on 15 February 1984 and 2200 on 8 December 1999. More recent counts at this site have been much lower. The only other zone with higher counts is the Eastern Cape but there birds tend to be more spread out and it is only after arrival and prior to departure that larger concentrations are found in St Francis Bay. The major sites there are the Gamtoos, Kabeljous, Seekoie and Kromme estuaries where combined totals of up to 1000+ have been found in November and again in late January and February. Once again this picture varies from year-to-year. Elsewhere in the Eastern Cape larger concentrations occur from Cape Recife east to about the Kei River mouth while in

Table 3. Source/recovery Zones of Sandwich Tern in southern Africa.

Location	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
England & Scotland	20 (20.2%)	39 (39.4%)	15 (15.2%)	13 (13.1%)	11 (11.1%)	1 (1%)
Ireland	21 (30.9%)	26 (38.2%)	7 (10.3%)	8 (11.8%)	6 (8.8%)	
Belgium	5 (55.6%)	2 (22.2%)		2 (22.2%)		
Helgoland	9 (25%)	13 (36.1%)	3 (8.3%)	4 (11.1%)	7 (19.4%)	
Netherlands	21 (51.2%)	10 (24.4%)	6 (14.6%)	3 (7.3%)	1 (2.4)	
Denmark	7 (23.3%)	15 (50%)	5 (16.7%)	2 (6.7%)	1 (3.3%)	
Sweden	1 (10%)	5 (50%)	2 (20%)	1 (10%)	1 (10%)	
Hiddensee	3 (37.5%)	3 (37.5%)	2 (25%)			
Estonia	4 (80%)		1 (20%)			
France	1 (20%)	2 (40%)		1 (20%)	1 (20%)	
Italy	3 (42.9%)	3 (42.9%)			1 (14.3%)	
Crimea			1 (100%)			
Turkmenistan to 21/06/2007	1 (100%)					

Table 4. Within-season movements of Sandwich Tern in southern Africa.

Band No.	Age	Date banded	Banding locality	Date recovered	Recovery locality	Distance moved	Recovery code
468112	3	11.01.1986	Fish R. mouth, E Cape	29.01.1986	Sordwana Bay, KZN	849 km NE	99
4H19637	7	16.12.2000	Lourens R. mouth, W Cape	29.03.2001	Kabeljous R. mouth, E Cape	565 km E	751

KwaZulu-Natal (eg Ryan *et al.* 1986) numbers are much lower and the bird appears to be generally uncommon in Mozambique on the information available from Köhler and Köhler (1996), Clancey (1997), Parker (1999). However, from a regular series of counts made in the general vicinity of Inhaca Island, Delagoa Bay, during October and November 1976 up to 450 birds were counted in a day. As far north as Beira 60 were seen on 15 December 1972 (Brooke *et al.* 1981), while "large numbers" were seen of the mouth of the Save River in April 1971 (Clancey 1997). Parker (1999) estimates a possible thousand birds for southern Mozambique; however, it is likely that numbers fluctuate annually as elsewhere in the sub-region.

Why, then, did high counts occur in False Bay in December of 1986, 1987, 1988 and 1999 and not in other years? While in Namibia the peak counts occurred in January of 1994, 1996, 2004 and 2005. In the Eastern Cape the highest counts occurred in November 2000 and January 2004. The only peaks reflected at more than one site in the same season were in January 2004; this may be reflecting a season of peak numbers in southern Africa. This variable seasonal distribution can only indicate positive or negative trends in food availability.

Small numbers of austral wintering birds are found from KwaZulu-Natal with occasional concentrations, of up to 250, found on the west coast of the Western Cape and in central Namibia. This is supported by band recoveries between 15 April and the end of August of which 86% (n=19) were made along the west coast (Western Cape and Namibia) with the remaining 14% (n=3) in the Eastern Cape and KwaZulu-Natal, all of the latter were found in the first year of life. The majority of the west coast birds were found in the first three years of life with two in the fourth year and one in the fifth (in Namibia). Two birds in their fifth year that were reported on the same day in mid-May 1918 from the Western Cape probably died earlier and the date shown is likely that of reporting and was not used in this analysis. A bird recovered in its ninth year in May in the Eastern Cape may have been either long dead or the recovery date was that of reporting.

Owing to the continuing movements of this species during its stay in the sub-region it is very difficult to arrive at an overall figure of occurrence and this may vary annually. I would suggest that at its peak a figure of 10-15 000 birds would be a fair estimate for the sub-region but that in poor years there may be fewer than 10 000 present. The Western European population is estimated at 166 000 to 171 000 birds (Delany & Scott 2006) so at peak the birds wintering in southern Africa comprise less than 10% of the overall. Møller (1981) considered that the Sandwich Tern was declining as a visitor to southern Africa (he uses this term to include the coastline from Nigeria to Mozambique) and this may be continuing or it may be that very variable numbers penetrate down the west coast from year-to-year possibly dependent on food resource availability.

Roost sites

Terns form mixed roosts at both diurnal and nocturnal sites. They tend to concentrate at certain points along the coastline with the most important known sites being Mile 4 saltworks (Swakopmund), Walvis Bay saltworks, Sandwich Harbour, Orange River mouth, saltworks and small bays in the St Helena Bay area, Mauritz Bay and Saldanha Bay/Langebaan Lagoon (west Coast), False Bay (Strandfontein to Strand), Mossel Bay, the Kromme and Gamtoos river mouths in St Francis Bay, Cape Recife, mouths of the Swartkops, Sundays, Great Fish, Keiskamma (Eastern Cape), Mvoti,

Mhlali, Mpenjati, Mfolozi and Tugela rivers, Richard's Bay (KwaZulu-Natal) and the Inhaca Island section of Delagoa Bay. Of these Sandwich Harbour, Walvis Bay and Mile 4 saltworks together with Strandfontein sector of False Bay may be the most important southern African sites for Sandwich Tern in certain years, followed by St Francis Bay in the Eastern Cape, which is an important pre-migratory gathering and staging area. Few nocturnal roosting sites for Sandwich Tern have been identified to date with known ones at Mile 4 saltworks, Lambert's Bay harbour, Berg River saltworks, Lourens River mouth (False Bay), Gamtoos mouth and just east of Port Alfred. Some of these roosts may be quite large at times but other major sites have yet to be discovered. It is not known to where the large concentrations found by day at Strandfontein sewage ponds went at night although some, if not all, may have moved to the Lourens River mouth at Strand. The favoured daytime sites at Mile 4 and Walvis Bay saltworks are on the tops of poles in the oyster rearing ponds. There are thousands of these poles available and are used by all tern species present but dominated by the larger birds.

The Sandwich and Swift terns are the first species to gather at a nocturnal site, assembling up to an hour-and-a-half before dark. They then form a gathering point for other later arriving species. The assembly point is either at or close to the final roost site. In tidal areas the birds remain restless and the majority prefer to sit on the damp sand left exposed by the receding tide. When the tide is flowing they may sit further up the beach and on sand dunes when there is spring tide. Birds drift in to diurnal loafing/roost sites throughout the morning and there is minimum feeding activity from mid-day to about 14.00 hours. Use of these daytime sites is very dependent on the feeding regime on any particular day. Movements of terns at night are variable but birds are rarely static and there may be arrivals of birds into a roost site in the middle of the night, possibly following disturbance at another site, after nocturnal fishing or during migration.

Migration

The Sandwich Tern is a west coast migrant arriving from early September in Namibia (M Boorman pers. comm.), reaching the Eastern Cape by late in that month or in early October (Tree 2002). Some of these continue through to KwaZulu-Natal and Mozambique. There are no recoveries of birds of five years of age or older before 7 October (15 September for Angola for a bird in its 16th year) and it is likely that many of the September arrivals are of birds, including some in partial nuptial dress, which may or may not have attempted to breed, but spent the boreal summer further north. Arrival of adults into the sub-region continues until November, and probably later, while birds-of-the-year continue to arrive until March. The earliest recovery of a banded first year bird was in Zone 3, on 6 October, but this was exceptional. Otherwise the earliest recoveries were 5 October for Angola, 16 November for Zone 1, 30 November for Zone 2, 10 December for Zone 4 and 25 November for Zone 5 (the latter as far back as 1951). It is likely that many first year birds continue to arrive into their second calendar year as the rate of recovery of this age group increases with time and there is an upsurge in numbers of immatures in Namibia during February and March. Movement is ongoing throughout the birds stay in southern Africa. Departure from the east begins in January with peak numbers in the Eastern Cape occurring in February and the majority of presumed breeding birds departed by mid-March. In the Western Cape some 5+ year-old birds continue to pass through till the end of the first week of April. There is considerable passage along the Namibian coast from February to April with numbers fluctuating considerably on a daily basis. Non-breeders wander more slowly onto the west coast, where concentrations of up to 250 birds may result during the austral winter, with very small numbers remaining along the east and south coast. There is a faint possibility that a few birds from the eastern populations may reach southern Africa via the east coast as to date there are some 23 records, mostly singletons, from coastal Tanzania (N Baker pers. comm.). This could account for the occurrence of the two birds from the Black and Caspian seas but it is more likely that both followed a west coast route. Black Sea birds winter mainly in the Mediterranean with small numbers penetrating down the west coast to about the Ivory Coast while birds from the Caspian Sea winter mainly in those waters or the north-west Indian Ocean (Cramp 1985). The bird from Crimea was found in Zone 3 nine months after banding and more likely followed a west coast route. The Turkmenistan bird was found at Oranjemund, in southern Namibia, just over three-and-a-half years later and there is the likelihood that it had shifted to a more westerly population and was now following the normal migration route of those birds. This is not unprecedented as a Caspian-born bird was later found in a Danish colony (Møller 1981).

The extreme mobility of birds throughout the season is well shown in Table 3. January is usually considered the best month to count palearctic migrants in non-breeding quarters yet note the bird banded in the Eastern Cape on 11 January 1986 and recovered dead 849 km to the north-east in KwaZulu-Natal only 18 days later. A further bird banded in mid-December 2000 in the Western Cape was controlled 565 km east in the Eastern Cape in late March 2001. Both of these birds were considered to be in their second year.

The Sandwich Tern migrates almost exclusively along the coasts of Europe and Africa rather than heading out to sea (Møller 1981). In Africa the strategy of migration is poorly known but Møller suggests that in Europe they normally travel in small groups, occasionally in flocks of several hundred, just above the surface of the sea and within a few hundred metres of the coast. He also suggests that migration is very leisurely normally averaging much less than 100 km per day. Departure may start as early as June with maximum movement late August/early September and with few remaining by October. For southward migration we have little evidence in Africa, either visually or from weight data, as to whether birds are short-, medium- or long-hop migrants. For northward migration the limited indications from the weight data show that they do not accumulate much lipid and the weight gain prior to departure may be no more than 25-45%. This would be indicative of medium-hop movements along the coast and the gains shown on the central Namibian coast could carry a proportion of the birds to Luanda in Angola in one flight, a distance of about 1450

km. However, birds are also known to stage at sites such as the Cunene mouth (about 670 km north of Walvis Bay) on migration so presumably some make shorter movements but it would appear that sites such as this are purely for resting and that no, or limited, feeding takes place. In such cases it is not known if the birds departed from the central Namibian coastline or bypass it travelling from some point further south such as the Orange River mouth. Arrival at north European waters occurs from mid-March with birds reaching their breeding grounds in large numbers from end of April into May, with immatures into June (Møller 1981, Cramp 1985), birds apparently make a fairly leisurely journey northwards so migration is probably short- and medium-hop with favoured stopping-off points all along the coast. Stopover and flight periods are not known. In southern Africa arrivals and departures appear to occur in both the morning and evening so migration is both diurnal and nocturnal, although Møller (1981) states that it is a typical diurnal migrant although often commencing migration at nightfall. Departure is usually easier to detect than arrival, as the behaviour of the birds is often different. During the 1999 expedition to Namibia some information was collated on migration (Keijl 2003):

Departures

6 March. Mile 4 saltworks. A compact flock of approximately 50 birds took off silently at about 20.00 hours flying north and ascending steeply.

11 March. Langstrand, between Swakopmund and Walvis Bay. At about 07.30 hrs eight birds, calling agitatedly, circled higher and higher until they disappeared into the cloud heading in a generally northerly direction.

11 March. Walvis Bay Yacht Club. Eight birds left at about 19.30 hours calling agitatedly and circling higher and higher until they disappeared into the mist.

18 March. Walvis Bay saltworks. From 18.00-18.05 hours parties of 4, 3, 2 and 3 birds departed towards the NNW. All birds climbed in tight circles calling continuously and rose to about 250-300 m altitude before levelling off. The earliest birds seemingly waited for the following birds to join them as they continued to call all the time.

Apparent arrivals/through migrants

6 March. Mile 4 saltworks. At 17.50 hours six Sandwich Terns were fortuitously discovered through binoculars heading north at an estimated altitude of about 3 000 m in a clear blue sky. These birds may have departed Sandwich Harbour or Walvis Bay a little earlier or, more likely at that altitude may have been ongoing migrants from further south.

11 March. Walvis Bay Yacht Club. At 18.38 hours six birds appeared from the clouds at about 1 500 m altitude and quickly descended. They continued to fly low over the water in a northerly direction possibly looking for a nocturnal roost site.

Some of these indications of active migration were discovered by chance and many more must have passed by unnoticed as the fluctuating numbers of birds at different sites gave the impression of continuous turnover. It is evident, however, that migration in the south takes place at some altitude and not normally at sea level. Some additional observations follow.

5 March 2005. Kromme estuary. Large-scale departure of Sandwich Tern was noted in the morning with excited and noisy calling drawing ones attention to the event. At about 08.30 hours a straggling flock of 100+birds left at an altitude of less than 200 m in a south-westerly direction towards Cape St Francis which, on rounding, they would then head west (pers.obs.).

Lambert's Bay is situated on the open west coast and being well away from major tern haunts is an ideal site to record tern migration. This tiny bay is formed from a small offshore island now connected to the mainland to create a harbour. Terns roost on an inner wall or on the floating pipes of the diamond dredging boats during the day and on the outer harbour wall or the floating pipes at night. Daily turnover of birds occurs and daytime numbers are generally quite low except when passage is taking place. The nocturnal roost forms towards and just after dark so with this normal early arrival of birds one can assume that birds arriving late at night have already travelled some distance to reach such a staging point and the potential range of this flight may be guestimated. Terns leaving the Orange River mouth in the late afternoon/evening should be able to travel the 460 kms to Lambert's Bay in 7-8 hours. On the night of 18/19 November 2003 a small arrival (11 birds caught) of Sandwich Tern was noted between 23.30 and 02.30 hours, none being recorded earlier at the roost site. It was only late on the following night that visible tern migration was witnessed with Common Tern passing over from 23.00 hours at altitudes between 100 and 300 m. The bright lights from several diamond dredging boats in the harbour reflected off their underparts making them easy to view. No Sandwich Terns were identified or caught on this second night but may have been present in more distant flocks. Lengthier movements from anywhere along the coast to the north could also have been occurring as a major release of the huge numbers of Common Tern in central Namibia was taking place due to a warm water event decimating their crustacean prey. (M Boorman, AJ Tree pers. obs).

During the period 8-14 April 2007 visible diurnal migration was recorded daily at Lambert's Bay. Birds arrived between 07.50 and 10.00 hours, rested for a while and had departed again by 11.00 hours. The Sandwich Tern occurred in small numbers (<90 each day) among the much larger numbers of migrating Common Tern, arriving from the south at altitudes between 100 and 300 m. On departure the mixed flocks headed north. Only Common Tern was seen departing in the afternoon. Numbers of Sandwich Tern diminished rapidly after 9 April and by the 14th only one or two were being seen daily. (M Boorman, AJ Tree pers obs).

Band recoveries

The recovery of banded birds in southern Africa is influenced by a variety of factors such as abundance along any stretch of coastline; human population density, which at resort areas peaks in mid-summer; the level of education or prosperity of the local inhabitants; numbers of birds banded in the breeding areas and the presence of scavengers, such as jackal and hyena, on the shoreline (Underhill *et al.* 1999). To

this may be added the effect of reporting due to the escalating high cost of postage.

Recoveries of all ages of banded birds in each of the Zones show a markedly varying pattern (Figure 3). In Namibia this clearly indicates the through passage of the majority of birds with peaks in November and March. In the Western Cape, an important over-summering area, recoveries peak in December and January while those for the southern Cape, a stretch of coastline not generally favoured by terns, show the strong through migrant pattern. The lack of recoveries in February in the Eastern Cape is strange as this is one of the peak months of occurrence in that Zone, while those for KwaZulu-Natal/Mozambique indicate the major months of presence at the end-point of migration.

As has been previously indicated (Møller 1981, Cramp 1985) the proportion of first year birds penetrating this far south is lower than in the Common Tern, which is estimated at about 41% from band returns (and 26% of all birds captured); the equivalent figures for first year Sandwich Tern in the review area are about 22.5% (and 13%) (M Boorman & AJTree). This is not directly comparable with the figure of 45% given by Møller (1981) for band returns as he considered as southern Africa from Nigeria southwards. This latter is obviously influenced by the increased numbers of young birds found from Angola northwards (Fig 3). However, the picture varies considerably between Zones (Table 1) and from different source areas (Table 2). The highest proportion of banded first year birds recovered is from Namibia (29.3%), as would be expected, but with only slightly lower figures for Zones 3, 4 and 5 while Zone 2, with its sometimes very large mid-summer numbers, shows by far the lowest proportion (13.3%). As the birds age there is a greater balancing out with the proportion of birds over two years old being highest in Zone 2 and lowest in Zone 5 but with a small degree of variability. The oldest bird recorded under the Safring scheme was one from Scotland found almost 27 years and 5 months later in the Western Cape. This compares well with the oldest known bird of 30 years and nine months (Staav 2001).

When looking at the source country of the different age groups a strange picture emerges. The large majority of first year birds from England, Scotland and The Netherlands evidently spend their formative year to the north of southern Africa while increased numbers of Irish, Swedish and Estonian birds reach this far south. The highest percentages of first year birds reaching southern Africa come from Germany and Denmark. Considering that there is much movement of birds between western colonies (Cramp 1985) this result seems somewhat surprising. The numbers of recoveries from other source countries may be a little low for analysis. For the four schemes for which I have data (Denmark, western Germany, Sweden and Britain/Ireland) it is obvious that a higher percentage of first year birds remain to the north in Angola, this being especially obvious for British/Irish and Danish-banded birds although care need be taken in reading this as tern hunting along Angolan beaches was high during Portuguese rule, with the more naive youngsters falling most easily to the gun, which may give rise to a synthetic result. By the time that birds have reached an age in excess of three years the proportions remaining to the north have dropped considerably while the proportions of British and Dutch birds visiting southern Africa has peaked. The overall sample is still a little small and these findings are tentative. Cognisance need also be taken of colour band sightings made in 1998 and 1999 in Namibia. A PhD study by Eric Stienen (pers. comm.) led to a large number of young being banded/colour-banded with a year and site code, at Griend in The Netherlands from 1995 to 1997, and the records below give an indication of the proportions of the age groups subsequently sighted. This does not take into consideration subsequent colour band loss, which is likely to be higher with the increasing age of the birds. Several birds were seen with only one of the original two bands, usually the site code, so could not be aged safely.

1998: 17 (71%) from 1995, 5 (21%) from 1996 and 2 (8%) from 1997
1999: 21 (52.5%) from 1995, 9 (22.5%) from 1996 and 10 (25%) from 1997 (Tree 1999)

The very low proportion of first-year birds seen in 1998 reflects the low figure shown for The Netherlands in Table 2 and the increasing proportions from second year show the changing distribution with age.

In Table 3 the banding source country and Zone in which recovery occurred show certain differences.

Birds from most countries are fairly evenly spread around the coastline. In the case of Belgium, The Netherlands, eastern Germany and Estonia there is a greater tendency for birds to stay in Namibia and further south along the west coast. The sample size from Italy is small but only one has penetrated beyond Zone 2. The relatively high proportion of western German birds from Zone 5, albeit old records, is inexplicable but may reflect a changing pattern of distribution around the coastline.

Cause of recovery (Fig. 4) is often ill defined as the majority of records simply indicate ‘found dead’ with no further details. A few indicate that the bird had been dead for varying periods of time. The second largest group are those controlled on purpose either through reading the band numbers in the field with the aid of telescope or by mist-netting. Birds found sick or injured usually have few following details as to whether the bird was left to its fate or was taken into care and subsequently released. Several were killed by vehicles, presumably speeding on the beach, while occasional birds flew into fences or telephone/electricity lines, but how two were killed by fire is difficult to understand. Those trapped unintentionally were usually caught in nets or fishing line lying on the beach while some may have been caught while diving for anglers bait. A few birds were shot for museum specimens but the remainder may have been shot for sport. The few reports of death due to weather, drowning, oiling, red tide or predator is surprising but presumably many of those in the first category would belong here.

CONCLUSION

As with all species of terns in southern Africa much has yet to be learnt. Unfortunately the Sandwich Tern is a species that has proved difficult to capture in adequate numbers

during mist-netting activities and daytime use of cannon-nets would probably result in much greater returns. Further, with such a mobile group as terns it is very difficult to obtain recaptures, especially within one season, to enable one to gather information on the individual throughout a season. The use of alphanumeric bands is probably the best method of tracking the individuals, as has been carried out in recent years in Italy doubling, in one year, the number of Italian recoveries to the sub-region. Hopefully the contribution above will give us a little more understanding of the Sandwich Tern in its southernmost non-breeding quarters.

ACKNOWLEDGEMENTS

I would like to thank the following for their help in bringing the Safring databank up-to-date: Belgium – Walter Roggeman, BTO - Mark Grantham, Denmark – Kjeld Pedersen, Estonia – Kaarel Kaisel, Helgoland – Olaf Geiter, Hiddensee – Ulrich Koppen, The Netherlands – Gert Speek, Russia – Sergei Kharitonov and Sweden – Bo Sallstrom. I would also like to thank Dieter Oschadleus of Safring for the original data, Marius Wheeler of the Avian Demographic Unit and Holger Kolberg of the Ministry of Environment and Tourism for use of all counts collated for the African waterbird census. Not least are those people who have submitted many tern counts over the years, particularly Keith Harrison, Gregg Darling, Alf Taylor and Phil Whittington but also to people who have submitted itinerant counts during this period. And lastly to Mark Boorman, who has shared both his time in the field and his records with me over many years.

REFERENCES

Brooke, R.K., J. Cooper & J.C. Sinclair. 1981. Additional records of seabirds on the coast of southern Mozambique. The Cormorant 9(1): 30-40

Clancey, P.A. 1997. The Birds of Southern Mozambique. African Bird Book Publishing, Westville

Cramp, S. (chief ed). 1985. Handbook of the Birds of Europe the Middle East and North Africa. Vol 4 Terns to Woodpeckers. Oxford University Press, Oxford.

Cyrus, D. & N. Robson. 1980. Bird Atlas of Natal. University of Natal Press, Pietermaritzburg.

Delany, S. and S. Scott. 2006. Waterbird Population Estimates. Wetlands International.

Elliot, C.C.H. 1971. Analysis of the ringing and recoveries of three migrant terns. Ostrich Supplemnt 9: 71-82.

Hofmeyer, J. & F. Krone. 1995. Sandwich Tern at Tulbagh. Promerops 218: 13.

Keijl, G.O. 2003. Departure of terns in spring 1999 from Namibia. Atlantic Seabirds 5(3): 111-118

Kohler, P. & U. Kohler. 1996. The Bazaruto Archipelago, Mozambique, a site of potential international importance for Palearctic waterbirds. Ostrich 67(3&4): 165-167

Møller, A.P. 1981. The migration of European Sandwich Terns Sterna s. sandvicensis. L. Die Vogelwarte 31: 74-94 and 149-168

Parker, V. 1999. The Atlas of the Birds of Sul do Save, Southern Mozambique. Avian Demography Unit, Cape Town.

Ryan, P. G., J. Cooper, P.A.R. Hockey and A. Berruti. 1986. Waders (Charadrii) and other water birds on the coast and adjacent wetlands of Natal. Lammergeyer 36: 1-33.

Staav, R. 2001. Complimentary longevity list of birds ringed in Europe. Euring Newsletter 3: 40-43

Tree, A.J. 1998. Terns on the Namibian coast in early 1998. Safring News 27(1 & 2): 7-11

Tree, A.J. 1999. The 1999 tern and wader expedition to Namibia. Safring News 28(1 & 2): 3-8

Tree, A.J.. 2002. An analysis of tern counts from the Eastern Cape coastline. *Bee-eater* 53(1): 3-11

Tree, A.J. 2005. Tern status report for the Eastern Cape, 2003/2004. *Bee-eater* 56(1): 6-11

Tree, A.J. *In* HOCKEY PAR, DEAN WRJ, RYAN PG (eds). 2005. Sandwich Tern *pp* 455-456. *Roberts – Birds of Southern Africa*, VIIth ed. The Trustees of the John Voelker Bird Book Fund, Cape Town.

Tree, A.J., & M. Boorman. 2006. A mini tern expedition to the Namibian coast in October/December 2005. *Afring News* 35 (1&2): 9-12.

Underhill, L.G. & D.A. Whitelaw. 1977. An ornithological expedition to the Namib coast. Summer 1976/77. Western Cape Wader Group, Cape Town.

Underhill, L.G., A.J. Tree, H.D. Oshadleus and V. Parker. 1999. Review of ring recoveries of waterbirds in southern Africa. Avian Demography Unit, University of Cape Town.

Vanderwalle, F.J. 1988. Origins and migration routes of some palaearctic terns wintering in Africa south of the Zambesi and Cunene Rivers. Le Gerfaut 78: 131-150.

Addendum. Peak counts of Sandwich Tern in southern Africa, by zone and month.

Limit	Month	Year	Count	Locality
Namibia (Zone 1)				
>100	July	2007	112	Walvis Bay
	July	2005	145	Walvis Bay
	July	2003	193	Walvis Bay
	July	2004	250	Sandwich Harbour
	August	2002	200	Walvis Bay
>150	October	2005	175	Walvis Bay
	October	1997	830	Cape Cross
>200	November	2005	240	Dolphin Park area
	November	2005	480	Mile 4 saltworks
>500	December	1999	525	Sandwich Harbour
	January	1998	523	Mile 4 saltworks
	January	2004	567	Walvis Bay
	January	2007	715	Walvis Bay
	January	1999	836	Sandwich Harbour
	January	2005	1807	Walvis Bay
	January	2004	2200	Sandwich Harbour
	January	1996	2500	Conception Bay
	January	1994	3792	Sandwich Harbour
	February	1993	652	Sandwich Harbour
	February	1998	700	Walvis Bay
	February	2000	717	Sandwich Harbour
	February	2007	755	Mile 4 saltworks
	February	1998	800	Mile 4 saltworks
	February	2005	5400	Sandwich Harbour
>200	March	1998	280	Mile 4 saltworks
	March	1999	300+	Walvis Bay
>100	April	2005	150	Sandwich Harbour
Namibia/N Cape (Zones 1/2)				
>100	January	2002	111	Orange estuary
	January	2001	112	Orange estuary
	February	2001	122	Orange estuary
	February	2003	202	Orange estuary
	February	2004	602	Orange estuary
W Cape - west coast (Zone 2)				
>20	July	2006	48	Wadrif saltpan
	August	2004	30	Berg River
	September	2003	40	Mauritz Bay
	October	2004	190	Berg River
>100	October	2007	500	Berg River
	November	2003	124	Lambert's Bay
	January	1999	101	Berg River
	January	2006	130	Saldanha mussel rafts
	January	2003	141	Modder estuary
	February	1998	189	Modder estuary
	February	2002	1474	Langebaan Lagoon (all)
	March	2006	175	Mauritz Bay
	March	2006	250	Saldanha mussel rafts
	April	2006	160	Mauritz Bay
	April	2005	320	Berg River
	April	2007	470	Berg River
>20	May	2005	250	Berg River
	June	2004	195	Berg River
W Cape - southwest (Zone 2)				
>20	July	1995	25	Botriviervlei
	September	1987	20	Strandfontein Sewage Works

>100	October	2000	270	Lourens River mouth
	October	1992	305	Strandfontein Sewage Works
	October	1997	309	Strandfontein Sewage Works
>200	November	1984	370	Strandfontein Sewage Works
	November	1999	377	Strandfontein Sewage Works
	November	2002	395	Strandfontein Sewage Works
	November	1993	422	Strandfontein Sewage Works
	November	1983	700	Strandfontein Sewage Works
	December	1995	271	Strandfontein Sewage Works
>500	December	1987	1122	Strandfontein Sewage Works
	December	1988	1122	Strandfontein Sewage Works
	December	1999	2200	Strandfontein Sewage Works
	December	1986	3027	Strandfontein Sewage Works
	January	1987	515	Strandfontein Sewage Works
	January	1994	586	Strandfontein Sewage Works
	January	1989	1678	Strandfontein Sewage Works
	February	2003	500	Botriviervlei
	February	2004	600	de Mond NR
	February	1989	606	Strandfontein Sewage Works
	February	1987	761	Strandfontein Sewage Works
	February	1996	951	Botriviervlei
	February	1984	2620	Strandfontein Sewage Works
>50	March	2005	61	Duivenhoks mouth
	March	2004	65	Botriviervlei
	March	2000	284	Strandfontein Sewage Works
	March	1990	308	Strandfontein Sewage Works
	April	1994	206	Strandfontein Sewage Works
>10	June	2003	12	Botriviervlei
W Cape - south coast (Zone 3)				
>50	January	2004	70	Keurbooms estuary
	January	2005	169	Keurbooms estuary
	February	2002	100	Keurbooms estuary
	March	2003	145	Keurbooms estuary
E Cape (Zone 4)				
>10	July	1998	11	Swartkops estuary
	July	2000	16	Kabeljous
	July	1992	21	Swartkops estuary
>20	September	2002	28	Cape Recife
	September	1999	145	Gamtoos estuary
>50	October	2004	61	Cape Recife
	October	2002	72	Cape Recife
	October	2002	80+	Riet Point
	October	2004	91	Cape Recife
	October	2004	100	Sunday's estuary
	October	2003	140	Riet Point
	October	2000	145	Cape Recife
	October	2001	170	Cape Recife
>200	November	2004	255	Keiskamma estuary
	November	2000	260	Kromme estuary
	November	2001	360	Cape Recife
	November	1999	520	Gamtoos estuary
	November	2000	800+	Gamtoos estuary
	January	2004	250	Gamtoos estuary
	January	2004	260	Kabeljous
	January	2004	570	Kromme estuary
	February	2005	200	Kromme estuary
	February	2002	210	Kei River mouth
	February	2006	220	Cape Recife
	February	2007	221	Kromme estuary
	February	1994	316	Swartkops estuary

	February	1998	350	Swartkops estuary
	February	2001	590	Gamtoos estuary
	March	2005	410	Kromme estuary
>20	April	2004	20	Riet Point
	April	2001	21	Cape Recife
	April	2001	22+	Kabeljous
	April	2006	45	Seaview
	April	2002	85	Cape Recife
	April	2005	140	Kromme estuary
>10	May	2006	13	Cannon Rocks
	May	1999	21	Riet Point
	June	2002	21	Cape Recife
KwaZulu-Natal (Zone 5)				
>10	July	2005	10	Trafalgar Marine Reserve
	July	2005	50	Mpenjati estuary
	August	2006	30	Mvoti estuary
>50	December	1981	76	Lovu estuary
	December	1981	81	Nyoni-Matigulu estuary
	December	1981	94	Mhlali estuary
	December	1981	120	Mvoti estuary
	January	2000	50	St Lucia (all)
	January	2005	50	Trafalgar Marine Reserve
	January	1996	59	Richard's Bay
	January	1998	63	Richard's Bay
	January	1994	81	Richard's Bay
	January	2002	105	St Lucia (all)
	January	2005	110	Mpenjati estuary
	January	2003	141	Richard's Bay
	January	2007	500	Mfolozi estuary
	February	2007	50	Trafalgar MR
	February	2004	55	Richard's Bay
	February	2007	75	Mpenjati estuary
	February	1997	80	Tugela estuary
	February	2005	136	Mfolozi estuary
	February	2006	200+	Casuarina, Richard's Bay
>10	April	2004	19	Mpenjati estuary
	June	2006	30	Mpenjeti estuary
Mozambique (Zone 6)				
	October	1974	450	Inhaca Island
	November	1974	350	Inhaca Island
	December	1972	60	Beira
	January	1998	12	Bazaruto Island

SHOREBIRDS AND THEIR KNOWN HABITAT/STATUS IN THE GASCOYNE REGION, WESTERN AUSTRALIA

LES GEORGE
Box 897, Carnarvon, Western Australia 6701

INTRODUCTION

The study area includes approximately 800km of coastline including islands, between the communities of Coral Bay (113° 45'E 23° 45'S) in the north and beyond Useless Loop (113° 09'E 26° 15'S) in the south. It includes the larger towns of Denham and Carnarvon, Lake MacLeod, riverine pools and ephemeral clay pan habitat (Figures 1 & 2). The permanent population of Coral Bay is less than 100 but is boosted by the annual influx of tourists, the privately operated mining town Useless Loop has a population of 120, Denham approximately 850 and the largest town, Carnarvon, 6240, this excludes outlying populations of other small business and pastoral leases. The Shire of Carnarvon administers the north of the study area while the Shire of Shark Bay (Denham) administers the southern portion. The shire draws its name from the waters surrounding the area and begins 13 km south of 26th parallel on the northern border of Carbla Station (pastoral lease) and encompasses the southern section of the survey area. Much of the shire is within the Shark Bay World Heritage Area which covers 2.2 million hectares, about 70% of which is marine, and has about 1500 km of coastline. Within the World Heritage Area boundary there are several different types of land tenure, including national parks, nature reserves and conservation parks, pastoral leases, unallocated crown land, shire reserves, and freehold (private) land. World Heritage listing does not alter tenure or take away land ownership rights or control. The mining lease of Useless Loop is excluded from the World Heritage area. Much of this coastline remains unsurveyed by the author so only areas that were known will be expanded upon. The region is semi arid with an average annual rainfall of 230mm and a mean average maximum winter temperature of 23°C (lowest 2.4°C) and mean average summer maximum of 32.5°C (highest 47.7°C) recorded at Carnarvon Bureau of Meteorology. There were at least 48 wader species recorded in the region of which 33 were migratory, 32 were listed under JAMBA (Japan-Australia Migratory Bird Agreement) and CAMBA (China-Australia Migratory Bird Agreement), since the inception of Republic of Korea and Australia Migratory Bird Agreement (ROKAMBA) another species officially recognised has been added bringing the total to 33.

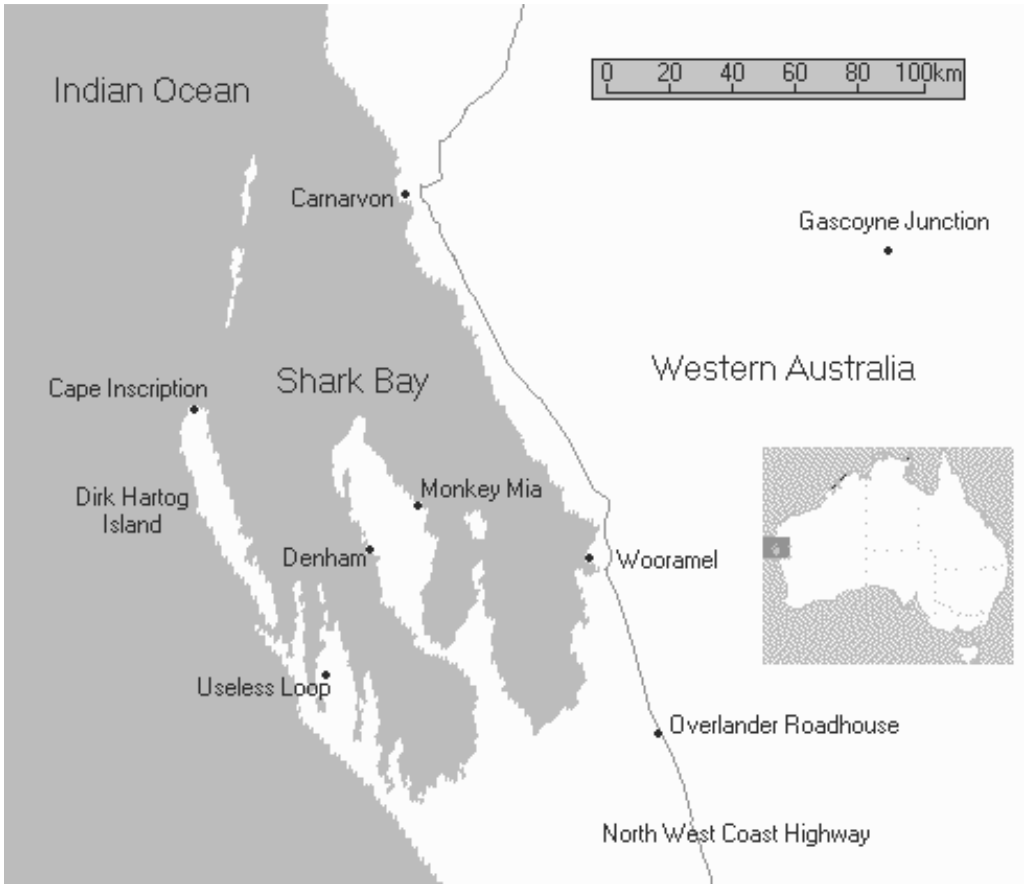


Figure 1. Map of Shark Bay, Western Australia.

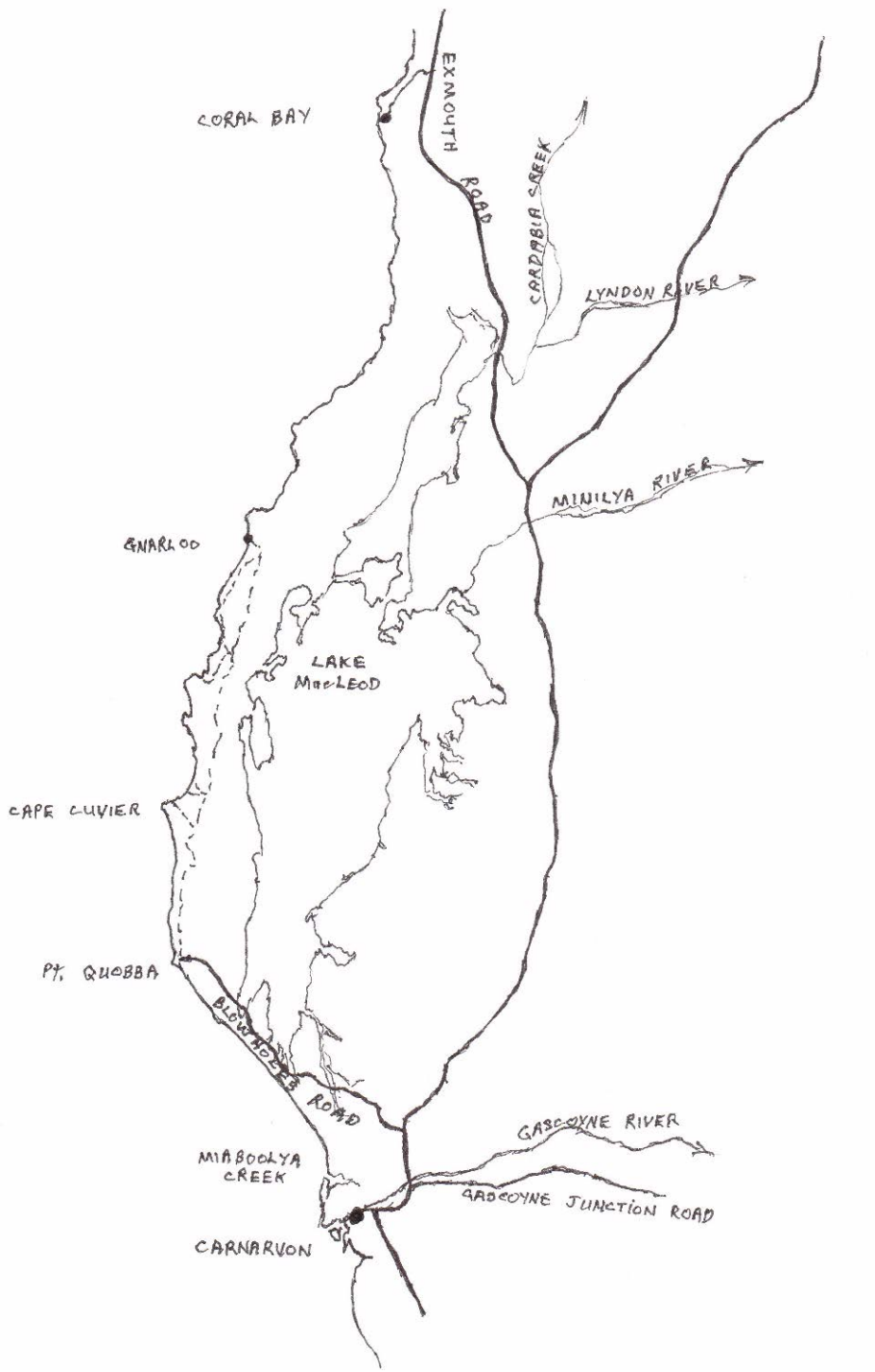


Figure 2. Map of Lake MacLeod

METHOD

Data was collected during personal surveys using binoculars and telescope in most cases, not all sites were visited equally, and much of the area not at all. A monitoring program of Lake MacLeod was initiated by Dampier Salt Limited (DSL) as part of the 'Bird watch Project', a partnership between Rio Tinto, DSL and Birdlife International of which I have participated since January 2002. Some counts data is available in the literature.

COUNT REPORTS

Coral Bay south to Cape Cuvier

Little known about this stretch of coast which consists of largely sandy beaches in the northern reaches and some precipitous rocky coastline interspersed with small sandy beaches to the south. No areas were predicted to attract significant numbers of shorebirds.

Lake MacLeod

This lake is situated 10 km inland from the coast and approximately130 km long and 40 km across at its widest point (Figure 2). The lake surface is usually dry but after sufficient rainfall water can flow into it from the Minilya and Lyndon Rivers from the north or from the south through Cardabia and Boolathana Creeks. Two permanent water bodies occur in the north, Cygnet & Ibis Pond, collectively termed "the northern ponds". These ponds were unique in that they were fed water from the sea through subterranean flaws, up-welling through 'vents' in the lake floor and one of few places in the world with inland mangroves *Avicennia marina*. Many of these mangroves drowned during a flood event in 2000. The 'flood sheet' formed after rainfall can have a dramatic affect at opposing ends of the lake, a dry bed can be found to be under several centimetres as the wind shifts the water around the lake. This phenomenon is also common around the ponds with shifting water levels, there is no known evidence that sea tides have any influence on water levels but it may have. Lower than normal levels may be caused by brine extraction from the south of the lake for solar salt production. The surface of lake here is also changeable with much of it unstable soft sediment, some with a harder overlay that can be treacherous and making surveys difficult. Most surveys were conducted at various points around Cygnet Pond; access has been by motorised aluminium or inflatable dingies and thereafter by foot where possible. Some areas accessed one year were found inaccessible the next. Ibis Pond is too shallow for watercraft and due to soft sediments is mostly inaccessible.

A draft plan was drawn up to nominate this area for Ramsar listing but was curtailed after strong opposition from pastoralists. Jaensch & Vervest (1990) reported 41,606 birds at Lake MacLeod during their September 1987 visit and established the lake as an important staging area for Curlew Sandpiper on their southern migration. Bird surveys were conducted in November 1999, September 2000, October 2001, January & September 2002, March & October 2003, March & November 2004, September 2005 and October 2006 (Davis 2003; Hassell 2005) (Table 1). Colin Davis led surveys till November 2004, those after by Chris Hassell. Waterfowl and shorebird number fluctuate markedly in some years, mostly due to climatic conditions or the result of climatic conditions such as the flood event of 2000.

Table 1. Lake MacLeod count records 1999 to 2006

Scientific name	**Common name**	Nov-99	Sep-00	Oct-01	Jan-02	Sep-02	Mar-03	Oct-03	Mar-04	Nov-04	Sep-05	Oct-06
Limosa limosa	Black-tailed Godwit	14	0	12	0	0	0	0	66	1	0	0
Limosa lapponica	Bar-tailed Godwit	386	18	60	54	160	3	26	65	50	1	26
Numenius madagascariensis	Eastern Curlew	0	1	0	0	0	0	0	0	0	0	0
Tringa stagnatilis	Marsh Sandpiper	3	0	43	0	10	2	1	0	3	0	0
Tringa nebularia	Common Greenshank	235	300	120	30	40	72	70	62	270	112	132
Tringa glareola	Wood Sandpiper	3	0	0	0	0	0	0	0	2	5	0
Xenus cinereus	Terek Sandpiper	0	0	2	0	0	0	0	0	4	0	0
Actitis hypoleucos	Common Sandpiper	6	2	5	2	2	7	20	2	11	11	16
Heteroscelus brevipes	Grey-tailed Tattler	2	0	1	0	0	0	0	0	13	0	0
Arenaria interpres	Ruddy Turnstone	37	10	50	2	25	2	3	6	38	14	26
Calidris tenuirostris	Great Knot	21	39	38	0	75	10	60	83	260	1	0
Calidris canutus	Red Knot	137	8	660	0	515	187	668	150	250	2	278
Calidris alba	Sanderling	1	1	0	0	0	0	0	0	5	3	0
Calidris minuta	Little Stint	2	0	0	0	0	0	1	1	1	0	0
Calidris ruficollis	Red-necked Stint	2350	6000	4	250	3340	6206	6440	6000	7750	4	25000
Calidris subminuta	Long-toed Stint	0	0	0	0	0	0	0	1	1	1	0
Calidris melanotos	Pectoral Sandpiper	0	0	0	0	0	0	0	1	0	0	0
Calidris acuminata	Sharp-tailed Sandpiper	214	100	21	3	50	23	205	8	850	295	129
Calidris ferruginea	Curlew Sandpiper	18392	40000	2000	70	8000	16690	26283	485	45000	1066	55000
Limicola falcinellus	Broad-billed Sandpiper	1	0	0	0	3	0	0	30	0	0	0
Phalaropus lobatus	Red-necked Phalarope	0	0	0	0	0	0	0	0	0	0	17
Haematopus longirostris	Australian Pied Oystercatcher	6	2	2	1	6	6	6	6	8	2	24
Himantopus himantopus	Black-winged Stilt	5	500	284	530	1000	79	885	230	850	3008	60
Cladorhynchus leucocephalus	Banded Stilt	2042	8000	0	600	6000	15645	16204	1	100000	25700	9000
Recurvirostra novaehollandiae	Red-necked Avocet	0	70	0	402	346	778	214	28	2315	1240	600
Pluvialis fulva	Pacific Golden Plover	3	0	5	0	1	0	0	0	4	0	0
Pluvialis squatarola	Grey Plover	31	0	40	0	14	18	5	60	21	10	7
Charadrius ruficapillus	Red-capped Plover	114	500	24	70	300	454	442	400	3125	402	2027
Charadrius mongolus	Lesser Sandplover	3	0	0	0	17	0	4	0	0	1	0
Charadrius leschenaultii	Greater Sandplover	12	0	3	0	35	3	6	0	515	18	68
Charadrius veredus	Oriental Plover	33	0	12	0	0	0	0	0	3	0	9
Charadrius australis	Inland Dotterel	0	0	0	0	0	0	0	6	0	0	0
Erythrogonys cinctus	Red-kneed Dotterel	0	0	0	0	14	2	5	0	0	1	0
Vanellus tricolor	Banded Lapwing	0	4	0	0	3	0	0	0	0	0	0
Turnix velox	Little Button-Quail	0	0	0	0	0	0	0	0	0	0	0

Button-Quail *Turnicidae* have recently been added to the order Charadriiforms so were included here. Bush Stone-Curlew *Burhinus grallarius* have also been seen in the area but not during surveys.

Flag sightings

Banded birds with leg flags from Victoria, Broome, Chongming Dao and Hong Kong were seen. Orange Victorian flags were the most common, followed by yellow flagged birds from Broome, white over yellow from Hong Kong followed by white over black from Chongming Dao, China. Curlew Sandpiper were the most common with Victorian, Hong Kong and Broome flags, Red Knot with Broome flag and Bar-tailed Godwit with Chinese flags. There has also been one bird, a Red-necked Stint seen with a single white flag on right tibia, this bird was deemed most likely to have been flagged in Chongming Dao but having lost the black flag. Now that a white flagged bird from New Zealand has been recorded in Broome it cannot be certain that this bird was not also of the same flagging region.

Cape Cuvier south to Point Quobba

Mostly rocky coastline with some stretches of sandy beach with shorebirds found in small numbers throughout this area. A species list is provided in Table 2. No roosts containing significant numbers were found.

Point Quobba south to Carnarvon

Mostly sandy beaches, mangroves were found at Miaboolya Creek eight km north of Carnarvon and continue down the coast till meeting the Gascoyne River mouth. Shorebirds feed within mangrove and marshy habitat of this creek and on the mud and sand flats where the mouth reaches the sea. Access to the coastal strip south of Miaboolya Creek and north of the river mouth is difficult and shorebird usage within mangroves or marsh areas not assessed. The highest count record between 2004-2008 is shown in Table 3. Red-necked Stint, Black-winged Stilt, Red-capped Plover and Greater Sand Plover were the most numerous.

Table 2. Shorebird species found from Cape Cuvier to Point Quobba

Scientific name	Common name
Numenius madagascarensis	Eastern Curlew
Numenius phaeopus	Whimbrel
Tringa nebularia	Common Greenshank
Actitis hypoleucos	Common Sandpiper
Tringa brevipes	Grey-tailed Tattler
Arenaria interpres	Ruddy Turnstone
Calidris tenuirostris	Great Knot
Calidris canutus	Red Knot
Haematopus longirostris	Australian Pied Oystercatcher
Haematopus fuliginosus	Sooty Oystercatcher
Himantopus himantopus	Black-winged Stilt
Pluvialis fulva	Pacific Golden Plover
Pluvialis squatarola	Grey Plover
Charadrius leschenaultii	Greater Sand Plover

Carnarvon environs

High tide roosts exist on opposing sides of the former southern arm of the Gascoyne River; these roosts were regularly surveyed since February 2002 (Figure 3). Pickles Point referred to as 'Boat Harbour' is regularly used by larger shorebirds such as Bar-tailed Godwit, Knots and Common Greenshank (Table 4). It is bounded by larger mangroves that form a barrier from southerly winds with open water interspersed with smaller mangroves prior to the shoreline and a bank of smaller mangroves to the west. Large expanses of the mud flats exposed or accessible to shorebirds at low tides occur from this point southward for at least 30km.

Pelican Point has also been regularly surveyed since

Table 3. Shorebirds found at Miaboolya Creek, maximum count 2004-2008.

Scientific name	Common name	Maximum count 2004-2008
Limosa lapponica	Bar-tailed Godwit	18
Numenius phaeopus	Whimbrel	2
Numenius madagascariensis	Eastern Curlew	3
Tringa nebularia	Common Greenshank	12
Tringa glareola	Wood Sandpiper	1
Xenus cinereus	Terek Sandpiper	1
Actitis hypoleucos	Common Sandpiper	10
Tringa brevipes	Grey-tailed Tattler	18
Calidris cautus	Red Knot	1
Calidris tenuirostris	Great Knot	21
Calidris alba	Sanderling	48
Calidris ruficollis	Red-necked Stint	181
Calidris acuminata	Sharp-tailed Sandpiper	26
Calidris ferruginea	Curlew Sandpiper	10
Haematopus longirostris	Australian Pied Oystercatcher	17
Himantopus himantopus	Black-winged Stilt	220
Recurvirostra novaehollandiae	Red-necked Avocet	2
Pluvialis fulva	Grey Plover	4
Pluvialis ruficapillus	Red-capped Plover	196
Charadrius leschenaultii	Greater Sand plover	130
Erythrogonys cinctus	Red-kneed Dotterel	6

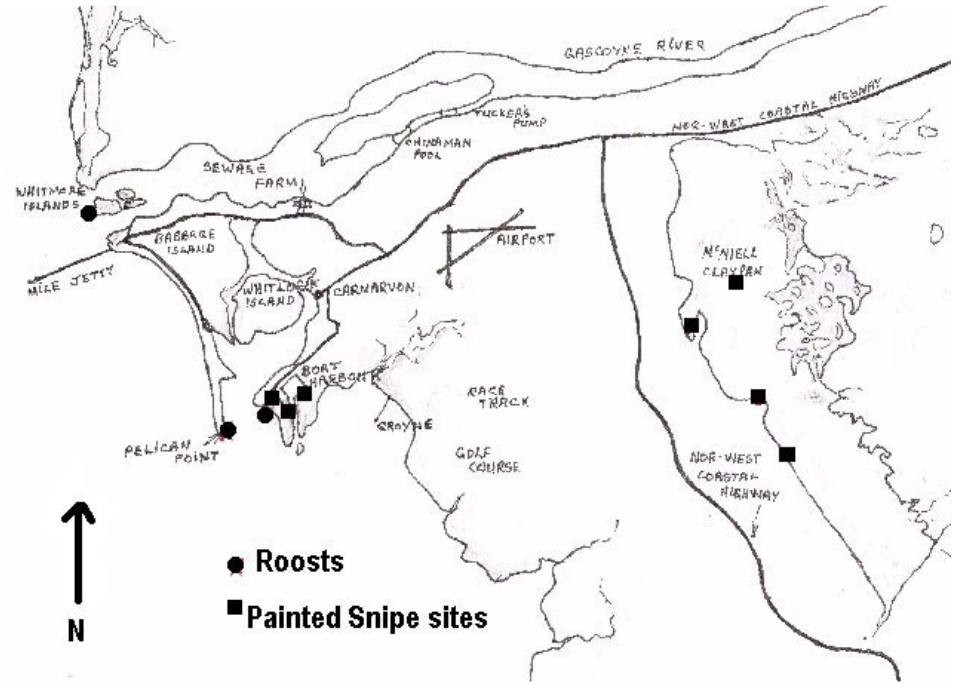


Figure 3. Map of roost and count sites around Carnarvon, Western Australia.

February 2002 and is a sandy promontory with the open ocean to the west with estuarine water to the east. This site is favoured by Greater Sandplover and smaller shorebirds but is often used by Bar-tailed Godwit also, especially at 'spring' tide intervals that leave very little open space at the Boat Harbour roost (Table 5). Recent surveys in February found Greater Sand Plover to have abandoned the Pelican Point roost site and were found roosting on sandbars off Whitmore Islands in the Gascoyne River mouth. The reason for this is unknown. Will they return here on southern migration?

Chinaman Pool and Tucker's Pump were pools in the Gascoyne River that have also been surveyed regularly,

Table 4. Shorebird counts - Boat Harbour, maximum count 2002-2008.

Scientific name	Common name	Maximum count 2002-2008
Limosa limosa	Black-tailed Godwit	1
Limosa lapponica	Bar-tailed Godwit	1000
Numenius phaeopus	Whimbrel	112
Numenius madagascariensis	Eastern Curlew	116
Tringa totanus	Common Redshank	1
Tringa stagnatilis	Marsh Sandpiper	1
Tringa nebularia	Common Greenshank	52
Xenus cinereus	Terek Sandpiper	31
Actitis hypoluecos	Common Sandpiper	3
Tringa brevipes	Grey-tailed Tattler	424
Arenaria interpres	Ruddy Turnstone	2
Limnodromus semipalmatus	Asian Dowitcher	2
Calidris canutes	Red Knot	146
Calidris tenuirostris	Great Knot	112
Calidris alba	Sanderling	15
Calidris ruficollis	Red-necked Stint	413
Calidris acuminata	Sharp-tailed Sandpiper	46
Calidris ferruginea	Curlew Sandpiper	560
Limicola falcinellus	Broad-billed Sandpiper	2
Haematopus longirostris	Australian Pied Oystercatcher	6
Himantopus himantopus	Black-winged Stilt	2
Cladorhynchus leucocephalus	Banded Stilt	5
Recurvirostra novaehollandiae	Red-necked Avocet	6
Pluvialis fulva	Grey Plover	16
Pluvialis ruficapillus	Red-capped Plover	30
Charadrius mongolus	Lesser Sand Plover	1
Charadrius leschenaultii	Greater Sand Plover	312

Table 5. Shorebird counts for Pelican Point. Maximum count 2002-2008.

Scientific name	Common name	Maximum count 2002-2008
Limosa lapponica	Bar-tailed Godwit	751
Numenius phaeopus	Whimbrel	1
Numenius madagascariensis	Eastern Curlew	6
Tringa tetanus	Common Redshank	1
Xenus cinereus	Terek Sandpiper	10
Tringa brevipes	Grey-tailed Tattler	386
Arenaria interpres	Ruddy Turnstone	4
Calidris canutes	Red Knot	175
Calidris tenuirostris	Great Knot	75
Calidris alba	Sanderling	62
Calidris ruficollis	Red-necked Stint	850
Calidris acuminata	Sharp-tailed Sandpiper	16
Calidris ferruginea	Curlew Sandpiper	300
Limicola falcinellus	Broad-billed Sandpiper	1
Haematopus longirostris	Australian Pied Oystercatcher	4
Himantopus himantopus	Black-winged Stilt	16
Pluvialis fulva	Grey Plover	6
Pluvialis ruficapillus	Red-capped Plover	42
Charadrius mongolus	Lesser Sand Plover	2
Charadrius leschenaultii	Greater Sand Plover	319

mostly as some species found there were non-flocking or fresh water specialists (Table 6). The river base is mostly coarse sand with some mud and areas of Typha and other reeds.

Carnarvon sewage treatment ponds were also visited and were favoured by fresh water species (Table 7).

McNeill Claypan is a large ephemeral water body six km south east of Carnarvon. This system may be dry in most years but hosts a large number of waterfowl and some waders when flooded (Table 8). Water enters this system after rainfall, more from heavier rains causing run off rather than light rains which have more time to soak in to surrounding soils. This can be from cold fronts bringing winter rains or from summer rains, storms or from cyclones, water levels dependant on quantity rainfall/run off. The greatest inundations usually occur after cyclonic activity and rain may not even fall locally but come from the Gascoyne River catchment 480km inland. This catchment is 68,326 square kilometres and after heavy rainfall events we can experience floods; it was such a major flood that inundated Lake MacLeod in 2000 and drowning many mangroves. Large expanses of spike rush and other low vegetation cover the claypan as water recedes leaving only the deeper channels. Shorebirds were mainly found there during the drying phase as water levels drop.

This is a fresh water wetland surrounded by Coolibahs (*Eucalyptus victrix*) and some patches of Sedge (*Cyperus spp.*) with acacia scrubland beyond. The central basin is covered by Common Spike Rush (*Eleocharis acuta*), the areas of deeper water and inner channels were lined with (*Sesbania cannabina*) as water levels decrease, much of the outer areas were covered by Rat-tailed Couch (*Sporobolus virginicus*) and various other herbs such as (*Stemodia viscosa*) while much of the northern area was covered by

Table 6. Shorebird counts for Chinaman Pool/Tucker's Pump, maximum count 2002-2008

Scientific name	Common name	Maximum count 2002-2008
Gallinago stenura	Pin-tailed Snipe	1
Numenius madagascariensis	Eastern Curlew	1
Tringa nebulara	Common Greenshank	14
Tringa glareola	Wood Sandpiper	34
Actitis hypoluecos	Common Sandpiper	25
Calidris canutes	Red Knot	2
Calidris ruficollis	Red-necked Stint	78
Calidris subminuta	Long-toed Stint	1
Calidris ferriginea	Curlew Sandpiper	5
Philomachus pugnax	Ruff	1
Himantopus himantopus	Black-winged Stilt	56
Recurvirostra novaehollandiae	Red-necked Avocet	6
Pluvialis fulva	Pacific Golden Plover	3
Pluvialis ruficapillus	Red-capped Plover	12
Elseyornis melanops	Black-fronted Dotterel	171
Erythrogonis cinctus	Red-kneed Dotterel	17

Table 7. Shorebird counts for Sewage Treatment Ponds, maximum count 2002-2008.

Scientific name	Common name	Maximum count 2002-2008
Limosa limosa	Black-tailed Godwit	1
Limosa lapponica	Bar-tailed Godwit	1
Tringa stagnatilis	Marsh Sandpiper	2
Tringa nebulara	Common Greenshank	5
Tringa grareola	Wood Sandpiper	12
Xenus cinereus	Terek Sandpiper	1
Actitis hypoleucos	Common Sandpiper	18
Heterosceles brevipes	Grey-tailed Tattler	11
Calidris ruficollis	Red-necked Stint	7
Calidris melanotus	Pectoral Sandpiper	2
Calidris acuminata	Sharp-tailed Sandpiper	1
Calidris ferruginea	Curlew Sandpiper	4
Philomachus pugnax	Ruff	1
Himantopus himantopus	Black-winged Stilt	42
Cladhorynchus leucocephalus	Banded Stilt	2
Recurvirostra novaehollandiae	Red-necked Avocet	5
Pluvialis ruficapillus	Red-capped Plover	2
Elseyornis melanops	Black-fronted Dotterel	19
Erythrogonis cinctus	Red-kneed Dotterel	4

Table 8. Shorebird counts for MacNiell Claypan, maximum count 2002-2008.

Scientific name	Common name	Maximum count 2002-2008
Limosa limosa	Black-tailed godwit	2
Numenius minutes	Little Curlew	3
Tringa nebulara	Common Greenshank	17
Tringa glareola	Wood Sandpiper	26
Actitis hypoleucos	Common Sandpiper	2
Calidris ruficollis	Red-necked Stint	25
Calidris subminuta	Long-toed Stint	6
Calidris acuminata	Sharp-tailed Sandpiper	23
Philomachus pugnax	Ruff	2
Rostratula australis	Australian Painted Snipe	30+
Himantopus himantopus	Black-winged Stilt	200
Cladorhynchus leucocephalus	Banded Stilt	10
Recurvirostra novaehollandiae	Red-necked Avocet	48
Pluvialis ruficapillus	Red-capped Plover	18
Elseyornis melanops	Black-fronted Dotterel	22
Erythrogonis cinctus	Red-kneed Dotterel	270
Glareola maldivarum	Oriental Pratincole	7

Northern Bluebush (*Chenopodium auricomum*).

The Festival Grounds were grassed playing fields, some shorebird species were found there (Table 9).

Flags

Banded birds with leg flags were recorded from three locations, Victoria, Broome, Western Australia and Chongming Dao, China.

Species found with Victorian (orange) flags were Red-necked Stint, Curlew Sandpiper, Great Knot and Red Knot; those from Broome (yellow flag) included Eastern Curlew and Red Knot, while Great Knot, Bar-tailed Godwit and Curlew Sandpiper were sighted with Chongming Dao, China (white over black) flags. The Curlew Sandpiper also had an orange flag, this 'double journey' bird able to be individually recognised, as this species is uncommon in China.

Two further species were recorded in this sector, (2) Bush Stone-Curlew (*Burhinus* grallarius) and (1) Australian Pratincole (*Stiltia isabella*) both found on the pastoral lease of Boolathana Station.

Carnarvon south to New Beach

This area is not well known, the coastal margin is almost entirely covered by mangroves, the mangrove fringe extending as much as two km from the coast in the northern sector and six km south of Carnarvon. From about 25° or 15 km south of Carnarvon there were expanses of tidal marshland beyond the mangrove fringe where shorebirds can be readily seen and surveyed. The most productive areas for birds or for roost sites were not determined although some areas were visited on a number of occasions and the prospects were promising. The most often visited a small tidal inlet roost north of Uendoo Creek, with another small roost site at Bush Bay.

Table 9. Shorebird counts for the Festival Grounds, maximum count 2002-2008.

Scientific name	Common name	Maximum count 2002-2008
Numenius minuta	Little Curlew	7
Vanellus tricolor	Banded Lapwing	77
Himantopu himantopus	Black-winged stilt	5
Pluvialis ruficapillus	Red-capped Plover	1
Pluvialis squatarola	Pacific Golden Plover	13
Elseyornis melanops	Black-fronted Dotterel	2
Glareola maldvarnum	Oriental Pratincole	2

New Beach south to Wooramel River

An area yet to be surveyed and of unknown potential.

Bernier & Dorre Islands

These islands were in the Carnarvon Shire and were part of the Shark Bay World Heritage area, some species of shorebirds utilised these islands that had rocky coastline and high-energy seas.

Fauri Island

This island has not been surveyed but has high potential for shorebirds.

Debaut Point & Debaut Creek

Anecdotal information has been received that shorebirds occur here but the area was not formally surveyed.

Monkey Mia

Small numbers of shorebirds feed and roost in this sandy shoreline.

Guishenault Point

Visited on one occasion and found good numbers of shorebirds. There were some mangroves and a small tidal creek surrounded by a large area of course sands and shell grit.

Little Lagoon

The inlet to this lagoon was sometimes used as a roost by Pied Oystercatchers while the sandy mud flats out from the mouth were used by a variety of shorebirds.

Useless Inlet

This area is utilised by Shark Bay Salt for reduction of seawater to brine for solar salt production. One visit was made to this area with few shorebirds found, Banded Stilt that were there just days before had departed after rain.

Mangrove Creek

This area was adjacent to Useless Inlet and reasonable numbers of shorebirds inhabited the mangroves and tidal flats.

Dirk Hartog Island

Not visited and of unknown potential.

Steep Point

There is potential for some shorebirds on the west side of Bellefin Prong, west of Useless Inlet and perhaps the three bays on the west coast south of Steep Point as some patches of mangrove exist, from Zuytdorp Point south there is little or no likelihood of shorebirds or suitable habitat within the Gascoyne area as the coast is precipitous with high-energy seas.

SPECIES ACCOUNTS

Australian Pied Oystercatcher

Australian Pied Oystercatchers made breeding attempts at Pelican Point, one egg was found on 30 July 2007 in sand 2m above high water mark and incubation of three eggs was underway on 8 August but eggs were found gone on 16 August. New scrapes were evident so a further attempt was expected. Two long abandoned eggs were found in January 2008.

This species has bred at Lake MacLeod, two adults with a juvenile in October 2006 and two pair using distraction displays at opposite ends of a short sandy beach on Bernier Island in September 2007 indicated they had young.

Sooty Oystercatcher

Sooty Oystercatcher successfully bred on a small un-named island off Point Quobba 50km north of Carnarvon. A number of trips were made there to monitor breeding Crested and Roseate Tern and a pair of Sooty Oystercatchers was seen on 21 August, 22 September & 16 October. Breeding activity was first noted on 1 November due to distraction displays by both parent birds, young existed at this time though none were seen. On 16 November a juvenile bird of adult size was seen with one adult while the other adult foraged on the exposed reef. Sooty Oystercatchers were quite prevalent on Bernier & Dorre Islands and would breed at these locations.

Red-capped Plover

Red-capped Plover were recorded breeding at a number of sites within a variety of habitat, at Lake Macleod in September 2005, October 2006 and May 2008. Also recorded at breeding Miaboolya Creek in September 2004 and at Carnarvon Golf Links August 2007.

Black-fronted Dotterel

The largest number of Black-fronted Dotterel recorded on western most river pools (171) many of which may have migrated from inland regions. Much larger numbers than

usual were observed around an inland river pool (35 km) in October 2007. They were moving westward toward the coast, bolstering local numbers considerably. The inland pool was normally host around 30 birds while over 100 birds were seen in October 2007. The western most pools might normally host 50/60 birds of this species. Black-fronted Dotterel were also recorded breeding in the sands of the Gascoyne River bed (August-September), McNeill Claypan and Boolathana Pool.

Hooded Plover

Four Hooded Plover (vagrants) were reported from a claypan at Wooramel River crossing, North West Coastal Highway, on 21 June 1977. I did not observe this species during my surveys.

Red-kneed Dotterel

Red Kneed Dotterel were recorded breeding at McNeill Claypan, usually very close to water, often on higher ground under a bush and surrounded by water; September 2004 and August-September 2006.

Banded Lapwing

Banded Lapwing were found to be extremely opportunistic breeders, breeding will be attempted within a very short time after good rain or when conditions were otherwise favourable. Preferring to nest in open habitat they were regularly found breeding at Carnarvon Golf Course, areas surrounding the airport and occasionally at playing fields. Birds with runners have also been found in outlying areas such as the airstrip at Lake MacLeod and on roadsides. Unfortunately breeding success is very low, most failures were before hatching but instances were known where runners were lost and one instance of an adult predated on the nest. Breeding has been known February-August.

Australian Painted Snipe

It is also possible that Australian Painted Snipe bred at McNeill Claypan in 2005, the number found there was the largest recorded for many years. Australian Painted Snipe (two) were recorded here on 26 October 2005, having flushed from under Lignin bushes *Muehlenbeckia cunninghamii* while conducting a survey of all birds in a section of this wetland. This discovery sparked an interest from people within the Birds Australia Threatened Bird Network (TBN) whom sought more information as to water levels, habitat and encouraged a search for more birds as this time frame coincided with the national Australian Painted Snipe count. A further survey for Australian Painted Snipe was conducted on October 31, no Australian Painted Snipe were found at the original site but six were seen en-route, two female together and another group of four males (may have been juveniles) in another group. On returning from the original site the four males were located in the same spot but the females could not be seen. A search for these females resulted in flushing an estimated 15 other birds from amid grasses *Paspalidium jubiflorum* beneath a Coolibah *Eucalyptus victrix*.

Estimates only could be given as this species does not stay together or fly as a flock, rapidly dispersing in all directions. Of these birds only eight could be later located four of each sex. Further to this, another group of 15 birds was located among Lignin bushes about 1km westward. A follow up survey was conducted on 2 November in attempt to ascertain sexes/juveniles. The first site had 10 birds in three groups, a single female, a group of one female/four male/juvenile and four male/juvenile, the second site had 14 birds, four female/seven male and possibly three juvenile. No certainty could be given regards juveniles due to observer unfamiliarity. On 8th November the first site had 12 birds with at least three female, the second of six birds one female and six male /juvenile. On returning to Carnarvon after time away, no Painted Snipe were found on 9 December.

The only previous record of this species was of a specimen (male) collected near Carnarvon on 21 November 1963. There has been one further sighting since, a single bird at McNeill Claypan 31 October-2 November 2007. It is possible that this site has been utilised by this species for some years when conditions were favourable, the prevailing conditions would not have been deemed favourable when this last bird were seen so there remains much to be learnt. Red-kneed Dotterel have bred here prolifically, Black-fronted Dotterel to a lesser extent, this species seen to breed more often in the sands of the Gascoyne River bed.

Addendum

At time of writing, one vegetation sample was inadequate for identification so a trip was made to this wetland and while there; a single male was opportunistically sighted in flight and landing a short distance away. This is the earliest month in any year this species has been seen and if further birds of this species exist a breeding event may ensue.

Pin-tailed Snipe

Another rare species found inhabiting riverine pools in the Gascoyne River is Pin-tailed Snipe. Species of *Gallinago* Snipe were most difficult to identify unless in the hand, this species deemed to be Pin-tailed by photographs and other information supplied to the West Australian Museum. The possibility exists that more than one species of this genus has visited. One previous record exists for the survey area, a possible *Gallinago stenura* at Hamelin on 30th January 1991. Three sightings of single *Gallinago* Snipe at Gascoyne River pools, February 2005, February 2007& January 2008. There were also two *Gallinago* Snipe seen at Exmouth sewage works (outside the survey area) in February 2008. This species may be a more frequent visitor than previously known.

Bar-tailed Godwit

Found all year round the most prolific shorebird found in the Carnarvon area is Bar-tailed Godwit though numbers fluctuate markedly, usually peak numbers were found on return from migration during October, dropping slightly and stabilising through till February when numbers can begin to vary, but usually stable until departures begin once more. These departures were usually made in March/April but sometimes earlier in groups over time rather than en-mass, often leaving a very small number of birds remaining. From the remaining birds numbers then increase once more and

can stabilise at numbers approximating 40% of summer populations in winter. It is not known where these birds come from but assumptions were made that they have moved north from much further south or that they moved north with migrating birds and have later returned.

Eastern Curlew & Whimbrel

Eastern Curlew and Whimbrel were another two conspicuous species when present. These two species were seen less often and peak numbers were generally recorded in October but have also been recorded in numbers approximating 40% of peak numbers in July. These species number have also been known to begin to increase as early as August but were not present at all months over summer or were in lower numbers. It is believed that most of the birds seen at local roost in Carnarvon disperse mostly southward as it is known that these species can be regularly found in the marshlands and mangroves 20-30 km away. Others occur locally but were believed to mostly roost in mangroves during high tide where they can't be seen.

Grey-tailed Tattler

Grey-tailed Tattler spends a lot of time in among mangroves and has been easily noted on arrival on such occasions they roost in open areas. This species is present all year round but numbers were difficult to assess due to their usage of mangrove habitat. It was believed they occurred in sufficient numbers regards Important Bird Area (IBA) and considerable time was spent to record more accurate counts. Numbers peak in September on arrival and again in February and in March 2007 a count exceeding 400 was achieved with a further 88 being recorded at a known roost 20 km south (Uendoo north).

Ruff

Ruff is a rare visitor to Carnarvon; this species has been seen at Chinaman Pool in the Gascoyne River, McNeill Claypan and also at Carnarvon sewage farm. One previous record existed for the survey area, one seen at Hamelin bore overflow in November 1961. In Carnarvon, most were recorded at sewage farm, single birds only, first seen in February 2003, with regular sightings from December 2003 and early 2004 but failing to show in late 2004. Sightings since have been few.

DISCUSSION

Lake MacLeod regularly hosts internationally significant numbers of Red-necked Stint and Curlew Sandpiper, both species exceeding the 1% criteria on most surveys. Banded Stilt, Red-necked Avocet and Red-capped Plover were found in nationally important numbers (November 2004). In most surveys large numbers of waders remained unidentified, most seen as distant 'smokes' in areas not able to be accessed, unidentified numbers ranged from as low as 34 in January 2002, to 40,000 in September 2002. The highest total count during all surveys was 171,149 in November 2004 of which 10,000 were unidentified, all 'grey waders' presumed to be mostly Curlew Sandpiper and Red-necked Stint.

Waterfowl, terns and other water dependant species were also found in large numbers and some were recorded breeding. This wetland provides important refuge for many birds in dry seasons and droughts. Conversely, when conditions were good many species may be in low numbers or absent. Species such as Banded Stilt move to saline inland lakes after rainfall to breed. Weather conditions associated with cyclones were also believed to have influenced bird abundance during surveys; the low numbers of Curlew Sandpiper in March 2004, most were believed to have departed earlier than normal having taken advantage of favourable conditions. There was also noticeable difference in some species wader abundance after the flood event of 2000; especially two of the major species found here, Red-necked Stint and Curlew Sandpiper.

Most survey effort was in the Carnarvon region; the variety of habitats yielding the highest diversity found in the study area, seven species were found breeding, Little Button-Quail, Pied and Sooty Oystercatcher, Red-capped Plover, Black-fronted and Red-kneed Dotterel and Banded Lapwing.

Of birds recorded wearing leg flags the most often seen and of more species were of Victorian origin. Birds originally flagged in Broome in the north west of Western Australia have also been recorded but in lesser numbers. This may be a reflection of banding effort but where were these Victorian birds coming from? Curlew Sandpiper were one of the more common birds found with orange (Victorian) flags and they were known to take a more westerly route in the East Asian Australasian Flyway. It is therefore deemed possible that a small proportion of birds might make their first landing in this region (rather than the far north of Australia) on a more westerly route, perhaps through Malaysia/Indonesia. Of the coastal section within this study area Carnarvon is the one area that experiences zero or minus tides during the early full moon phase during October, November and December, this provides birds with a larger expanse of tidal area within which to feed and therefore the carrying capacity during these months would be higher than for areas south or north, the north having little area of shallows or reefs to be exposed at low tides. Birds would then have rested and put on sufficient weight to make a further flight back to their original banding areas. This is conjecture that would best be proven by a banding regime in this area.

The tides within the Shark Bay area were complex, high tide at Monkey Mia on the east side of Peron Peninsula can be markedly different than Denham on the west side. As an example, 1 February at Monkey Mia there were four phases, peak of 1.88m at 1847 while Denham experienced only two phases with the higher tide being 1.38m at 1859.On 15th Feb Monkey Mia had four phases, peak of 2.16m at 1802 while Denham had four phases and peaked at 1.61m at 1813.

Within the Shark Bay area a large section of coastline is likely to be unsuitable for most if not all shorebirds, that of Hamelin Pool and L'Haridon Bight and most of the waters below Fauri Island, these waters were hyper saline with few marine organisms able to live in this environment. There were two well-known exceptions that is included in the Word Heritage values, the stromatolites (ancient living organisms) of Hamelin Pool and a marine bivalve mollusc,

the shells (*Fragum eragatum*) of which deposit and form Shell Beach in the south of L'Haridon Bight. The afore mentioned Hamelin bore is on adjacent pastoral lease to Hamelin Pool and though brackish, forms an important refuge in a largely waterless environment in dry periods.

There were over thirty small islands, islets or rocks within the Shark Bay World heritage area, most of which remain un-named. Some of these were known to be important roosting or nesting areas for many seabirds but their value to waders is unknown. There were 67 species migratory birds protected by international treaties within the World Heritage area and a number of these listed as threatened at a national level.

It seems that shorebird numbers decrease overall from north to south for most species. Due to the size of the study area and paucity of observers there is much to be learnt. While not supporting the huge numbers recorded in the northern regions such as Broome and Eighty Mile Beach or the many areas from Exmouth northward, this region has a high diversity in an overall arid area and is an important bird area.

ACKNOWLEDGEMENTS

Thanks were given to Marcus Singor whom gave encouragement to write an article for this region, his assistance with the layout and suggestions for content and also for suggestions of additional information after reading a draft copy.

Thanks were also given to John Stretch for help with identification of vegetation.

REFERENCES

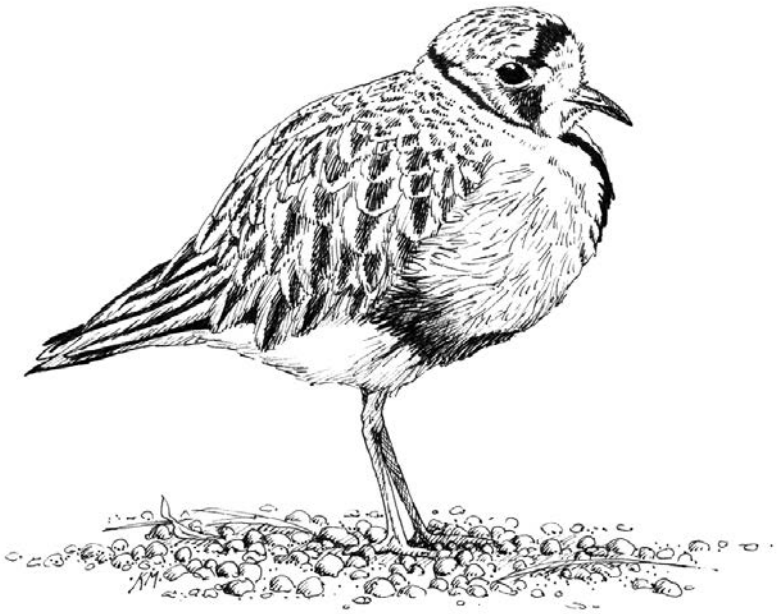
Davis, C. 2004. Wader Study Group Surveys at Lake MacLeod, March 2004. West Australian Bird Notes: 112.

Hassell, C. 2005. Lake MacLeod Survey, 8-12 November 2004. Western Australian Bird Notes: 114.

Jaensch, R.P. & R. M. Vervest. 1990. Waterbirds at Remote Wetlands in Western Australia, 1986-8, Part 2: Lake MacLeod, Shark Bay, Camballin Floodplain and Parry Floodplain. *RAOU Report* 69.

Johnstone, R.E., A.H. Burbidge & P. Stone. 2000. Birds of the Southern Carnarvon Basin, Western Australia: distribution, status and historical changes. Records of the Western Australian Museum Supplement: 61: 371-448.

Leader, P.J. & G.J. Carey. 2003. Identification of Pintail Snipe and Swinhoe's Snipe. British Birds 96:178-198.



NORTH-WEST AUSTRALIA WADER AND TERN EXPEDITION 8 TO 29 NOVEMBER 2008

CLIVE MINTON[1], ROSALIND JESSOP[2], CHRIS HASSELL[3], AND MAUREEN CHRISTIE[4]

[1]165 Dalgetty Road, Beaumaris, Victoria 3193. Australia. mintons@ozemail.com.au; [2]Phillip Island Nature Park, PO Box 97, Cowes, Victoria. 3622. Australia. [3]PO Box 3089, Broome, Western Australia. 3925, Australia; [4]Carpenter Rocks, South Australia, 5291. Australia.

INTRODUCTION

The long-term Australasian Wader Studies Group program of wader research at Roebuck Bay, Broome, and at Eighty Mile Beach in north-west Australia has four main components:

a) Wader population counts at Roebuck Bay and on a section of Eighty Mile Beach in two periods each year (usually June and October/December). These censuses are carried out by teams of experienced counters and form part of the MYSMA (Monitoring Yellow Sea Migrants in Australia) program funded this year by DEWHA and DEC.

b) Regular cannon net catches of waders and terns in Roebuck Bay, and mist-net catches at Lake Eda/Taylor's Lagoon, by the North-West Wader Study Group (led by Chris Hassell) in conjunction with Broome Bird Observatory and the Global Flyway Network.

c) A three-week long "expedition" each November which aims to catch sufficient waders (and terns) at Roebuck Bay and Eighty Mile Beach to obtain, *inter alia*, a measure of the breeding success of the principal species during the previous breeding season in the Northern Hemisphere.

d) Regular searches of the waders at Roebuck Bay to read engraved flag and colour-band/flag combinations, to facilitate survival rate calculations. This work is mainly carried out by Chris Hassell, Adrian Boyle and Alice Ewing (who is preparing a Masters thesis at Melbourne University). However, many other people also furnish valuable sightings.

This report covers the results of the November 2008 NWA Expedition and relates to the third of the above activities. November has now become the preferred time for this annual monitoring based on the assumption that most juvenile waders (as well as adults) have arrived in north-west Australia by then. A November date also impacts less on wader studies in other parts of Australia than a later date would. It also avoids the main wet season months of January and February.

MAIN ACHIEVEMENTS

The 2008 expedition started and finished on a high. A marginal tide on the first catching day (9 November) led to the decision to try and catch Sanderling and terns on the beach at Coconut Well, about 10 km north of Broome. It seemed unlikely that we could achieve all these targets in one catch but our nerve held and we did! 105 Roseate Terns, 60 Common Terns and 41 Sanderling were an unbelievable start.

Then, on the final catching day of the expedition (28 November), an attempt to catch Whimbrel on the beach very close to Crab Creek was a extremely successful with our best ever catch of this species (78), a bonus of 49 Little Curlew, and a couple of Bar-tailed Godwits. Even the latter produced a surprise as one was carrying an implanted satellite transmitter first put on in Broome in February. The transmitter ceased functioning when the bird was on the New Siberian Islands, Siberia in late June, so it was particularly welcome to learn that this bird had made the journey safely back to Broome again (as several others, with transmitters still working, did).

The above were probably the main highlights of the expedition but there were many other achievements, some of which are detailed below.

A total of 2673 waders (29 species) and 250 terns (7 species) were caught during 18 days in the field between 9 and 28 November (Table 1). The total of 2923 was lower than on each of the previous two expeditions (around 4000) but similar to 2004 and 2005.

Birds were caught in 16 cannon-net catches, six clap-net sessions and one mist-net catch. A total of 1646 birds were caught in the Broome area and 1277 at Eighty Mile Beach (Table 2). The nine cannon-net catches at Broome averaged 169 birds per catch and the seven at Eighty Mile Beach 166, rather lower than the average of just over 200 per catch in the previous two years.

The largest cannon-net catches were 432 at Eighty Mile Beach on 18 November and 384 at Broome on 12 November. Notable large species totals in individual catches were 290 Great Knot at Broome, 199 Great Knot with 101 Bar-tailed Godwit at Eighty Mile Beach, 186 Greater Sand Plover at Broome and 44 Sharp-tailed Sandpipers on the beach, unusually, at Eighty Mile Beach.

The mist-net catch of 123 at Lake Eda on 22 November was most notable for including a Bush Stone Curlew.

The two Chinese visitors from Shanghai, Mr. Jin Weiguo and Mr. Xue Wenjie, brought with them one of the clap-nets which they use so successfully to catch migrating waders at Chongming Dongtan National Nature Reserve during northward and southward migration each year (typically a total of 6000 waders). Jin Weiguo set his clap-net up on six

Table 1: NWA 2008 Expedition Catch Totals

Date	Location	New	Retrap	Total		Capture Method
9/11/2008	Broome	206	2	208		cannon
10/11/2008	Broome	93	31	124	including 33 terns	cannon
11/11/2008	Broome	187	46	233		cannon
12/11/2008	Broome	288	96	384		cannon
13/11/2008	Broome	33	9	42		cannon
Sub-total		*807*	*184*	*991*		
14/11/2008	80 Mile Beach	7	0	7		clap net
15/11/2008	80 Mile Beach	190	12	202		cannon
16/11/2008	80 Mile Beach	130	3	133		cannon
16/11/2008	80 Mile Beach	51	0	51		clap net
17/11/2008	80 Mile Beach	266	20	286		cannon
18/11/2008	80 Mile Beach	411	21	432		cannon
18/11/2008	80 Mile Beach	20	0	20		clap net
19/11/2008	80 Mile Beach	74	3	77	including 24 terns	cannon
19/11/2008	80 Mile Beach	2	1	3		clap net
20/11/2008	80 Mile Beach	1	2	3	excluding 10 Silver Gulls	cannon
20/11/2008	80 Mile Beach	7	0	7		clap net
21/11/2008	80 Mile Beach	32	0	32		cannon
21/11/2008	80 Mile Beach	24	0	24		clap net
Sub-total		*1215*	*62*	*1277*		
22/11/2008	Lake Eda	120	3	123	including 25 terns	mist net
25/11/2008	Broome	303	70	373	including 1 tern	cannon net
26/11/2008	Broome	9	3	12		cannon net
27/11/2008	Broome	12	6	18		cannon net
28/11/2008	Broome	123	6	129		cannon net
Sub-total		*567*	*88*	*655*		
Total		**2589**	**334**	**2923**	16 cannon net, 6 clap net, and 1 mist net catch (Lake Eda)	

Summary: 2673 waders (29 species); 250 terns (7 species)

different days at Eighty Mile Beach and successfully caught a total of 112 waders in a series of small catches. This traditional Chinese design of clap-net includes an interesting leverage system, with an extra hinged pole, to increase its speed of operation. Birds were mainly caught on Eighty Mile Beach as they flew low over the clap-net, though some makeshift decoys and twinkling were also employed. This is different to much of the catching in China where artificial and tethered live decoys, plus the skilled whistle calls of the catcher, help attract birds to come in to land at small pools, especially as they arrive after their non-stop migration from Australia.

Further experimentation will be carried out by Chris Hassell and Adrian Boyle in NWA to explore whether there are particular species or locations where this clap-net technique can be employed to catch species which can't be successfully caught by current cannon-netting and mist-netting techniques.

As usual, Great Knot had the highest catch total but, at 618, this was less than half the number caught in 2007 (1412) (Table 3). Greater Sand Plover (491), Red-necked

Table 2: Comparison of catch totals for the 2006, 2007 and 2008 NWA Expeditions

Location	Year	New	Retrap	Total
Broome	2006	857	174	1031
	2007	985	223	1208
	2008	807	184	991
80 Mile Beach	2006	1619	55	1674
	2007	1690	95	1785
	2008	1215	62	1277
Broome	2006	1120	176	1296
	2007	861	192	1053
	2008	567	88	655
TOTAL	2006	3596	405	4001
	2007	3536	510	4046
	2008	2589	334	2923

Table 3: NWA 2008 Expedition - Wader and Tern Catch Details

Species	**Catch Totals**		**Total**
	New	Retrap	
Waders			
Great Knot	527	91	618
Greater Sand Plover	424	67	491
Red-necked Stint	257	58	315
Curlew Sandpiper	235	36	271
Bar-tailed Godwit	186	30	216
Grey-tailed Tattler	145	8	153
Terek Sandpiper	102	8	110
Sharp-tailed Sandpiper	95	3	98
Whimbrel	75	4	79
Common Greenshank	47	3	50
Little Curlew	48	1	49
Sanderling	41	2	43
Black-winged Stilt	27	3	30
Red Knot	24	5	29
Red-capped Plover	25	0	25
Pied Oystercatcher	18	3	21
Marsh Sandpiper	15	0	15
Oriental Plover	12	0	12
Lesser Sand Plover	8	4	12
Ruddy Turnstone	6	1	7
Broad-billed Sandpiper	6	0	6
Red-necked Avocet	2	4	6
Masked Lapwing	3	1	4
Wood Sandpiper	3	0	3
Black-fronted Dotterel	3	0	3
Australian Pratincole	3	0	3
Long-toed Stint	2	0	2
Bush Stone-Curlew	1	0	1
Black-tailed Godwit	1	0	1
Total Waders (29 species)	**2341**	**332**	**2673**
Terns			
Roseate Tern	105	0	105
Common Tern	61	0	61
Gull-billed Tern	55	2	57
Little Tern	11	0	11
Whiskered Tern	11	0	11
White-winged Black Tern	4	0	4
Lesser Crested Tern	1	0	1
Total Terns (7 species)	**248**	**2**	**250**
Total Waders + Terns	**2589**	**334**	**2923**

Stint (315), and Bar-tailed Godwit (216) also, as usual, featured strongly. However, Curlew Sandpiper (271) were way down on the record total (567) caught during the November 2007 expedition.

The number of Great Knot (especially) and Bar-tailed Godwit seen at Eighty Mile Beach was noticeably less than in previous years, and this was confirmed by the MYSMA population counts just before/after the expedition. It is tempting to suggest that these marked reductions were related to the loss of feeding area at the Saemangeum estuaries reclamation site on the west coast of Korea (where 30-40% of the Great Knot population in the Flyway used to visit). The poor breeding success of both these species in 2008 would have also contributed to the lower numbers. For the first time ever we had to deliberately try and catch these species at Eighty Mile Beach rather than accept them as a probable by-product of almost every catching attempt there. Their lower numbers undoubtedly contributed to the lower catch totals of these species during NWA 2008 compared with NWA 2007.

Other notable species totals were Sharp-tailed Sandpiper (98), Whimbrel (79), Common Greenshank (50), Little Curlew (49) and Sanderling (43). Disappointing totals were achieved for two of the main monitoring species - Red Knot (29) and Ruddy Turnstone (7). It was also nice to catch 21 Pied Oystercatchers (the whole flock present at the beach that day) and add some new birds with engraved flags to the population of this species, which is the subject of a special local breeding study by Clare and Grant Morton.

We again tried, and failed, to catch any significant numbers of the Oriental Plover which throng Eighty Mile Beach. The only time we have really done well in catching them was during a good wet season one February when they were concentrated in particular paddocks on nearby Anna Plains Station.

Operating conditions for fieldwork were rather more suitable in 2008 than the extremely hot weather encountered in the previous year. There were no rain interruptions either, not even a threat of rain at any time.

The equipment all performed satisfactorily. The additional new three-cannon small-mesh net was mainly used for catching at Roebuck Bay but the larger more traditional large-mesh nets were again necessary in the wide open spaces of Eighty Mile Beach. Catching at Eighty Mile Beach again proved relatively unprofitable as the neap tide period approached.

Techniques previously developed for handling catches in the hot weather conditions encountered in north-western Australia in November again proved satisfactory and no heat stress problems with birds (or team) were encountered.

A total of 332 waders and (two terns) already carrying bands were recaptured. This represents an overall retrap rate of 12.4 %, almost the same as 2007. The rate was again significantly higher at Roebuck Bay (17.9%) than at Eighty Mile Beach (4.9%). Banding is carried out much more regularly at Roebuck Bay and the overall population being sampled is smaller than at Eighty Mile Beach.

Ten overseas banded waders were caught, all from China. These were of a good variety: three Great Knot, two Bar-tailed Godwit, a Terek Sandpiper, a Sanderling and a Red-necked Stint. These have only just been sent to China and we are still awaiting original banding details.

Several of the banded birds recaptured during the expedition were now more than 15 years old (Table 4). The oldest was a Greater Sand Plover now at least 20½ years old.

Quite a number of birds (mostly Great Knot and Bar-tailed Godwit) carrying Chinese flags were observed both at Broome and Eighty Mile Beach during the expedition. Several individually marked waders from Broome were also seen at Eighty Mile Beach. A surprise set of sightings followed the catching and marking with engraved leg-flags of the 48 Little Curlew at Broome on 28th November. 14 of these were seen feeding on the ovals in Broome the following day. And even more surprising was the sighting of one at Eighty Mile Beach, 50 km south of Anna Plains Station, on December 12th!

The proportion of juveniles in cannon-net catches at Broome and Eighty Mile Beach is shown in Table 5. It appears that 2008 was generally a poor breeding year for most of the wader populations which spend the non-breeding season in north-western Australia. This is a complete reversal of the 2007 situation when most species had good breeding success.

Particularly poor performers were Great Knot (5.8% juvenile) and Bar-tailed Godwit (6.0%). Samples were too small to make a judgement on some species, or there was inadequate data from previous years to know what the norm is (e.g. on Whimbrel). However it would appear that Ruddy Turnstone, Sanderling, Little Curlew and Red Knot also

Table 4: Oldest Recaptures during NWA 2008

Species	Date banded	Banding location	Age at banding	Retrap date	Retrap location	Minimum age at retrap
Greater Sand Plover	11/09/1994	Roebuck Bay	3+	12/11/2008	Roebuck Bay	17+
Greater Sand Plover	25/10/1990	Roebuck Bay	2+	12/11/2008	Roebuck Bay	20+
Bar-tailed Godwit	5/06/1995	Roebuck Bay	1+	25/11/2008	Roebuck Bay	15+
Red-necked Stint	6/03/1996	Roebuck Bay	2+	12/11/2008	Roebuck Bay	15+
Great Knot	25/04/1996	Roebuck Bay	2+	25/11/2008	Roebuck Bay	15+

Table 5. Percentage juveniles in cannon net catches in NW Australia 9-29 November 2008.

Species	No. of catches	Total caught	Juvenile/1st year		Average % Juv. 98/99-08/09	Assessment of 2008 breeding success
MAIN			Total	%		
Great Knot	6	618	36	5.8	9.4	Poor
Greater Sand Plover	15	491	119	24.2	22.5	Average/Good
Red-necked Stint	13	313	32	10.2	21.9	Poor
Curlew Sandpiper	9	271	28	10.3	16.3	Poor
Bar-tailed Godwit	8	216	13	6.0	8.6	Poor
Grey-tailed Tattler	11	153	58	37.9	19.2	Excellent
Terek Sandpiper	10	110	17	15.4	13.0	Average/Good
Red Knot	4	29	3	(10.3)	16.2	(Poor)
Ruddy Turnstone	3	7	0	(0)	13.1	(?Poor)
Additional species:						
Whimbrel	2	79	3	3.8		?
Little Curlew	1	49	0	0		?Poor
Common Greenshank	5	45	2	4.4		?
Sanderling	3	43	0	0		?Very poor

fared poorly in 2008.

An exception to the above pessimistic picture was Grey-tailed Tattler with a record 37.9% juveniles. There was a similar picture in most of the 11 catches of this species indicating that it was unlikely to be a quirk of the sampling method. With Terek Sandpiper and Greater Sand Plover also having reasonable breeding seasons it appears that the waders which breed rather less far north in Siberia fared better than those which predominately breed in the Arctic.

A variety of information received from Russia indicates that the weather in the Arctic in June/July 2008 was particularly bad (with unusually late snowfalls) and that predation levels were high (following a good Lemming season in 2007). An unknown factor is the level of the negative effect on breeding success of Great Knot, and some other species, caused the loss of the huge feeding area at a previously key migratory stopover site in Korea (Saemangeum). It should be possible to determine this in due course, when additional years of % juvenile data enable yearly variations to be differentiated from long term trends.

The Australian Quarantine and Inspection team, lead by John Curran, again joined the expedition in the field, in order to collect samples for Avian Influenza testing from waders we were handling. They were particularly pleased with the catch of 78 Whimbrel on 28th November as this is a species from which they previously had very few samples.

Their faecal swab and blood testing continues to indicate that waders are extremely "clean" birds, compared to most other species, especially waterfowl. Though some strains of Avian Influenza have been found in our waders, none are of the highly pathogenic H5N1 strain.

The number of terns caught (250) was more than twice the number caught in 2007 (107). In addition to the Roseate and Common Terns already mentioned a good total of 57 Gull-billed Terns was also achieved. Many of these were from the northern hemisphere race (*affinis*).

OTHER MATTERS

Participants

Twenty six people from six different countries participated: 18 from Australia (nine from Victoria, six from Western Australia, one from South Australia, one from New South Wales and one from Queensland), three from China, two from Indonesia, one from Japan, one from Sweden and one from Finland.

Two of the Chinese participants were from Chongming Dongtan National Nature Reserve, the main Chinese wader banding location at the mouth of the Yangtze River, near Shanghai. One of these (Jin Weiguo) is the principal bird catcher for the shorebird research at the reserve. He previously earned his living as a bird hunter. The third person from China, Katherine Leung, works for WWF in Hong Kong.

Daniel Gustaffson, from Sweden, joined the expedition specifically to help his PhD studies on ecto-parasites in waders. He collected samples from the plumage of a good number and variety of the species handled.

The complete list of participants is given at the end of this report.

Itinerary

The expedition followed the usual format of a period at Broome followed by a period at Eighty Mile Beach, with a return to Broome for the last week. Altogether 10 days were spent at Broome, seven at Eighty Mile Beach, two in travel between locations, and this year there was actually a real "day off". Because this followed a complete night of mist-netting however many spent much of it sleeping!

Finances

The total income was $27,031. This included generous contributions from AQIS for the use of AWSG personnel and equipment to assist their Avian Influenza monitoring studies in the Northern Territory (just prior to the expedition) and at Broome/Eighty Mile Beach. Chris Hassell also kindly made a donation of $200 in recognition of AWSG equipment being made available to him for other catching purposes.

Expenditure so far has been $22,840, giving a provisional surplus of $4,191. However further expenditure has still to be incurred in replacing items used during the expedition such as engraved flags, Darvic sheet, solvent cement and electric fuses. We also intend to purchase an additional radio and spare batteries. Nevertheless, a small surplus is still expected.

It is interesting that the average cost of food per person per day during the expedition was $13.80. This is a surprisingly small increase on the 2007 figure ($12.50) given the large escalation in food prices during the past year. We ate exceedingly well, as usual, during the expedition and Maureen Christie and her team are to be congratulated on achieving such a reasonable cost outcome.

Passerines

A total of 185 birds of nine species was caught in two early morning mist-netting sessions at Anna Plains Hot Bore Pool. Brown Honeyeaters (64) and Rufous-throated Honeyeaters (40) were the most numerous species caught, with three Rainbow Bee-eaters probably being the most enjoyable to see in the hand. A further 22 passerines of seven species were caught one morning mist-netting at Broome Bird Observatory, with 12 Double-barred Finches and a Diamond Dove being the most notable.

NEXT EXPEDITION

The NWA 2009 Expedition will take place slightly earlier than normal, starting on Saturday 31 October and finishing on Saturday 20 November. The timing is dictated by suitable tides. Any later date would have taken the expedition through to 5 December, which was considered to perhaps be a little later than many people would want to be away in NWA.

We want to have a really large and experienced team in the field this year. Because many people plan their travel commitments a long way ahead we are hoping to firm up on most of the participants by April/May. **Would anyone receiving or reading this report who may possibly be available to join us in November 2009 please let one of the expedition leaders know as soon as possible?**

ACKNOWLEDGEMENTS

As always, the expedition could not have taken place or been so successful without the input of so many different people in so many ways. It was a magnificent, hard working, happy team and we thank everyone who input so much during their time in NWA We certainly hope that as many as possible will come again, and already several past expedition participants have put their hands up for 2009.

Particular thanks are again due to Maureen Christie for organising all catering (and doing the financial work as well after Clive departed). Frank O'Connor again organised the leg-flag manufacture, supported by a dedicated team. And Roz Jessop again put into the computer all the field data collected, as well as being a key person in the leadership team. Chris Hassell again played the major role, most successfully, in all fieldwork operations.

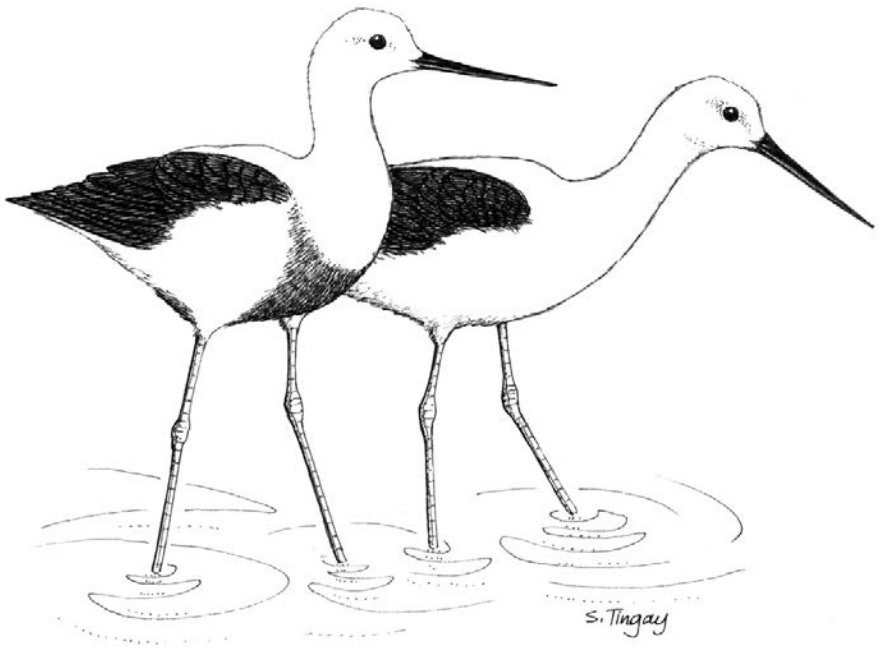
We also greatly thank Anna Plains Station owners - John Stoate, David and Helen Stoate - for providing two houses and other additional sleeping accommodation during the period we were based there while catching waders on Eighty Mile Beach. Life would be much less comfortable and enjoyable without their welcoming and generous help in so many different ways.

Maureen Christie, Prue Wright, Chris Hassell, David Wilbraham, Maurice O'Connor and Jan Lewis very kindly provided their vehicles to assist the expedition. This greatly helped its financial viability. The expedition also thanks those who kindly loaned trailers - Chris Hassell, George Swan, BBO, AQIS and DEC.

Finally we greatly appreciate the financial support provided by the WA Department of Environment and Conservation which enabled the two Chinese visitors from Chongming Dongtan to participate. BBO also kindly provided these visitors with free accommodation. Chris Hassell's participation is funded by Vogelbescherming Nederland (BirdLife Nederland).

LIST OF PARTICIPANTS

Australia:	
VIC	Clive Minton, Roz Jessop, Prue Wright, Mike Dawkins, Doris Graham, Heather Gibbs (& Dominic), David and Jean Wilbraham, Inka Veltheim.
WA	Chris Hassell, Frank O'Connor, Maurice O'Connor, Jan Lewis, Claire Stevenson, Andrea Spencer
SA	Maureen Christie
NSW	Brian Speechley
Queensland	Beck Ryan
China:	Jin Weiguo, Xue Wenjie, Katherine Leung
Japan:	Naoko Takeuchi
Indonesia:	Iwan Londo, Zulfi Arsan
Sweden:	Daniel Gustaffson
Finland:	Antii Kause



Please note:

- Views and opinions expressed in *The Stilt* are those of the author(s) and not necessarily those of the AWSG or RAOU.
- Publication of data in *The Stilt* does not constitute permission for the commercial use of those data. All such inquiries should be directed to the Editor.
-
- The Editorial Team does its best to ensure the accuracy of information published in the *Stilt*, but it is recommended that anyone wishing to cite material within the *Stilt* contact the relevant authors.

Vignettes:

Back Issues:

Most volumes of *The Stilt* are available as back issues. Please contact the Secretary for details of costs and availability.

Deadlines:

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

Stilt 55 – April 2009
Table of Contents