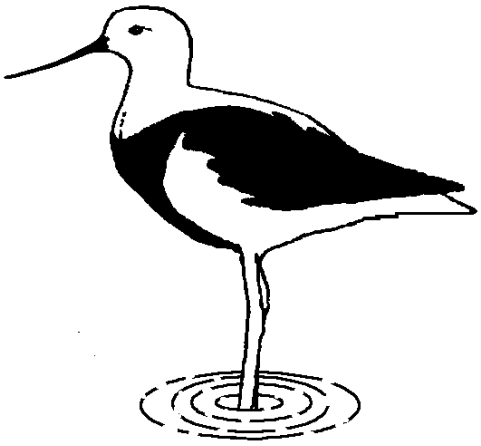
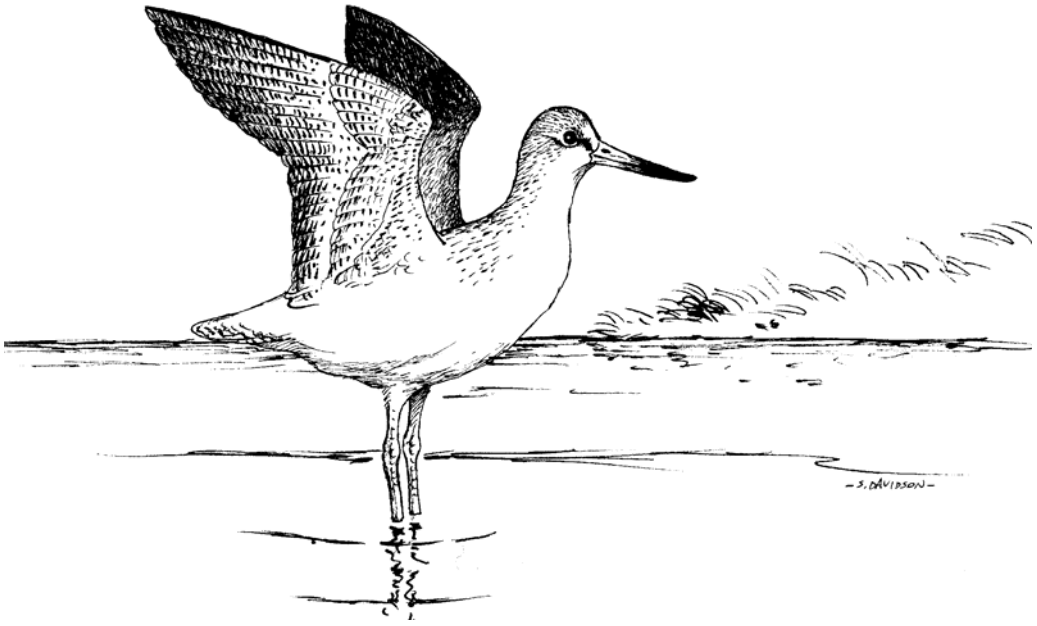
The Stilt



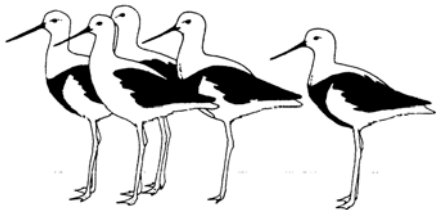
The Bulletin of the East Asian-Australasian Flyway



Australasian Wader Studies Group

A special interest group of Birds Australia

Number 36
April 2000



The 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 the *Stilt*, the *Tattler*, other journals, the internet, the media, conferences and lectures.
- To formulate and promote policies for the conservation of waders and their habitat, and to make available information to local and national governmental conservation bodies and other organisations to encourage and assist them in pursuing this objective.

To encourage and promote the involvement of a large band of amateurs, as well as professionals, to achieve these objectives.

MEMBERSHIP OF THE AUSTRALASIAN WADER STUDIES GROUP

Membership of the AWSG is open to anyone interested in the conservation and research of waders (shorebirds) in the East Asian-Australasian Flyway. Members receive the twice yearly bulletin *The Stilt*, and the quarterly newsletter *The Tattler*. Please direct all membership enquiries to the Membership Manager at Birds Australia (RAOU) National Office, 415 Riversdale Rd, East Hawthorn, 3122. Vic., AUSTRALIA.
Ph: 03-9882 2622, fax: 03-9882 2677.
Email: membership@raou.com.au

Annual Subscriptions:	Australia	$25.00
	New Zealand	$25.00
	Overseas	$30.00
	Institutions	$35.00

Cover Illustration: Stephen Davidson

EDITORIAL

Things have been quiet on the publication front in the past six months and this issue is the smallest I have dealt with since taking over as editor of *Stilt* from Mike Weston in 1998. Despite this, I think that the articles are interesting and up to the recent high standards. Please keep the articles coming in, as the bulletin is only as good as its contributors. Many people have promised to write something, but these have failed to materialise. I am equally to blame and have failed to complete planned articles on waders in Indonesia and locally in Moreton Bay for a variety of reasons.

Jim Wilson explains in his chairman's report why many potential contributors are occupied elsewhere. AWSG members are becoming involved in an increasing array of activities important to the understanding and conservation of waders in the East Asian-Australasian Flyway. We all prefer the doing to the reporting afterwards, but many of these activities will not reach those that need to know without publication in the general literature.

I hope readers enjoy this smaller issue and I look forward to being involved in a bumper issue in October.

David Milton

CHAIRMAN'S REPORT FOR 1999.

The highlight of the year was undoubtedly the very successful second AWSG conference held at Phillip Island on 12 and 13 June. This was attended by about 70 people and 25 talks were held on a wide variety of topics. The third AWSG conference is planned to be held on 1 and 2 July 2000 at Brisbane, in conjunction with Southern Hemisphere Ornithological Conference (SHOC). The theme will be long distance migration between the hemispheres.

On the expedition front, AWSG members continued to assist the Queensland Wader Study Group with the on-going surveys of the Gulf of Carpentaria in March and April. In May, members of the AWSG took off to China again. Two members continued with the training programs run by Wetlands International and supported by Environment Australia. Three sites were censused on the north coasts of the Yellow Sea, two for the first time. The work over the last two years has demonstrated the crucial importance of these coasts to Australian migratory waders. This year a new site of "world class" was discovered at Yalu Jiang on the border with North Korea. Wader expeditions planned for 2000 include a mini NW Australia expedition in May, more work in China and possibly South Korea, and an expedition to census the coasts of South Australia.

The population-monitoring project continued during 1999. There are now 30 sites that are monitored on a more or less regular basis. There is more and more demand being generated for these data on wader populations. The AWSG receive at least five applications for data on wader distributions from different organizations such as Parks Victoria and Melbourne Water. This demand for AWSG data is growing.

The AWSG is gearing up for this demand as many of the wader population estimates are based on data from the early 1980s. The terms of the Ramsar Convention stipulate that wader population estimates should be updated every nine years. Australia published the initial population estimates in 1993 and should produce new estimates by 2002. At the moment, we just do not have the data for large parts of Australia. As part of a program to address this inadequacy, AWSG, together with the South Australian Ornithological Association, were awarded funds through the NHT to recount much of the coast of South Australia. This survey took place in January and February 2000, with two teams in the field for a month and assisted by Peter Driscoll and his ultralight plane. The results will be reported in a future edition of *Stilt.*

In October 1999, George McKay was awarded a contract by Environment Australia to design and test methods for monitoring wader populations (PMP). The AWSG will be assisting George with field trials during 2000. There is no reason to suppose that we would change our methods at the present core sites, some of which now have 20 years of continuous counts. However, we do need measures of expected inter-observer variance, and we do need to have better guidelines for counters to make sure that the data is collected in a similar way each year. The PMP trials brief also calls for design of a new database, something that is badly needed to make the PMP data more readily accessible.

In addition to the PMP trials, the AWSG needs to look at setting up a second database, linked to the PMP database, into which all count data from any site can be entered. Such a database would be of enormous value to government, planners, state authorities and others and would make the regular updating of estimates of total wader populations in Australia much simpler. It is planned to address this issue in 2000.

We have also to consider whether the long-term administration of these Population Monitoring Projects should be funded through the sale of data, or externally funded, and how they should be run in the future. One weakness of the current scheme is the lack of on-going analysis and reporting back to the observers. In 2000, we will be encouraging individuals to analyse parts of the old data. The Eastern Curlew paper in this edition is the result of one such analysis.

Two editions of *Stilt* and four editions of *Tattler* were produced in 1999. The value and quality of these publications is recognised by Environment Australia. In 1999 they awarded funds for the continued support of our 100 Asian members until 2001.

Interest and activity in waders is increasing and the AWSG needs to identify new goals, and update the old ones. For many, the fun of waders is the field work, yet many of our members often live long distances from other members, and are not interested in traditional activities such as banding. Regular searching for flagged birds in a systematic way could yield results that have hitherto not been sufficiently recognised. There may be opportunities to help with the Painted Snipe Project reported elsewhere in this bulletin. There is need for new counts at every wader site in Australia. Most sites not included in the Population Monitoring Project have not been counted since the 1980s, and it is also becoming apparent that there exist hitherto unknown sites of international importance for some species.

Behind the scenes there is an enormous amount of effort which goes into running the AWSG such as preparing the *Stilt* and *Tattler* and getting them posted, running the accounts and membership, preparing for conferences, attending meetings, planning expeditions, etc. I thank the committee and all other helpers for their work. Laurie since the start. Mark Barter gives a special tribute to her elsewhere in this edition.

David Close (SA) and Mike Bamford (WA) have joined the committee. Both are well known in the wader world. David has already put an enormous amount of effort into helping with the recent South Australia surveys.

Jim Wilson.
Chairman.

TREASURER'S REPORT FOR 1999

The Consolidated Accounts provided below show that income exceeded payments by $4142.31 *excluding* the $645.00 of Specific Donations. In addition, Environment Australia acknowledge an outstanding amount of $6000 being part of a 3 year contract we have to provide our publications and other services to nominated recipients in the Flyway.

The overall result was in accordance with budget and a significant improvement on last year as a result of increased membership and the finalisation of a 3 year contract with Environment Australia.

Australian Wader Studies Group
Consolidated Accounts
Statement of Receipts and Payments
1 January 1999 - 31 December 1999

RECEIPTS

Item	1999	1998
	$	$
Balance B/f	19,195.30	19,453.63
Subscriptions	7,345.77	8,456.00
E.A. Contract	7,318.00	
Sales	82.00	629.00
Specific Donations	645.00	1238.50
Conference (Phillip Is)	6478.50	
TOTAL INCOME	**21,869.27**	10,323.50
BALANCE AT 31/12/99	**23,982.61**	

PAYMENTS

Item	1999	1998
	$	$
Stationary/Printing	6,400.98	5,918.15
Photocopying	33.75	63.60
Insurance	285.00	
Postage/Courier	2,185.21	2,593.78
Phone/Fax	3.50	16.30
Subscriptions	193.62	
Conference	6286.90	
Admin Fee (BA)	1,000.00	1,000.00
Depreciation	693.00	990.00
TOTAL EXPENSES	**17,081.96**	10,581.83

Living and Brenda have stepped down from the committee. Both have worked for the AWSG in various roles over a number of years: Brenda has been there

Research Fund

The Research Fund comprises Specific Donations and is included in the statement of accounts. It is proposed to report on this separately on an annual basis.

Donations over period 1995 - 1998	$4403
Donations 1999	$645
Total Research Fund 31/12/99	$5048

Membership Statistics for 1999

The membership for 1999 was:

Australia/ New Zealand	175
Overseas (excl. NZ)	30
Institutions	11
EA Funded	100
TOTAL	316

Ken Gosbell
Secretary/ Treasurer

A THANK YOU TO BRENDA

The saying goes that "Good things always come to an end". Well this certainly happened last year when Brenda Murlis finally stepped down from the AWSG Committee after 20 years of service. Brenda held the office of Secretary for all but the last few of those years.

When I became Chairman in 1986, Brenda was already an old hand and it quickly became apparent that it was she who really held the Group together. She had an excellent personal knowledge of members and was always a valuable source of information and down-to-earth advice. Her good memory was assisted, I'm sure, by the card index system she operated to which she meticulously added information as subs were received and *Stilts* dispatched. When we were having teething problems in recent years whilst transferring membership records to the Birds Australia system, Brenda's cards often came to the rescue!

Brenda cared deeply for members and she was very interested in them as individuals. She used to talk about them as though each was a personal friend. I recall numerous instances when the Committee carried out the annual review of "non-financial" members – whether to stop sending *Stilt* or not – that her knowledge of the personal circumstances of members often led to us continuing with some "non-financials ". They invariably came good. Not that it probably made much difference anyway. I'm sure that kind-hearted Brenda would have spirited copies of *Stilt* in the right directions anyway!

She also enjoyed visiting far-flung members (from Melbourne, that is) during her travels with husband Mick. This also greatly assisted in building up the Group.

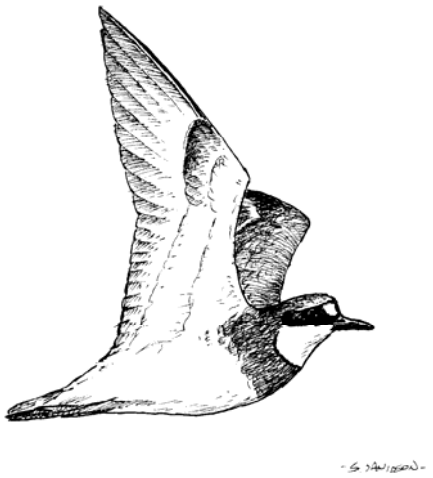
Brenda played a very active role in both AWSG and VWSG field work. She participated in a number of north-west Australia Expeditions and also in the Victorian twice-yearly wader counts. Brenda frequently took part in the catching programme in Victoria. I often see her name on the field sheets I'm checking when analyzing wader data – right back to the early eighties.

And just to fill in those spare moments, Brenda was Secretary/Treasurer of the VWSG for most of the time she was AWSG Secretary! And, most of the keeping cages used in Victoria and the north-west have been made by her. And…….

So, you can see that the wader community (birds and people) have a good deal to thank Brenda for. Without her efforts and involvement, we'd all be far worse off.

Brenda – many thanks from all of us for a job exceedingly well done.

Mark Barter



NOTES ON THE WADERS WINTERING AT THREE SITES AT THE NORTH-WESTERN TIP OF SUMATRA, INDONESIA

A.C. Crossland
46 Frensham Crescent, Christchurch, 8006, NEW ZEALAND

ABSTRACT
Twelve wader species were recorded wintering at three small coastal wetlands at the north-western tip of Sumatra in Nov-Dec 1995. A maximum of 546 waders were counted in the study area with Little Ringed Plover (36.6%), Red-necked Stint (31.9%) and Pacific Golden Plover (13.6%) the most abundant. No waders were found on a follow-up survey on 27 April 1997.

INTRODUCTION

Despite the fact that more than 13,000 Indonesian islands straddle the equatorial seas between the Asian mainland and Australia, the wader communities inhabiting these islands remain little studied. On the island of Sumatra, the waders inhabiting the east coast of the three southern provinces of Lampung, South Sumatra and Jambi were first surveyed in 1984 (Silvius 1988). Meanwhile, the waders along the east coast of North Sumatra Province were surveyed in 1995-96 and 1997 (Crossland in prep.). Elsewhere in the northern half of Sumatra, there have been no systematic surveys and records have appeared only as casual observations, published mainly in Holmes (1996) and Lopez & Mundkur (1997).

This paper summarises visits to three small coastal wetlands at the north-western tip of Sumatra in Nov-Dec 1995 and April 1997. Although the number of waders found were small (<550 birds), observations on the wintering wader community and notes on the relative abundance of species will help to plug another gap in our knowledge of the distribution of waders on the shores of the Indonesian archipelago.

METHODS

Study area

The north-western tip of Sumatra lies approximately midway between Bali and India, and about 560 km across the Strailts of Malacca from the Malay Peninsula. Politically, the area falls within the Indonesian Special Territory of Aceh and is bordered to the north by the Andaman Sea, to the south-west by the Indian Ocean, and to the south-east by the province of North Sumatra. Geologically the area comprises limestone hills forming the north-western end of the Barisan mountain range, fertile alluvial lowlands and a coastal belt of sandy beaches, small river mouth estuaries, mangrove forest remnants and fish and prawn ponds.

Wader surveys

Between 30/11/95 and 12/12/95, I made visits to two small coastal estuaries (Krueng Aceh and Dunjung Batee), and an area of prawn ponds, mangrove remnant and saltmarsh (Lamnga) north-east of the provincial capital, Banda Aceh (5° 29’ N, 95° 20’ E) . A second visit was made to Krueng Aceh and Lamnga on 27/4/97.

All three sites were surveyed on foot - by walking around the perimeters of Dunjung Batee and Krueng Aceh; and by walking a transect through Lamnga following the main Banda Aceh-Kreung Raya road. Waders were identified and counted as they were encountered. Much care was taken to locate all birds present and to avoid double-counting. Location, size and habitat characteristics of the three surveyed sites are described below:

Krueng Aceh

A large tidal river bounded by concrete flood walls on the outskirts of Banda Aceh near the campus of Darusalam University. A narrow strip of tidal mudflat and low-growing saltmarsh along both banks (area <25 ha), mainly between the second and third bridges above the river mouth. A relatively simple area to survey, given the elevation provided by the flood wall and the narrowness (50-150m) of the mudflats. The true right bank (eastern side) held 90% of waders present on all visits. This site was surveyed for waders on 9/12, 10/12, 11/12/95 and on 27/4/97. All observations were made from mid to low tide and between 09:30 and 13:00 hrs.

Dunjung Batee estuary

A small (<50 ha) river estuary at the east end of Dunjung Batee Beach, 17 km north-east of Banda Aceh. Enclosed by a sandy spit and not open to the sea when visited. Approximately one-third of the area comprised either bare sand and mudflats or low saltmarsh with shallow (<0.5m) brackish water covered the remainder. Riparian vegetation comprised mainly coconut palms and *Casuarina* with a few small stands of mangrove. This site was visited twice; on 10/12/95 starting at 16:30 hrs and on 12/12/95 starting at 13:00 hrs.

Lamnga

A coastal area of prawn ponds, mangrove remnants and saltmarsh about six kilometres east of Banda Aceh. I walked a transect of about three kilometres along the

main Banda Aceh-Krueng Raya road, checking ponds on either side of the road. Visits were made on 30/11, 7/12, 9/12, 10/12 and 12/12/95 as well as on 27/4/97. Timing of observations varied from mid morning to sunset.

RESULTS

The Nov-Dec 1995 survey recorded a maximum of 546 waders from 12 species on the three coastal wetlands. No waders were found on a follow-up visit on 27 April 1997 (Table 1).

Species account

Common Greenshank *Tringa nebularia*
Four seen foraging on the muddy edge of a prawn pond at Lamnga on 30/11.

Common Sandpiper *Tringa hypoleucos*
Widespread in ones and twos, but not numerous. This species is probably more abundant than the surveys indicate as they utilise a wider range of habitats than those surveyed. Common Sandpipers seemed more abundant on Weh Island, 25 km offshore from Banda Aceh. Around this island they favoured sandy beaches and rocky shorelines with the most seen in one area being 11 counted along three km of shoreline between Pantai Kasih and Sabang Port on 4/12/95.

Terek Sandpiper *Xenus cinereus*
Seen only at Krueng Aceh with a maximum of 39 on 10/12/95.

Ruddy Turnstone *Arenaria interpres*
Only one seen, at Krueng Aceh on 10/12.

Red-necked Stint *Calidris ruficollis*
The most numerous wader at Krueng Aceh with a maximum count of 174 on 11/12. Red-necked Stints accounted for 31.9% of all waders found on the survey but were only seen at the one site.

Broad-billed Sandpiper *Limicola falcinellus*
Only one seen, at Kreung Aceh on 11/12.

Grey Plover *Pluvialis squatarola*
Only one seen at Dunjung Batee on 10/12 and 12/12, feeding and roosting with Pacific Golden Plovers. Not seen elsewhere.

Pacific Golden Plover *Pluvialis fulva*
Common at Dunjung Batee with 74 on 10/12 and 69 on 12/12. Not seen elsewhere.

Little Ringed Plover *Charadrius dubius*
The most numerous small plover, common at all three sites and accounting for 36.6% of all waders recorded. Maximum count at Kreung Aceh was 123, including many immatures on 11/12. At Lamnga scattered individuals and small groups totalling 30+ were noted feeding around the edges of pools in partly dry prawn ponds as well as foraging over low saltmarshes. At Dunjung Batee numbers varied markedly from 47 on 10/12 to 4 on 12/12. This difference probably reflects movement of Little Ringed Plovers between Dunjung Batee estuary where they roost and forage in the late afternoon and the prawn ponds and saltmarshes at Lamnga where they feed during the day. The 10/12 survey at Dunjung Batee commenced at 16:30 hrs (late afternoon) while the 12/12 survey took place at 13:00 hrs (early afternoon).

Lesser Sand Plover *Charadrius mongolus*
Small numbers occurred at all three sites with a maximum of 7 at Krueng Aceh on 11/12, 8+ at Lamnga on 9/12 and 16 at Dunjung Batee on 10/12. None were at Dunjung Batee on 12/12 when, like the Little Ringed Plovers, they were presumably on nearby prawn ponds.

Greater Sand Plover *Charadrius leschenaultii*

Table 1. Maximum counts of wintering waders at three coastal wetlands at the north-western tip of Sumatra, 30/11/95 to 12/12/95.

Species	Krueng Aceh	Lamnga	Dunjung Batee	Total	Relative abundance
Common Greenshank	-	4	-	4	(0.7%)
Common Sandpiper	2	6+	1	9	(1.6%)
Terek Sandpiper	39	-	-	39	(7.1%)
Ruddy Turnstone	1	-	-	1	(0.2%)
Red-necked Stint	174	-	-	174	(31.9%)
Broad-billed Sandpiper	1	-	-	1	(0.2%)
Pacific Golden Plover	-	-	74	74	(13.6%)
Grey Plover	-	-	1	1	(0.2%)
Little Ringed Plover	123	30+	47	200	(36.6%)
Lesser Sand Plover	7	8+	16	31	(5.7%)
Greater Sand Plover	4	-	4	8	(1.5%)
Malaysian Plover	-	-	4	4	(0.7%)
TOTALS	351	48+	147	546	(100%)

Less common than Lesser Sand Plover with a maximum of four at Dunjung Batee on 10/12 and four at Krueng Aceh on 10/12.

Malaysian Plover *Charadrius peronii*
Four (two pairs?) were present on the sandspit adjacent to Dunjung Batee estuary on 10/12. Two were seen on 12/12.

Follow-up visit, April 1997

I made a follow-up visit to Krueng Aceh and Lamnga on 27 April 1997. Despite an extensive low-tide search, no waders were found at either site. I also checked another small estuary, Uleh-leh, located 5 km to the west of Banda Aceh and found no waders there either. This absence of birds suggests that by the end of the fourth week in April, most, perhaps all, waders have left the area on spring migration.

DISCUSSION

This survey recorded small numbers of twelve wader species wintering on three coastal wetlands at the north-western tip of Sumatra. The wader community was dominated by two species, Little Ringed Plover and Red-necked Stint, which together comprised 68.5% of all birds counted. The next most abundant species were Pacific Golden Plover (13.6%), Terek Sandpiper (7.1%) and Lesser Sand Plover (5.7%). The remaining seven species each comprised less than 2.0% of the total.

With the exception of Common Greenshank, all waders recorded were either small plovers or sandpipers. No other larger waders (curlews, godwits or redshanks) were recorded. This contrasts with the east coasts of both northern (Crossland in prep.) and southern Sumatra (Silvius 1988, Verheught *et. al.* 1993, Parrott & Andrew 1996) where species such as Eurasian Curlew (*Numenius arquata*), Whimbrel (*Numenius phaeopus*), Black-tailed Godwit (*Limosa limosa*), Bar-tailed Godwit (*Limosa lapponica*), Asian Dowitcher (*Limnodromus semiplamatus*), Common Redshank (*Tringa totanus*) and Great Knot (*Calidris tenuirostris*) are all abundant.

The absence of these species in Northern Aceh can probably be put down to the fact that the study sites were small with fairly hard substrates and relatively high levels of human disturbance. These characteristics also apply to other coastal wetlands west of Banda Aceh and to most of those along the west coast south to Meulaboh (pers. obs.). In contrast, coastal wetlands on Sumatra's east coasts tend to be much larger, with expansive soft mudflats (often impassable to humans) and abundant molluscs, crabs and mud skippers, supporting much higher densities of waders and other waterbirds (pers. obs.).

This study fills a small gap in our knowledge of wader distribution at the far north-western tip of Sumatra. Large gaps still exist in this part of Indonesia, particularly on the northern and eastern coasts of Aceh, between the present study area and the Aceh-North Sumatra province border. Large estuarine areas such as Teluk Langsa and Teluk Aru, as well as a chain of smaller estuaries and lagoons all potentially hold concentrations of waders that as yet have never been surveyed.

ACKNOWLEDGMENTS

I made these bird surveys while holidaying in Indonesia. For help, advice and encouragement, I would like to thank the director and staff of the Banda Aceh Tourist Office; staff and students from Darusalam University; Imran, Musliady, Amat, Sule Ariestond and the many kind people of Aceh. I would like to thank Phil Battley and Kelvin Yeap for comments and suggestions on this manuscript.

REFERENCES

Holmes, D.A.1996. Sumatra Bird Report. Kukila 8: 9-56.

Lopez, A., & T. Mundkur (Eds.). 1997. The Asian Waterfowl Census 1994-1996. Wetlands International. Kuala Lumpur.

Parrott, S., & P. Andrew 1996. An annotated checklist of the birds of Way Kambas National Park, Sumatra. Kukila 8: 57-85.

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.

Verheugt, W.J.M., H. Skov & F. Danielson 1993. Notes on the birds of the tidal lowlands and floodplains of South Sumatra province, Indonesia. Kukila 6: 53-84.

SEASONAL MIGRATION OF BANDED STILT *CLADORHYNCHUS LEUCOCEPHALUS* TO THE NATIMUK-DOUGLAS SALT PANS IN WESTERN VICTORIA, AUSTRALIA

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ABSTRACT

The Natimuk-Douglas salt pans are an important seasonal habitat for the eastern Australian population of the endemic Banded Stilt. A large proportion of the population visited these lakes in 8 of the 10 survey years (1989-1998). The two years in which Banded Stilts failed to appear corresponded to exceptional rainfall elsewhere within the range of the Banded Stilt in south-eastern Australia. The Natimuk-Douglas salt pans are particularly important to Banded Stilts in dry years, providing reliable habitat when it is scarce elsewhere.

INTRODUCTION

Banded Stilts *Cladorhynchus leucocephalus* inhabit mainly saline and hypersaline waters of inland and coastal southern Australia, with seasonal patterns of abundance in some parts of the range with seasonal rainfall (Marchant and Higgins 1993). The Southern Wimmera district lies in a region of reliable winter and spring rainfall, and has an annual average rainfall of 410mm.

Past records (Alcorn 1985, Lane 1987) had shown that large numbers of Banded Stilts sometimes visited these wetlands. In order to determine the numbers involved, and whether the occurrence of Banded Stilts was seasonal or sporadic, we conducted monthly surveys for ten years from 1989 to 1998. This report documents the survey results, and relates Banded Stilt numbers to rainfall in the Southern Wimmera and other districts within the range of the Banded Stilt in Australia.

METHODS

Between the townships of Natimuk and Douglas in the Southern Wimmera district of western Victoria lies a chain of salt pans, ranging in size from 2 to 778 hectares (Figure 1, Table 1). Flat and shallow, they fill annually from winter and spring rains, then dry again in summer.

All salt pans were surveyed once per month from 1989-1998, excluding a few salt pans where access was more difficult. Most surveys were conducted in the middle fortnight of each month. Surveys were conducted at various times of the day. On no occasion did we observe Banded Stilts leaving or arriving at a salt pan, so it is unlikely that birds were double-counted or missed during a survey.

On each vist, each salt pan was surveyed completely from one or more vantage points using 9 x 25 binoculars or a 22x telescope. Birds were counted individually where numbers were small. Large flocks were counted in blocks of ten or one hundred birds.

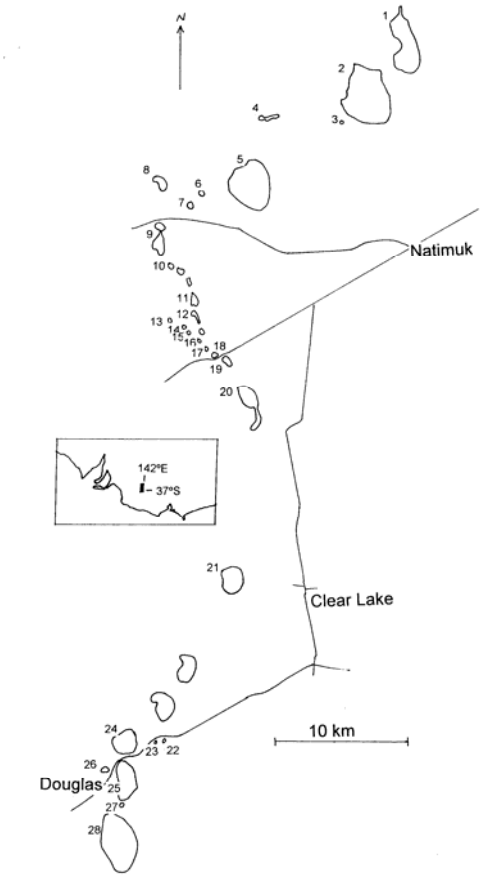

Figure 1. Location of the Natimuk-Douglas salt pans. Surveyed salt pans are numbered (see Table 1).

Each salt pan was also scored as wet or dry. A salt pan was scored as wet if more than half of the surface of the salt pan was covered with water. This definition was chosen to exclude salt pans where thin films of water might develop following summer showers, or where small patches of water might spread from a spring.

Table 1. Surveyed salt pans of the Natimuk-Douglas saline wetland system. Numbers refer to Figure 1.

Salt pan	Name	Max Number Observed 1989-1998
1	Olivers Lake	11700
2	Lake Wyn Wyn	9600
3	Un-named salt pan	-
4	Grass Flat Swamp	-
5	Mitre Lake	27257
6	Un-named salt pan	-
7	Un-named salt pan	150
8	Greenhill Lake	4000
9	Hatelys Lake	2580
10	Un-named salt pan	-
11	Un-named salt pan	11
12	Un-named salt pan	-
13	Un-named salt pan	4
14	Un-named salt pan	-
15	Un-named salt pan	-
16	Un-named salt pan	755
17	Un-named salt pan	80
18	Un-named salt pan	100
19	Jaka Lake	800
20	Heard Lake	17000
21	Bow Lake	6700
22	Brooksbys Lake	-
23	Duck Lake	-
24	North Lake	1800
25	Centre Lake	11000
26	Tea Tree Swamp	-
27	Un-named salt pan	3
28	White Lake	57560

RESULTS AND DISCUSSION

Banded Stilts were recorded on 18 of the 28 surveyed salt pans (Table 1), indicating that it is the Natimuk-Douglas wetland system as a whole that is important to Banded Stilts, rather than just a few salt pans. The salt pans utilised by Banded Stilts varied from year to year, and often from month to month.

Table 2 lists the maximum monthly count of Banded Stilts over all surveyed wetlands for each of the ten survey years. In eight of the ten years, between 14,515 and 60,389 Banded Stilts were recorded, representing between 7% and 29% of the estimated 206,000 birds in the Australian population (Watkins 1993). In the remaining two years, only a handful of Banded Stilts appeared.

The total number of Banded Stilts recorded month by month is shown in Figure 2. This figure also shows the proportion of salt pans scored as wet at the time of the survey. Months in which surveys were not conducted are indicated by the absence of a wetness symbol.

Table 2. Maximum total number of Banded Stilts recorded on the Natimuk-Douglas salt pans in each survey year, and the month in which this number occurred.

Year	Month	Maximum Number
1989	January	386
1990	October	17666
1991	October	29140
1992	October	130
1993	October	24200
1994	September	22433
1995	September	28031
1996	November	44553
1997	October	14515
1998	October	60389

All lakes were wet by June or July each year and remained that way throughout winter and early spring. Although small numbers of Banded Stilts often appeared in the winter months, peak numbers were always recorded between September and November, except in years when few Banded Stilts arrived at all. As the lakes dried in late spring or early summer, the Banded Stilts departed.

Figure 2 shows that, although all salt pans in the Natimuk-Douglas chain filled in each of the ten years from 1989-1998, the maximum number of Banded Stilts visiting the Natimuk-Douglas wetlands varied considerably from year to year. Figure 3 shows the correlation of peak annual Banded Stilt numbers on the Natimuk-Douglas salt pans with annual rainfall across rainfall districts in southern Western Australia, South Australia, south-western New South Wales and western Victoria. This area covers the main range of the Banded Stilt in Australia.

The pattern of negative correlations of maximum Banded Stilt numbers with annual rainfall in the eastern states of South Australia, New South Wales and Victoria means that there was a tendency for larger numbers of Banded Stilts to arrive on the Natimuk-Douglas salt pans in dry years in south-eastern Australia, and fewer in wet years. In wet years more habitat in the form of wet salt pans will be available, particularly in the drier northern districts, so Banded Stilts will be more widely dispersed and less likely to be found in any one district. Conversely in dry years less habitat will be available, and unless there has been a significant rainfall event elsewhere, Banded Stilts will congregate in the wetter, more southerly regions. The Natimuk-Douglas salt pans lie in the near-coastal zone of the southern part of this region, and clearly provide one of the principal habitats

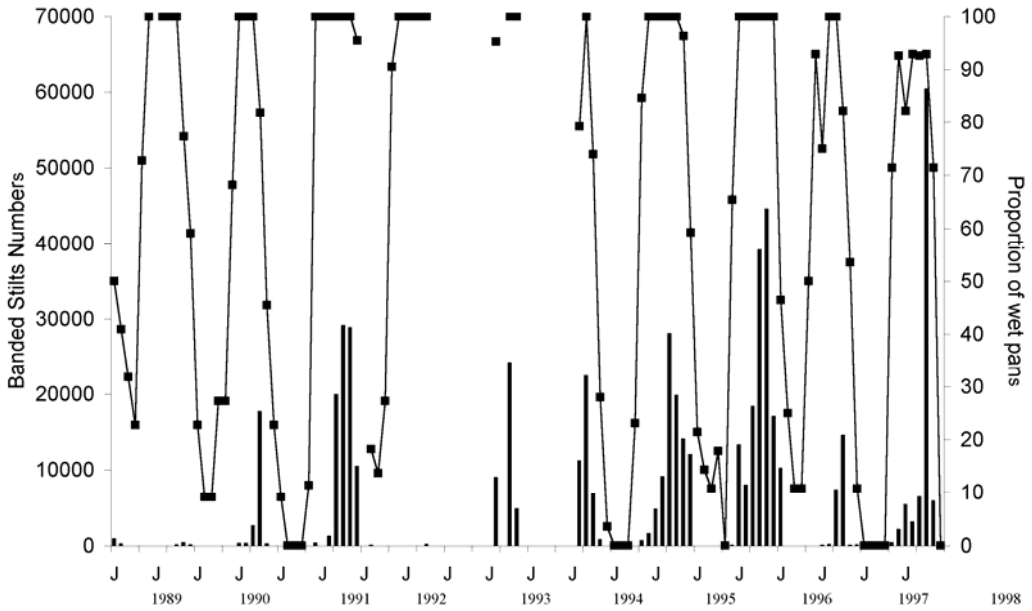

Figure 2. The total number of Banded Stilts recorded on each monthly survey. The solid line depicts the proportion of surveyed salt pans scored as wet.

of Banded Stilts in south-eastern Australia in the spring period of dry years.

Two years, 1989 and 1992, were unusual in that virtually no Banded Stilts appeared on the Natimuk-Douglas salt pans for the entire year. Exceptionally heavy rain fell over a large area of northern South Australia in March 1989. By April, up to 100,000 Banded Stilts, perhaps the entire eastern Australian population, had commenced breeding on Lake Torrens (Minton 1989). Although most birds had left Lake Torrens by August, they did not return to the southern Wimmera that year. Nineteen-ninety two was the wettest year during the survey period across many districts in western Victoria and eastern South Australia, and in some districts the wettest year on record. Undoubtedly extensive habitat was available throughout this region for much of the year. Whether or

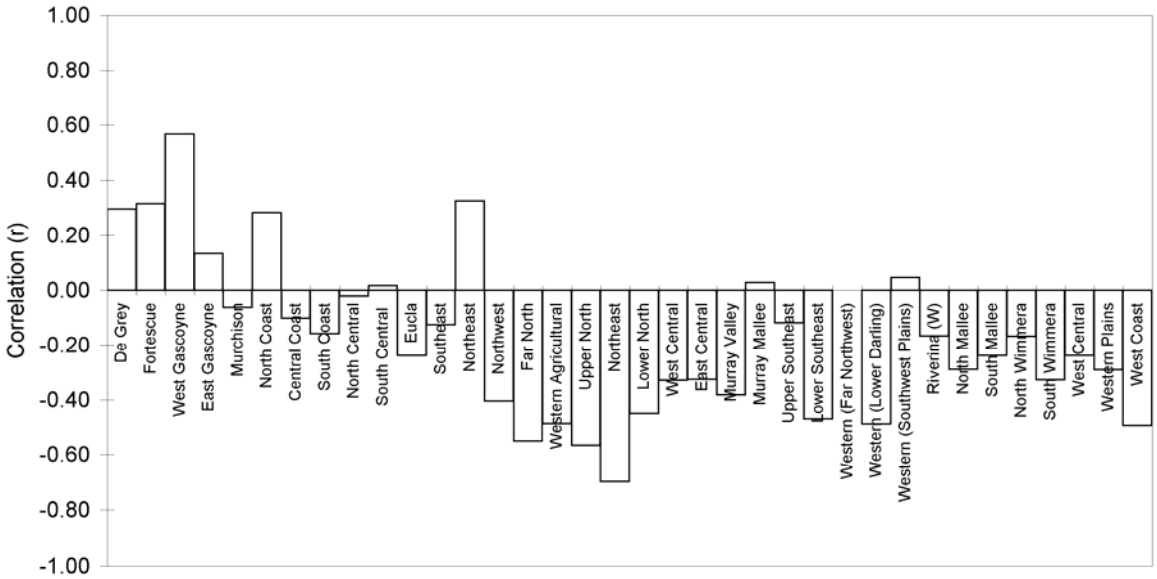

Figure 3. Correlation of peak numbers of Banded Stilts recorded each year on the Natimuk-Douglas salt pans with annual rainfall for all rainfall districts within their main range. Only the value for the Northeast district of South Australia is statistically significant ($p<0.05$).

not Banded Stilts bred in eastern Australia in 1992 is unknown.

Banded Stilts also bred at Lake Eyre in 1997 (Minton 1997), the only other documented breeding event in eastern Australia during the survey period. In February 1997, substantial rains fell across northern South Australia, a month earlier than in 1989. Large numbers of Banded Stilt chicks were observed on Lake Eyre in May. Banded Stilts did not arrive back in the southern Wimmera until November of that year, and then in smaller numbers than usual.

If rainfall in Western Australia had enticed Banded Stilts away from the southern Wimmera, we would expect to find a pattern of negative correlations for these districts in Figure 3. However Banded Stilts numbers in the southern Wimmera were positively correlated with rainfall in Western Australia during the survey period. This suggests that the eastern Australian population of Banded Stilts does not respond to rainfall events in Western Australia.

ACKNOWLEDGEMENTS

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REFERENCES

Alcorn, R. 1985. 50 000 Banded Stilts. RAOU Newsletter 66,4.

Anon. Monthly Rainfall Review Australia, January 1989 to December 1998. Bureau of Meteorology, Canberra.

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

Marchant S, Higgins P.J. 1993. Handbook of Australian, New Zealand and Antarctic Birds. Oxford University Press, Melbourne.

Minton, C. 1989. RAOU Newsletter 80,3.

Minton, C. 1997. The Tattler 12.

Watkins, D. 1993. A national plan for shorebird conservation in Australia. RAOU Report No. 90.

THE EFFECTS OF CYCLONIC WEATHER CONDITIONS ON THE BIRD LIFE AROUND BROOME, WESTERN AUSTRALIA

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ABSTRACT

The cyclone season in Australia's tropical north west typically starts in November and continues until February, although rain and storms can occur at any time. Few or no observations have been published about the effect cyclones have on the local avifauna of an area, especially an area as unique as Roebuck Bay and 80 Mile Beach, a Ramsar site. This article describes the effects that were noted when a tropical cyclone passed close to the coasts of Broome and 80 Mile Beach in December 1995. Special emphasis is made on the waders that occur in large numbers in these areas. Mention is also made of the reaction by land birds and those species that normally spend their non-breeding life well out to sea.

INTRODUCTION

On 18 December 1995, a tropical depression to the north of Broome, was re-categorised as tropical cyclone 'Gertie'. 'Gertie' developed 150 kilometres north of Cape Leveque at the top of the Dampier Peninsula (Fig. 1) and proceeded initially to move west south west, then turned south, following the coast line of the peninsula. It was upgraded to a category two cyclone at 03:00 hours on 19 December by which time it was 200 kilometres west north west of Broome. Wind speeds around the centre by this time had increased from 90 kph to 125 kph. During the next 45 hours 'Gertie' wandered southward 150 kilometres off the coast before turning sharply and crossing the coast at Wallal Downs Station (19° 47'S 120° 38' E), between Port Hedland and Broome at 24:00 on 20 December (Figure 1). Wind speeds peaked at 150 kph and 'Gertie' died a wet death near the gold town of Telfer (21° 43'S 122°13' E) at 21:00 the following evening.

The effects of an intense low pressure on the ground can be dramatic. At Broome, for instance, 'Gertie's' passing was heralded by strong onshore winds and the disruption of the normal tidal pattern. High tides in Roebuck Bay were higher than predicted as the low pressure area passed, causing the beaches where large numbers of waders roost to be inundated and therefore unusable by the birds. In Roebuck Bay the effect on the low tides could not be assessed as low tides are very low under normal conditions exposing large expanses of mud and it did not appear to change much just by using eyesight.

Roebuck Bay normally holds approximately 170,000 waders or shorebirds (Watkins 1993) of up to 50 different species. The bulk of these are Bar-tailed

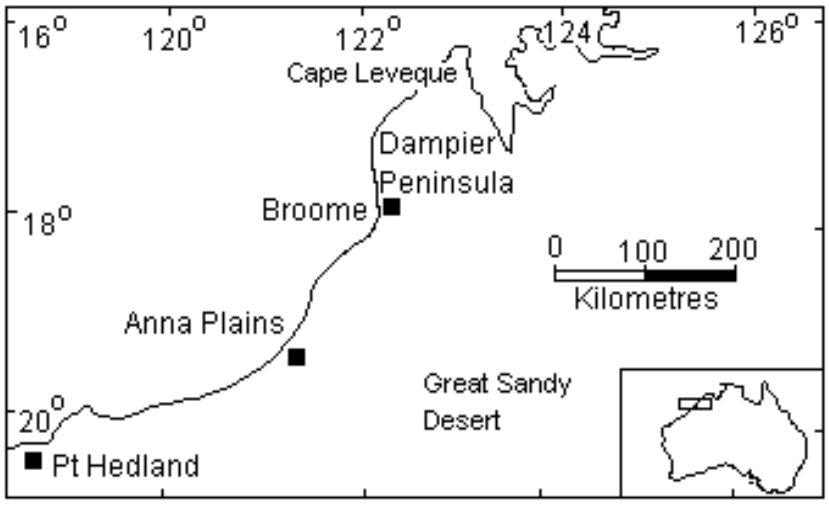

Figure 1. Map of the Broome area.

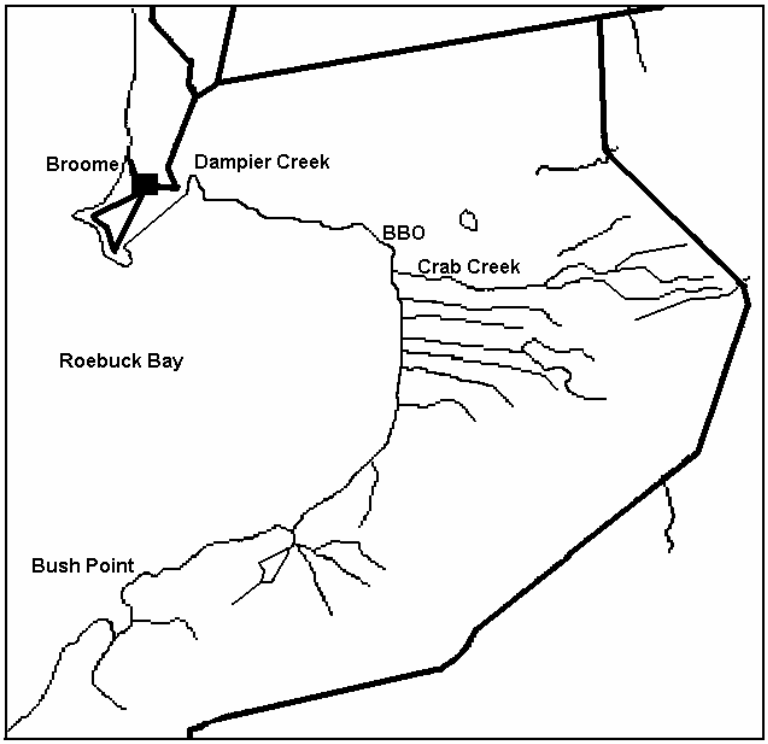

Figure 2. Map of Roebuck Bay, Broome.

Godwits *Limosa lapponica* (65,000) and Great Knot *Calidris tenuirostris* (22,600) although there are significant numbers of Red Knot *Calidris canutus* (11,200), Red-necked Stint *Calidris ruficollis* (19,800), Eastern Curlew *Numenius madagascarensis* (2,160), Terek Sandpiper *Tringa cinereus* (1,000), Grey-tailed Tattler *Heteroscelus brevipes* (3,180), Ruddy Turnstone *Arenaria interpres* (2,060) and Curlew Sandpiper *Calidris ferruginea* (6,000).

METHODS

Counts were made at major roost sites along the accessible shoreline of Roebuck Bay between Broome and the start of the mangroves to the south of the Broome Bird Observatory (Fig. 2) on 22 November 1995, 20 December 1995, just after the passage of Cyclone 'Gertie' and 26 January 1996. Leica 10x42 binoculars and a 22x telescope were used for all observations.

Incidental observations of wader behaviour near Crab Creek, Roebuck Bay, were made during an ongoing study of the feeding behaviour of Whimbrel. Observations were also made of the condition of 80 Mile Beach, Anna Plains Station during monthly wader and passerine counts.

RESULTS

Observations at Broome

The movement of waders away from the usual high tide roosts apparently began 12 days before the effects of the weather system became severe. During observations of feeding Whimbrel on 8 December, large numbers of waders were moving from the exposed southern and northern beaches of Roebuck Bay into more sheltered areas. These inland areas behind the fringing mangrove contain low-lying claypans surrounded by samphire and grassy plains. The birds flew up the system of creeks to reach the clay pans (Fig. 2). This was unusual as the predicted height of the tide was 7.7m and waders usually only use this area when tides are over 9.5m (pers. obs.).

The exact number of waders in the study area was difficult to estimate as they were in large to medium size mixed flocks. For instance, at 10:15 a flock of Greater Sand Plovers, Curlew Sandpipers and Grey-tailed Tattlers, numbering 10,000 birds flew as a mixed flock over the mangroves, closely followed by another 3,000 birds, mostly Red-necked Stints and Black-tailed Godwits. Further flocks were observed until 11:28 when the conditions became very squally and observations were discontinued. In the one hour and 17 minutes of observation, a total of 32,700 waders flew over the mangroves into the more sheltered areas behind. The majority of these birds flew in from the direction of Bush

Point, the most southerly area of Roebuck Bay and the most exposed.

The following day the movements were not as dramatic, but numbers in Roebuck Bay were noticeably lower than usual for the time of year probably because of the movements the previous day (see Table 1). However, significant movements of Eastern Curlew 1,100 or 51% of the total Eastern Curlew using the bay (Table 1), and White-winged Black Terns *Chlidonias leucopterus* (3,000) occurred, all heading in a similar direction to the birds the day before. Oriental Pratincoles *Glareola maldivarum*, Gull-billed Terns *Sterna nilotica* and Silver Gulls *Larus novaehollandiae* were also observed flying inland over Broome Bird Observatory in large numbers (not counted). Away from the Observatory, 2,000 Whiskered Terns *Chlidonius hybridus* were observed moving in a southerly direction at Anna Plains Station (Fig. 1).

Increased numbers of Crested Terns *Sterna bergii* and Lesser Crested Terns *S. bengalensis* were observed from the beaches, fishing close in shore and migratory tern species such as Little Terns *S. albifrons* and Common Terns *S. hirundo* also appeared in larger numbers than were normally experienced. A mixed flock of 7,000 terns were seen the day before the cyclone passed feeding *en masse* close to the shore but the weather conditions prevented specific identification.

Common Noddies *Anous stolidus* and Sooty Terns *Sterna fuscata* were also found in the more sheltered fishing areas at various points along the coast.

Counts at major roosts on Roebuck Bay

Immediately following the passage of Cyclone 'Gertie', lower than expected numbers of some wader species were found, notably Lesser Sand Plover (2), Greater Sand Plover (250) Ruddy Turnstone (122), Grey-tailed Tattler (155), Terek Sandpiper (7), Red Knot (0), Red-necked Stint (250) and Curlew Sandpiper (301). The number of Great Knot (20,701) was three times greater than that recorded in November and similar to those reported for the whole of Roebuck Bay by Watkins (1993) (Table 1). The number of Black-tailed Godwit increased four fold and the numbers of Grey Plover, Eastern Curlew and Bar-tailed Godwit were similar to that recorded in November (Table 1).

A month after the cyclone had passed a further count of accessible roosts was made. The number of Lesser Sand Plover, Ruddy Turnstone and Grey-tailed Tattler were similar to those recorded in November. The number of Greater Sand Plover, Terek Sandpiper, Black-tailed Godwit and Curlew Sandpiper were less and the number of Red Knot and Red-necked Stint greater than those recorded in November (Table 1).

It is of note that most of the large and medium sized waders appeared on the normal high tide roosts soon after the cyclone had passed. Species such as Grey Plover, Eastern Curlew and Bar-tailed Godwit showed little variation in numbers. Great Knot and Black-tailed Godwit showed an increase. This may be due to displacement of Great Knot from areas during the cyclone before they dispersed back to their usual roosts in other parts of the bay. The Black-tailed Godwits were probably displaced from inland feeding areas due to the

Table 1. Comparative counts for the accessible high tide roosts before, during and after the passing of Cyclone 'Gertie' and the maximum number of birds reported by Watkins (1993) for the whole of Roebuck Bay.

Species	22/11/95	20/12/95 (24 hours after the cyclone passed Broome)	26/01/96	Maximum numbers after Watkins (1993)
Black-tailed Godwit	792	3006	373	7374
Bar-tailed Godwit	22,407	18,650	19820	65,000
Whimbrel	137	83	24	1020
Eastern Curlew	284	311	48	2160
Terek Sandpiper	492	7	172	1000
Grey-tailed Tattler	596	155	731	3180
Ruddy Turnstone	238	122	297	2060
Great Knot	5799	20,701	7560	22,600
Red Knot	667	0	2237	11,200
Red-necked Stint	2350	250	4530	19,800
Curlew Sandpiper	665	301	400	6000
Grey Plover	135	161	147	1300
Lesser Sand Plover	690	2	790	1057
Greater Sand Plover	3750	250	1590	26,900

deepening of their favoured freshwater feeding areas by the large quantity of rain that was experienced. They returned to these areas as the water levels returned to more favourable depths. The number of Whimbrel observed a month after the passage of the cyclone was only one quarter that recorded in November. This species often feeds in open areas in the mangrove system and the high tides that occurred opened up new and easier feeding areas perhaps making it more energy efficient to forage in these areas rather than the open mudflats.

Of the smaller waders Lesser Sand Plovers, Ruddy Turnstone, Terek Sandpipers, Red-necked Stint and Curlew Sandpipers all showed a marked decrease in numbers when the weather conditions deteriorated but slowly increased to previous or slightly above pervious levels. Red Knot were absent from the bay during the cyclone but a month later were more numerous than before the passage of the cyclone. This increase in numbers may be an effect of the local change of habitat in inaccessible areas making them unsuitable for these birds or to influx of birds from further north following the onset of the wet season, or from 80 Mile Beach due to loss of food species (see description of the impact of the cyclone on 80 Mile Beach below).

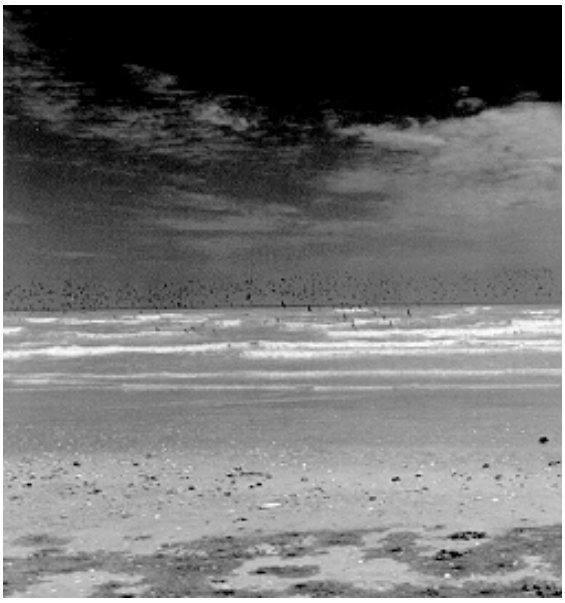

Figure 3. 80 Mile Beach prior to the passage of cyclone 'Gertie'.

Observations on 80 Mile Beach near Anna Plains Station

A visit was made to 80 Mile Beach soon after the passage of the cyclone. The churning effect of increased winds and waves on the open mudflats of 80 Mile Beach exposed many thousands of small to medium sized bivalves. The most common bivalves in this area belong to the families Lucinidae, Tellinidae and Donadidae (Piersma *et al* unpublished data). Many shellfish had been washed up on the high tide line producing an abundance of readily available food items for waders and Bar-tailed Godwit, Great Knot and Red Knot were observed feeding voraciously on them. Close inspection revealed that the vast majority of the bivalves were dead and the shells partially open making it easy to access the flesh.

The character of the beach was also changed as large amounts of sand were deposited onto the topmost areas of mud, high energy mega-ripples were apparent (Figs. 3 and 4). This not only cut down the amount of exposed mud but also the length of time the mud was exposed on an incoming tide. Roebuck Bay on the other hand although experiencing the same tidal effects was protected from the churning effects of the high winds as it is southward facing. No dead shellfish were found and the movement of large amounts of sand was not noted.

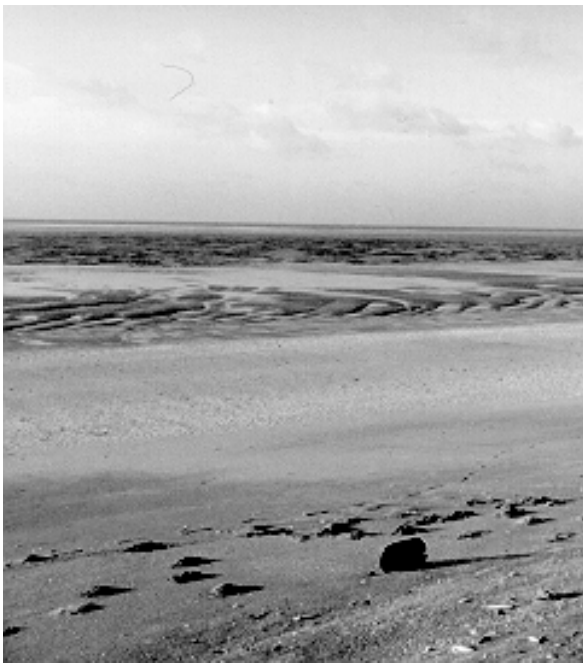

Figure 4. 80 Mile Beach soon after the passage of cyclone 'Gertie'. Note ripples of sand overlaying the mud in the foreground and gouging of mud in background.

One Bar-tailed Godwit was found dead on Anna Plains Station having been driven against a fence by high winds (George Swann pers. comm.). An Oriental Plover with a

damaged wing was also found in an exhausted condition and was rehabilitated and released five weeks later.

Other species affected

Waders and terns were not the only group of birds that were effected by the cyclone. Tree Martins *Hirundo nigricans*, Fairy Martins *H. ariel*, Barn Swallows *H. rustica* and Fork-tailed Swifts *Apus pacificus* were all seen to move through the area in large numbers and a small flock of seven White-winged Trillers *Lalage suerii* were seen travelling south along the dune system in Roebuck Bay.

Three species of Shearwater were also seen before and after the storm. Streaked Shearwater *Calonectris leucomelas* were common and several specimens of Wedge-tailed Shearwater *Puffinus pacificus* as well as one Hutton's Shearwater *P. huttoni* were found on Cable Beach in Broome (Collins & Jessop 1997), the latter two being new to the Broome area (Collins 1995).

Rarities also were found after the cyclone had passed and included a freshly dead Blue-winged Pitta *Pitta moluccensis* at Coconut Well and a *Phylloscopus* warbler of indeterminate species at Anna Plains.

DISCUSSION

During periods of cyclonic activity waders presumably move from exposed roosts to more sheltered areas to avoid extremely high winds and heavy rain. It would be energetically expensive for a wader to move against high winds. The disruption of the tidal cycle decreased the time available for waders to feed and meant that normal high tide roosts were unusable. The claypans behind the mangroves near Crab Creek have would provide a sheltered roosting area.

Apart from the Bar-tailed Godwit and Oriental Plover no other wader casualties were discovered along several kilometres of beach either around Broome or Anna Plains. Thiyagesan & Nagarajan (1997) reported the deaths of large numbers of birds, mostly nesting herons, egrets and storks during a severe storm in southern India. Deaths were attributed to collisions with trees and other vegetation. The migratory wader population abandoned the area but recovered to their previous numbers in a relatively short time.

Although the lack of bird bodies found at Broome and 80 Mile Beach could indicate that few birds died other factors also need to be considered. Dead or injured birds could have been eaten by the high number of predatory and scavenging bird in the area, such as Black Kites *Milvus migrans* , Whistling Kites *Haliaster sphenurus* and Brahminy Kites *H. indus* as well as Little Eagles *Hieraaetus morphnioides* and Wedge-tailed Eagles *Aquila audax*. Casualties could also have been be washed out to sea by the high tides and high run off experienced with the heavy rainfall accompanying the storm and then scavenged by marine animals such as crabs. Alternatively, the birds could have moved from the area in time to escape the worst effects and as a consequence suffered few casualties. The ability of waders to endure and in some cases ignore extreme weather has been noted before (Weston 1997) even during the stressful event of migration.

ACKNOWLEDGMENTS

Our thanks go to George Swann who provided us with information on the casualty at Anna Plains Station and Jon Fallaw and Becky Hayward the then wardens of Broome Bird Observatory for unrestricted access to the unpublished records that are held there. Also to Mavis Russel who assisted most ably in the counts along the shores of the Bay in trying conditions. We also thank the manager of Anna Plains Station, John Stoate for allowing us access to 80 Mile Beach.

REFERENCES

Collins, P.C. 1995. The Birds of Broome - An Annotated List.

Collins, P.C. & R.E. Jessop 1997. The occurrence of three species of Shearwater at Broome, North-western Australia. Australian Bird Watcher 17, 94-96.

Thiyagesan, K. & R. Nagarajan 1997. Effects of a cyclone on waterbird populations at the Pichavaram mangroves, southern India. Wader Study Bull. 84, 47-51.

Watkins, D. 1993. A national plan for shorebird conservation in Australia. RAOU Report 90.

Weston, M.A. 1997. An observation of wader migration in a tropical storm. *The Stilt* 31, 44.

THE NORTHWARD MOVEMENT OF IMMATURE EASTERN CURLEWS IN THE AUSTRAL WINTER AS DEMONSTRATED BY THE POPULATION MONITORING PROJECT

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ABSTRACT

Austral summer and winter counts of Eastern Curlew from the Australasian Wader Studies Group Population Monitoring Project were compared for 189 sites. The results showed that there is a northward movement of many immature birds in the winter and a strong relationship between latitude and proportion of Eastern Curlew observations in winter counts. North of 20°S in Queensland and NW Australia there were more birds in winter than summer.

INTRODUCTION

Immature birds of many wader species in Australia do not migrate to the breeding grounds in their first year. In larger species such as Bar-tailed Godwit *Limosa lapponica*, Eastern Curlew *Numenius madagascariensis*, Great Knot *Calidris tenuirostris* and Red Knot *Calidris canutus* most, if not all birds also spend their second austral winter in Australia. It is also probable that some or all Bar-tailed Godwit and Eastern Curlew also spend their third winter there.

Increasing evidence is accumulating from flag sightings and banding recoveries to show that many immature birds in some wader species move northwards within Australia for the Austral winter. However, there are no banding records or flag sightings of Eastern Curlews in the winter to show any such movements. This is possibly because few immature Eastern Curlew have been banded or flagged. Up to December 1998, only 614 Eastern Curlew had been banded in Victoria, the state where most have been banded. Not more than ten of these were juveniles/first year birds, although more may have been older immature birds which could not be separated from adults on plumage characteristics (VWSG 1999, Minton pers. com.).

This paper uses the count data from the Australasian Wader Studies Group Population Monitoring Project (PMP), as an alternative method to banding and flagging, to show that many immature Eastern Curlews move northwards within Australia for the winter.

METHODS

Waders have been monitored at core sites in Australia in February (summer) and June (winter) since 1981 as part of the AWSG Population Monitoring Project (PMP). There are 189 sites in the PMP that hold reasonable numbers of Eastern Curlews (> 50 birds). Some sites that were in the scheme when it was first set up are no longer counted. Other sites have been added in more recent years (Table 1). This paper only uses the 1986 to 1998 summer and winter count data reported in *Stilt*. For the few counts from some sites where data has not been published, it has been extracted from the PMP database.

For years where both summer and winter counts were made, the sum of all summer and winter counts was calculated for each site, and then the total number of winter birds was expressed as a percentage of summer birds (Table 1). The winter count was expressed as a percentage of the summer count for each year. The mean and standard error of percentages for each site was then calculated.

RESULTS

Table 1 shows the mean percentage that winter counts represent of summer counts at 18 sites and their latitudes. Figure 1 shows the percentage of birds in winter compared to summer plotted against latitude. There is a strong inverse relationship between percentage of immature birds and latitude. In the eastern states, Tasmania had the fewest wintering birds with 6.10 % at Derwent/Pittwater. The three sites in Victoria at Swan Bay/Queenscliff/Mud Island, Westernport Bay and Corner Inlet had 7.7–23.1%, 15.5–16.9% and 9.1–9.3% respectively. In New South Wales, five of the six sites ranged from 18.7–18.8% to 29.8–45.7%. The Hunter did not fit the pattern of the other sites, having 68.8–142.7%. This may be partly caused by the low summer counts in 1986 and 1992. Compared to other years, it looks as if all the birds were not counted in those years. However, even excluding these years the Hunter still had 54.5–67.4%. In Queensland, there was an increase northwards with 20.8–45.9% to 30.4–45.9% at Moreton Bay, Mackay and Gladstone, 49.2–72.8% at Townsville and 152.2–312.4% in Cairns. In South Australia, Gulf St. Vincent had 5.0–14.6%. In N.W. Australia and 80 Mile Beach (133.6–158.7%) and Broome (Roebuck Bay) (269.1–510%) in NW Australia were also very high.

There is clearly a strong relationship between latitude and proportion of wintering birds, with the exception of the Hunter and Gulf St.Vincent. There were fewest Eastern Curlew in Tasmania in the extreme south and increasing numbers northwards through Victoria, New

Table 1. Summer and winter counts of Eastern Curlew at sites monitored by the AWSG Population Monitoring Project. Also shown is the number of birds counted in winter expressed as a percentage of the summer count for years when counts were made in both summer and winter, and the number of years data used. Latitude of the sites is also given. The numbers of Eastern Curlews counted in winter expressed as a percentage of the summer count for each year in which a winter and summer count was made, at sites monitored by the AWSG Population Monitoring Project. Also shown are the sum of the birds in summer and winter for all years on which the percentages are based, the latitude of the sites, the number of years involved, the mean percentage for each site and the standard error of the mean.

Sites	QUEENSLAND					NEW SOUTH WALES						VICTORIA			TAS	SA	W.AUSTRALIA	
	Cairns	Townsville	Mackay	Gladstone	Moreton Bay	Tweed R	Richmond R	Clarence R	Hunter R	Botany Bay	Shoalhaven R	Corner Inlet	Westernport Bay	Swan Bay./Mud Island	E.Derwent/Pittwater	Gulf St Vincent	80 Mile Beach	Broome
Summer	150	405	1943	1171	16069	721	384	1359	1629	2002	689	17731	14510	2007	1348	483	301	363
Winter	220	155	644	230	5175	135	78	405	1120	504	141	1610	2255	154	81	24	402	977
Latitude	-16.9	-19.3	-21.1	-23.8	-27.4	-28.2	-28.9	-29.5	-32.9	-34	-34.4	-38.7	-38.3	-38.2	-42.9	-34.3	-19.2	-18.1
No Years	13	3	8	4	12	4	4	11	7	11	7	13	13	13	12	3	6	6
1986	87.5	-	38.8	-	38.3	-	-	26.1	550.0	-	-	5.3	26.5	1.8	3.1	8.5	-	-
1987	11.1	-	36.1	-	42.2	-	-	34.6	37.2	33.1	59.0	2.7	17.3	6.5	1.5	8.9	-	-
1988	81.5	-	40.8	-	21.1	-	-	7.5	58.3		2.1	14.7	14.8	55.6	7.8	-	-	-
1989	625.0	-	32.6	-	36.4	-	-	6.3	29.7	160.0	5.3	7.4	30.2	13.7	3.3	-	-	-
1990	20.4	-	48.5	-	-	-	-	15.9	-	43.8	-	14.8	15.6	11.1	11.8	-	-	-
1991	160.0	-	-	-	124.8	-	-	20.3	-		-	8.0	15.5	8.4	1.9	-	-	-
1992	400.0	-	12.7	-	103.7	-	-	212.5	112.1	33.3	33.3	0.9	13.6	7.4	-	-	-	-
1993	1000.0	-	48.1	-	22.2	-	-	67.9	-		-	7.3	14.5	153.8	6.0	-	59.6	71.0
1994	237.5	-	-	-	35.4	-	-	27.2	-	13.5	-	15.5	14.3	16.1	8.5	-	236.1	526.3
1995	666.7	36.0	10.8	18.5	45.4	33.7	33.3	42.7	57.5	21.5	28.6	12.9	12.2	12.8	12.2	-	84.3	75.9
1996	212.5	27.9	-	4.9	33.3	9.9	6.1	-	154.1	19.9	-	4.5	16.3	1.8	3.6	26.2	4.5	257.1
1997	342.9	-	-	24.9	14.9	19.9	21.2	41.4	-	17.7	-	12.4	22.0	1.9	2.2	-	408.0	1935.0
1998	216.7	154.5	-	35.0	32.6	11.6	20.9	-	-	24.3	28.6	14.1	7.2	9.3	11.8	-	159.5	194.6
Mean	312.4	72.8	33.6	20.8	45.9	18.8	20.4	45.7	142.7	40.8	26.2	9.3	16.9	23.1	6.1	14.6	158.7	510.0
Std error	81.3	40.9	5.1	6.3	13.3	5.4	5.6	17.5	69.9	13.8	7.9	1.4	1.7	11.6	1.2	5.8	59.8	293

South Wales and Queensland, and with the highest percentages being north of 20°S in Queensland and N.W. Australia. At these most northern sites there were more birds in winter than summer.

For all sites combined, winter counts represented an average of 80.2% of summer counts. As the winter percentage values from the three most northerly sites are much higher than elsewhere, the overall percentage of wintering Curlew is probably an overestimate. Recalculating the percentage without Cairns, 80 Mile Beach and Broome gives an estimate of the proportion of birds staying the winter in Australia at 30.8%.

DISCUSSION

There are a number of inconsistencies in the data that may have biased the pattern suggested in this analysis. At some sites, the individual counters and the counting techniques have changed over the years. For example, larger areas of Moreton Bay have been counted since 1993 than earlier, thus giving higher totals. Some summer counts at some sites show such large changes from year to year, that they suggest that birds were missed, or double counted, in some years. The proportion of immature birds in the population will also vary between years, depending on the success of the breeding season(s) prior to the count.

However the figures from the monitoring project were only used to calculate the number of birds counted in winter at a particular site, expressed as a percentage of birds counted in summer in the same year (for all years in which both summer and winter counts were made at that site). Thus, bias due to long term changes in counting techniques, count areas, observer skills or fluctuations in breeding success are minimized, since only within year counts are compared. The effects due to poor counts cannot be eliminated and inter-counter variance was not measured. Therefore, there are potential sources of error to the approach that cannot be quantified. Yet, the data shows a clear trend of increasing proportions of wintering birds to the north. Possibly, the pattern is so strong that it swamps errors due to miscounts or observer variability.

There are two possible interpretations for the pattern of increasing proportions of immatures to the north in winter. One interpretation is that immature birds may not generally fly to the far southern parts of Australia, and therefore tend to be further north than adults in the non-breeding summer season. They then remain on their summering area during the winter. This interpretation seems rather unlikely. It is not supported by evidence from banding of other wader species. One might expect the opposite to happen with immatures being pushed to

the south in the summer through competition with adults. The very high proportions of immatures in the far north, where the three most northern sites have more birds in winter than summer, shows that birds must be moving there from elsewhere. However, the data cannot show whether there is a tendency for fewer immatures to reach the most southern areas, or whether immatures are homogeneously mixed throughout the Australian summer population.

The other interpretation is that when the adults leave on migration in March for the breeding grounds, the immatures also move northward either at the same time as the adults, or during the course of the early winter. This is the most plausible interpretation as the evidence suggests that the immatures are not just filling up space vacated by adults. The three most northern sites have more birds in winter than summer. This also suggests that space is not a limiting factor there in summer, and that competition is therefore not a factor in determining the distribution of the adults and immatures.

From the data it is impossible to know if immature birds of all ages are involved in this northward movement, or mainly the older immatures, which may tend to move further and further north as they approach maturity after two to four years. There may be another reason why birds move northwards. The winter temperatures in southern Australia are much lower than in summer. It is therefore possible that birds are moving north simply because they are better off in the warmer climates of northern Australia in the winter. This northward migration of immature birds could, and probably does, extend north of Australia into South-East Asia and possibly even further north.

When the population monitoring project was set up it was stated that "the proportion of winter counts to summer counts will give a measure of breeding success". Obviously, in the case of Eastern Curlews, this is not so simple. Birds of different age classes are present in the winter population, so the winter numbers reflect the combined breeding success of two, three or even four seasons. Comparing numbers at the same site in winter from year to year may not give a good measure of the breeding success of combined seasons because there is no guarantee that immature birds are redistributing themselves in the same way every year. The degree to which immature birds move northwards in any year may depend on the severity of winter in southern Australia and also may be density dependent, with birds redistributing themselves differently when the populations are low, compared to when they are high.

There are currently estimated to be 29,000 Eastern Curlews in the East Asian/ Australasian Flyway (Watkins 1993 updated by new figures from Queensland (Driscoll 1997)), of which 27,000 are in Australia. The above calculations on proportions remaining in Australia in winter suggests that a minimum of 9,300-9,400 are

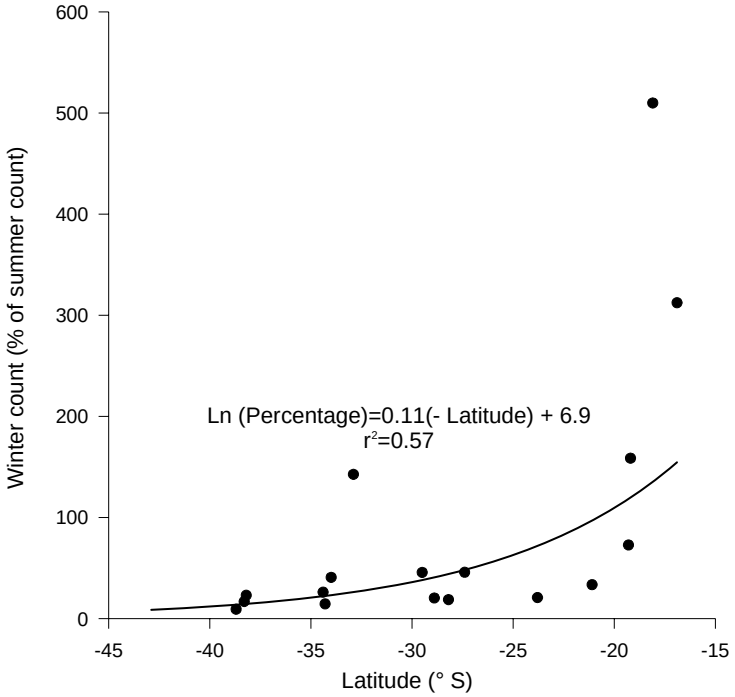

Figure 1. Comparison between summer and winter counts of Eastern Curlews at sites monitored by the AWSG Population Monitoring Project. Winter counts of Eastern Curlews expressed as a percentage of summer counts plotted in relation to latitude for 18 sites in the AWSG Population Monitoring Project.

non-breeders, leaving a maximum of about 10,000 breeding pairs. In the establishment of reserves for migratory waders in Australia, focus is usually made on the summer populations. In the case of the Eastern Curlew, and perhaps in other species, attention should also be paid to the winter sites that contain the future breeding stock. Key winter sites for Eastern Curlew are more likely to be found in northern, rather than southern Australia.

It seems that the potential of using the data from the PMP to demonstrate northward movements of immature waders has not previously been recognized. This paper demonstrates that even at sites with limited data, or low numbers, the PMP can be very useful for detecting such movements. Other species could be tested in the same way to investigate how widespread this winter movement is in immature migratory waders in Australia.

ACKNOWLEDGMENTS

The data used in this paper has been generated by hundreds of volunteers who have contributed to the Australasian Wader Studies Group Population Monitoring Project. Counts in Westernport Bay were made by members of the Bird Observers Club, who gladly gave permission to use their data.

REFERENCES

Driscoll, P. 1997. The distribution of waders along the Queensland coastline. Pp. 80-122.*In:* Straw, P (Ed.) Shorebird conservation in the Asia-Pacific Region. AWSG, Melbourne :

Victoria Wader Study Group. 1998. VWSG Bulletin 22. pp77.

Watkins, D.1993. A national plan for shorebird conservation in Australia. RAOU Report No 90.

THE IMPORTANCE OF THE MOROSHECHNAYA RIVER ESTUARY AS A STAGING SITE FOR SHOREBIRDS

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ABSTRACT

Data on shorebird migration through the Moroshechnaya River estuary were collected from 1970 to1990. The total period of field observations was about 12 months. From 2-17 August 1989, counts of feeding waders were carried out on the spit located between the river and the Sea of Okhotsk. During the period 21-30 May 1990, counts of migrating waders were conducted on the sea coast near the mouth of the river. Twenty-three species of waders were recorded. The total number of shorebirds migrating through the area on northward migration is about 300,000 individuals. The most abundant species (tens of thousands) were Dunlin, Red-necked Stint and Great Knot. Next most abundant species (thousands) are Red Knot, Bar-tailed Godwit and Whimbrel. Common species were Eurasian Oystercatcher, Pacific Golden Plover, Grey Plover, Mongolian Plover, Ruddy Turnstone, Black-tailed Godwit, Eastern Curlew, Terek Sandpiper, Wood Sandpiper, Common Greenshank and Spoon-billed Sandpiper. Ten species of shorebirds breed in the area, with Dunlin being the most common. Southward migration takes place in the July – September period, when Dunlin (350,000), Red-necked Stint (300,000), Great Knot (100,000), Black-tailed Godwit (50,000) and Bar-tailed Godwit (10,000) are the most numerous species.

INTRODUCTION

The west Kamchatka plain stretches along the Sea of Okhotsk coast for 800 km and has a width of 80-100 km in the central part. The plain contains tens of thousands of rivers and lakes; the total area of bogs is tens of thousands of km^2. All the big rivers of the west Kamchatka coast have estuaries. From July to the end of October, the coastal tundra has large quantities of different kinds of berries: *Rubus chamaemorus, R. arcticus, Vaccinium uliginosum, Lonicera kamtschatica, Empetrum sibiricum, V. vitisedaea, Oxycoccus palustris, Chamaepericlymenum suecicum.*

The Moroshechnaya River, which is one of the largest rivers along the west coast, is 270 km long and has a catchment area of 5450 km^2. The estuary is 20 km long and up to 2 km wide near the mouth. The maximum tidal range is 7 m. and tidal flow occurs over tens of km from the mouth. At low tide, large sandy beaches and mudflats are exposed which are important feeding areas for shorebirds during migration.

The Moroshechnaya River estuary is separated from the Sea of Okhotsk by a 1.5-2 km long sand spit. Most of the spit is covered by dry tundra with many berries. During autumn migration, the spit is also an important feeding place for shorebirds. The tundra located on the east coast of the estuary has a large number of small lakes surrounded by swampy ground.

MATERIALS AND METHODS

Shorebird data were collected from 1970-1990 with a total observation time of about 12 months. The most detailed studies were carried out in 1989 and 1990. From August 2-17 1989, daily counts were made of shorebirds feeding on the spit. Birds flying over the spit were not taken into account. The counting technique involved using a transect width of 300 m. The total transect length over the count period was 195 km. The total number of shorebirds counted was about 21,500 birds of 14 species. Counting in 1989 stopped before migration ceased.

From May 21-30 1990, during the period of most intensive migration, counts were made from the spit of shorebirds migrating above the coastal sea zone (Gerasimov 1991). This activity was part of the spring counts of migrating waterfowl conducted in Kamchatka from 1975-1995 (Gerasimov & Gerasimov 1995). Observations were made during all daylight hours from April 30 to June 3. In total, more than 66,000 shorebirds of 19 species were counted. The observation point was located on the seaward side of the spit and therefore, many of the shorebirds stopping to feed on the estuary and adjacent wet tundra were not counted

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RESULTS AND DISCUSSION

Northward migration

Eurasian Oystercatcher *Haematopus ostralegus*

This species is the earliest migrant. The first birds were observed on 3 (1977, 1990) and 9 (1980) May. The Eurasian Oystercatcher is one of the rarest and least known shorebirds of Kamchatka. Nearly all Oystercatchers fly above the wave break zone and this allows for accurate counting. In 1990, 391 individuals were counted during daylight in May. If allowance is made for birds passing in the night, the total number migrating through the area could be up to 500

individuals. This implies that no more than 250 pairs breed on the 800 km, or more, of shore north of the estuary. Most of the Oystercatchers migrate in the first week of May. In 1990, the majority - 195 individuals - had passed through by May 8. Sometimes it is possible to see late flocks, as on June 1 1976, when a flock of 17 birds was observed.

Dinlin *Calidris alpina*

Most shorebirds migrate through Moroshechnaya River estuary during the second and third week of May. Dunlin *Calidris alpina* is the most numerous species. The first individuals in 1976, 1977 and 1980 arrived on May 14. Three to four days later, flocks of more than 1,000 were present. Sometimes two migration peaks occur, with the second taking place at the end of the month. For example, in 1975, flocks, generally of 30-40 birds, but sometimes of a few hundred, occurred from May 22-24. After four days of decreasing migration intensity, large numbers were seen on May 29, with some flocks totalling more than 1,000 individuals.

In 1989 and 1990, the character of migration changed slightly. Smaller numbers of Dunlins stopped to feed in the lower part of an estuary. However, during May 21-29 1990, from only one observation point located on the seaward side of the spit near the top, more than 36,000 Dunlins were counted (Gerasimov 1991; Fig. 1). The total number of Dunlin migrating in the spring through the estuary is probably 100,000-150,000 birds (Gerasimov *et al.* 1992; Gerasimov & Gerasimov 1997).

Red-necked Stint *C. ruficollis*

This species is the second most common migrant. Birds arrive from 18 (1976) to 22 May (1977). The most intensive migration, as a rule, is observed over two to three days, with active migration (usually during the rising tide) occurring for no more than two to three hours each day. In 1990, we made observations from a point on the coast one km from the river mouth and on May 29 during a period of three hours more than 12,000 Red-necked Stint were counted (Gerasimov 1991; Fig. 2). Migration declines in the last few days of May. In early June, no more than 200-300 individuals can be seen arriving; however, the total number feeding on the estuary is still significant. It is estimated that about 100,000 Red-necked Stints migrate in the spring through the Moroshechnaya River estuary (Gerasimov & Gerasimov 1997).

Great Knot C. tenuirostris

Great Knot is the third most common species of shorebird. The point at which the Great Knot migration route meets the west coast of the peninsula is not known, but no sites with high numbers have been found south of the Moroshechnaya River, which has the greatest concentration of Great Knot discovered so far in Russia.

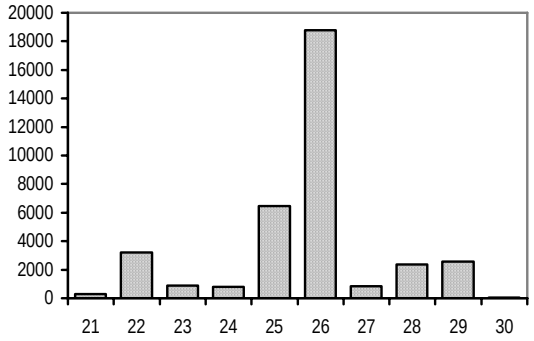


Figure 1. Daily migration of Dunlin along the sea coast in May 1990.

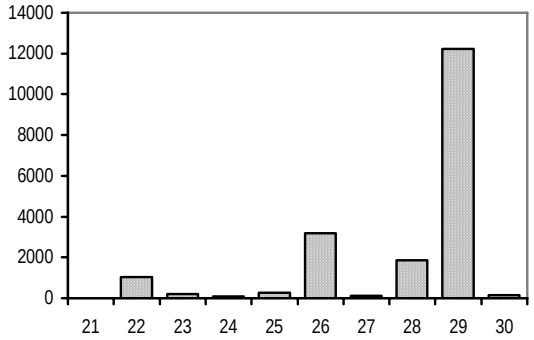


Figure 2. Daily migration of Red-necked Stint along the sea coast in May 1990.

The first Great Knot occurred on 15 (1977, 1980) and 18 (1983) May. In 1980, when a very late thaw occurred, birds arrived when most of the estuary and all the tundra were covered in snow and ice.

From data collected during 1975-1976, it was estimated that less than 20,000 Great Knot migrated northwards through the estuary (Gerasimov 1980). Further studies in 1977, 1980 and 1990 have led to a re-estimate of 35,000-40,000 birds (Gerasimov & Gerasimov, 1997; Fig. 3). One flock seen rising from the roost at the end of the spit on the morning of May 26 1980 totalled 12,000-15,000 birds. During low tide, birds move on to the mudflats to feed where dense flocks of several hundreds up to 1,500-2,000 individuals gather.

Other species

The next group of shorebirds contains Bar-tailed Godwit *Limosa lapponica*, Whimbrel *Numenius phaeopus* and Red Knot *C. canutus*. They each number in the thousands. Bar-tailed Godwit first arrive between 10 (1977) and 16 May (1976). Peak migration occurs from the end of the second to the middle of the third week of May (Fig. 4). The latest record was on June 2 1976. It is estimated that not less than 4,000-5,000 Bar-tailed Godwits migrate northwards through the Moroshechnaya River estuary.

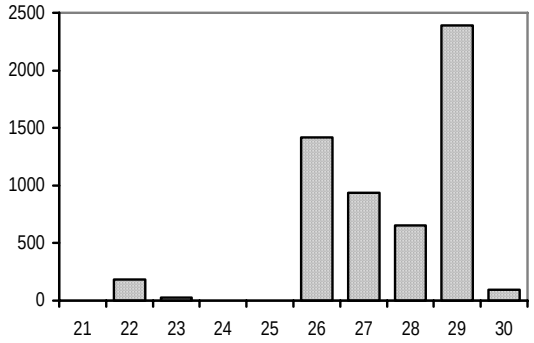


Figure 3. Daily migration of Great Knot along the sea coast in May 1990.

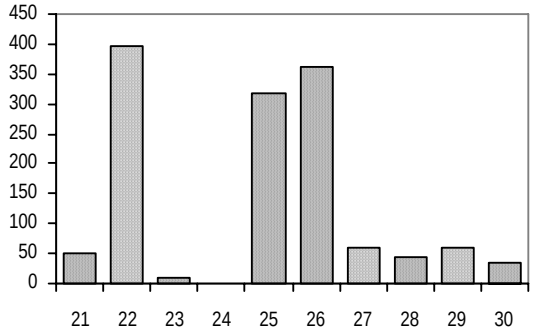


Figure 4. Daily migration of Bar-tailed Godwit along the sea coast in May 1990.

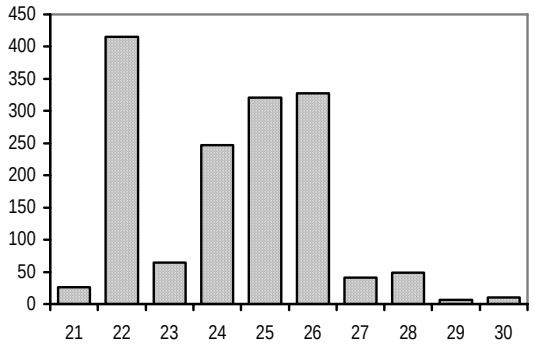


Figure 5. Daily migration of Whimbrel along the sea coast in May 1990.

Whimbrels appear from May 17-25. Migrants fly over the coastal tundra of Western Kamchatka on rather a wide front and only a small proportion of the total number of birds migrating northwards pass over the estuary. During active migration it is possible to see up to 20-30 flocks per day, each numbering from 5 to 150 individuals. The total number of birds observed during northward migration is some thousand individuals (Gerasimov 1988b; Gerasimov *et al.* 1992; Gerasimov and Gerasimov 1997; Fig. 5)

Red Knots migrate at the same time as Great Knot, often in mixed flocks (Gerasimov 1980). The total of birds observed during northward migration is estimated to be a maximum of 2,500-3,000 individuals (Gerasimov and Gerasimov 1997).

A number of species make up a group varying from several hundreds up to 1,000 individuals: Pacific Golden Plover *Pluvialis fulva*, Grey Plover *P. squatarola*, Ruddy Turnstone *Arenaria interpres*, Lesser Sand Plover *Charadrius mongolus* and Black-tailed Godwit *L. limosa*. The first Pacific Golden Plover were seen from 21 (1990) to 25 May (1977). During May 1990, about 150 birds were counted on the seacoast (Gerasimov 1991). Whereas the Grey Plover is a more common migrant. In 1990, the first flock was observed on the spit on May 17. About 100 birds were counted during the last week of this month. The total number of Grey Plover migrating through this area is around several hundred individuals (Gerasimov & Gerasimov 1997).

The earliest arriving Lesser Sand Plover was observed on May 10 1976; usually they appear not earlier than the third week of May. During May 1990, about 400 birds were counted from the coast near the river mouth (Gerasimov 1991). The Ruddy Turnstone is common during northward migration. The first birds were observed from 14 (1976) to 22 May (1977). It is estimated that at least one hundred Ruddy Turnstone migrate northwards through the area (Gerasimov & Gerasimov 1997). Black-tailed Godwit arrive from 13 (1980) to 18 May (1977). Normally, only a total of some tens of birds are seen during migration although, in some years more than 100 birds occur (Gerasimov *et al.* 1992). The first Eastern Curlew *N. madagascariensis* were seen earlier, from the 10 (1977, 1989) to 13 (1974) May. Most birds pass through from May 15-25, with total numbers being some hundreds (Gerasimov *et al.* 1992)

The Wood Sandpiper *Tringa glareola* is the most common *Tringa* species. It arrives from 10 (1976) to 18 (1977) May. The study area has little suitable habitat for this species and birds were counted as they were heard flying overhead. The largest flock of Wood Sandpiper (44 individuals) was observed on May 28 1976 (Gerasimov *et al.* 1992). The last birds were seen on June 2 1976. In 1980, migrating birds were observed on May 13-29, but even in the period of the most active migration (May 23-24) daily counts did not exceed 10-15 birds.

Terek Sandpiper *Xenus cinereus* is an uncommon species, with flocks numbering from several individuals up to 30-40 birds. During May 1990, about 200 Terek Sandpipers were counted at the river mouth. Almost all had left by May 27-29 (Gerasimov 1991). Another species, Greenshank *T. nebularia* first appear, flying over the estuary, from 13 (1980) to 18 (1975, 1976)

May. Similar to Wood Sandpiper, they fly at some height. The greatest number of birds recorded on a single day numbered about 120 individuals (May 25 1980).

Although the Spoon-billed Sandpiper *Eurynorhynchus pygmeus* is one of the rarest shorebirds, it is rather common on the estuary. The first significant number of birds of this species was seen on June 7 1983, when a mixed flock of 200 shorebirds was observed, half of which consisted of Spoon-billed Sandpipers (Gerasimov 1988). In 1990, the first Spoon-billed Sandpiper was observed on May 29 during active migration of Red-necked Stint. That evening, three groups (6, 18 and 40) of Spoon-billed Sandpiper were feeding at the river mouth. Additionally, calling Spoon-billed Sandpiper could be heard in flocks of Red-necked Stint flying overhead. During subsequent days, small flocks were seen, often feeding with Red-necked Stints. It is estimated that hundreds of Spoon-billed Sandpipers migrate northwards through the area (Gerasimov & Gerasimov 1997).

The Red-necked Phalarope *Phalaropus lobatus* is uncommon during migration. The earliest observation occurred on May 14 1975. Usually these birds migrate during the third week of May. Counts never exceeded more than several tens of birds. About the same time of year, Common Snipe *Gallinago gallinago* appear (May 13 1990) although active migration has not been observed. However, in the middle of the third week of May flying courting birds are normal.

Common Sandpiper *Actitis hypoleucos*, Spotted Redshank *T. erythropus*, Grey-tailed Tattler *Heteroscelus brevipes* and Long-toed Stint *C. subminuta* are uncommon migrants and we observed few birds of these species during northward migration. The Curlew Sandpiper *C. ferruginea* has only been seen once - on May 24 1975 two individuals were observed in a Dunlin flock. The Sanderling *C. alba* is also a rare migrant, sometimes being seen in late May - early June. One individual was collected on June 1 1990 (Gerasimov *et al.* 1992). Lastly, Nordmann's Greenshank *T. guttifer* is one of the rarest shorebirds in the world. It was first observed on May 22 1976. In 1980, birds were seen making courting flights from May 24-29 (Gerasimov 1985). The total number of the shorebirds migrating through the Moroshechnaya River estuary during northward migration is estimated to be approximately 300,000 individuals (Gerasimov & Gerasimov 1997).

Breeding season

Ten shorebird species breed in the region around the Moroshechnaya River mouth. Dunlin is the most numerous and P. S. Tomkovich, using material collected in this area, has described a new subspecies *C. a. kistchinski* (Tomkovich 1986). Red-necked Phalarope, Common Snipe, Eastern Curlew, Black-tailed Godwit and Long-toed Stint are common breeding species. Wood Sandpiper, Greenshank and Common Sandpiper breed in small numbers on the riverbanks. Two-three pairs of Eurasian Oystercatcher annually breed on the coast near the river mouth (Gerasimov & Vyatkin 1973; Gerasimov *et al.* 1992).
Large numbers of shorebirds use the estuary in June and July, including thousands of Black-tailed Godwit and Great Knots, and hundreds of Red-necked Stint. A flock from 170 Eastern Curlew was observed on July 9 1984.

Southward migration

Some southward migration is observed in July. Intensive migration begins in August (Figs. 6 and 7). On July 9 1984, Black-tailed Godwit began moving south. At that time, about 7,000 Black-tailed Godwit were present in the estuary. Flocks consisting of hundreds of individuals are observed up to the middle of September (Gerasimov *et al.* 1992).

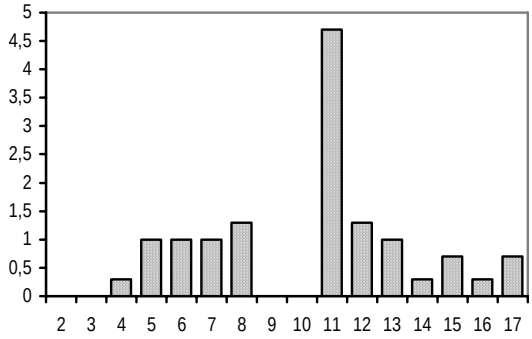


Figure 6. Number of Black-tailed Godwit (indiv./km^2) on the spit in August 1989.

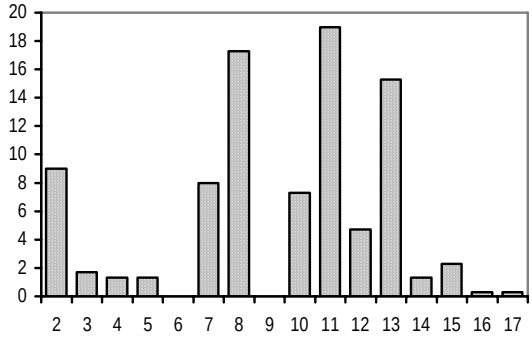


Figure 7. Number of Pacific Golden Plover (indiv./km^2) on the spit in August 1989.

The largest numbers of Bar-tailed Godwit are observed at the end of August and the beginning of September. On the nearby tundra, thousands of birds can be found in mixed-species flocks with Whimbrel. The numbers of both Black-tailed and Bar-tailed Godwit stopping on the estuary during southward migration considerably exceeds those occurring on northward migration (Gerasimov & Gerasimov 1997).

The first returning Whimbrel occurs in the middle of July. From the beginning of August, birds concentrate on the spit separating the estuary from the sea. On August 1 1989, flocks of up to 500 individuals were observed. Over subsequent days, numbers continued to increase and reached a maximum on August 13. In the evening of that day, one of the flocks flying up from the spit contained about 3,000 individuals. Special counts carried out throughout the period showed that Whimbrel were distributed evenly over the 20 km long spit. In censuses based on 300 m wide transects in each km, 100-130 individuals were counted. On some days, densities of 500/km^2 occurred (Fig. 8). As birds leave to the south, others arrive from the north. It is estimated that tens of thousands of Whimbrel visit the spit during September. The migration of Whimbrel, like that of Bar-tailed Godwit, is mostly finished by the end of the first week of September.

Dunlin and Red-necked Stint are very numerous on southward migration. In the first half of August there are only small flocks, but in the second half of the month mixed flocks of the two species sometimes total thousands. Both species are present up to October.

In the 1970s, flocks of Great Knot were observed in the estuary all summer. In August, this species is one of the most numerous shorebirds (Fig. 9). Some of the Great Knot feed on berries on the spit. *Tringa* species are uncommon during southward migration. The Greenshank is the most numerous. However, flock sizes were always less than 15.

Eurasian Oystercatcher begins to concentrate on the estuary in August when flocks of up to several tens can be seen. For example, five flocks of Oystercatchers containing 40-50 birds fed on a 6 km length of the estuary during low tide on August 28 1983. On September 12 1980, 60 birds fed in two flocks; whilst on September 29 1986, 15-16 individuals were observed.

It is provisionally estimated that up to 800,000 shorebirds migrate southwards through the Moroshechnaya River estuary (Gerasimov & Gerasimov 1997). Further counting is needed to refine this estimate.

The Zakaznik (Game Refuge) Moroshechnaya River, established in 1974, includes the estuary, the lower part of the Moroshechnaya River and the adjacent wetlands, with a total area of 1,500 km^2. The Refuge was created to protect breeding Thick-billed Bean Geese. Later it became clear that the area is very important for other Anatidae species and for shorebirds. In 1994, the Game Refuge was nominated as a Ramsar Site and in 1996, was included in the East Asian - Australasian Shorebird Site Network.

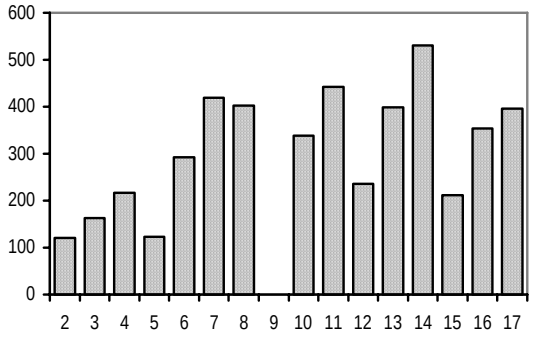


Figure 8. Number of Whimbrel (indiv./km^2) on the spit in August 1989.

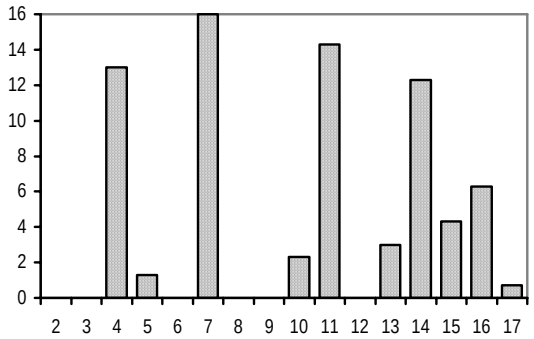


Figure 9. Number of Great Knots (indiv./km^2) on the spit in August 1989.

REFERENCES

Gerasimov, N. N. 1980. Spring migration of Great Knot and Red Knot on the west coast of Kamchatka. Pp. 96-98. *In:* V.E. Flint (Ed.) New studies of the Biology and Distribution of Waders. Moscow (in Russian).

Gerasimov, N. N. 1985. Spotted Greenshank *Tringa guttifer* on Kamchatka. Rare and endangered species of Far East. Pp. 144-145 (in Russian).

Gerasimov, N. N. 1988a. Spring find of Spoon-billed Sandpiper on west coast of Kamchatka. Ornithology 23: 205 (in Russian).

Gerasimov, N.N. 1988b. Whimbrel on Kamchatka. Pp. 26-30. *In:* V.E. Flint and P.S. Tomkovich (Eds.) Waders in USSR: Distribution, Biology and Protection. Moscow.

Gerasimov N. N. and P. S. Vyatkin 1973. New data about shorebirds breeding on Kamchatka. Fauna and ecology of shorebirds 2: 25-28 (in Russian).

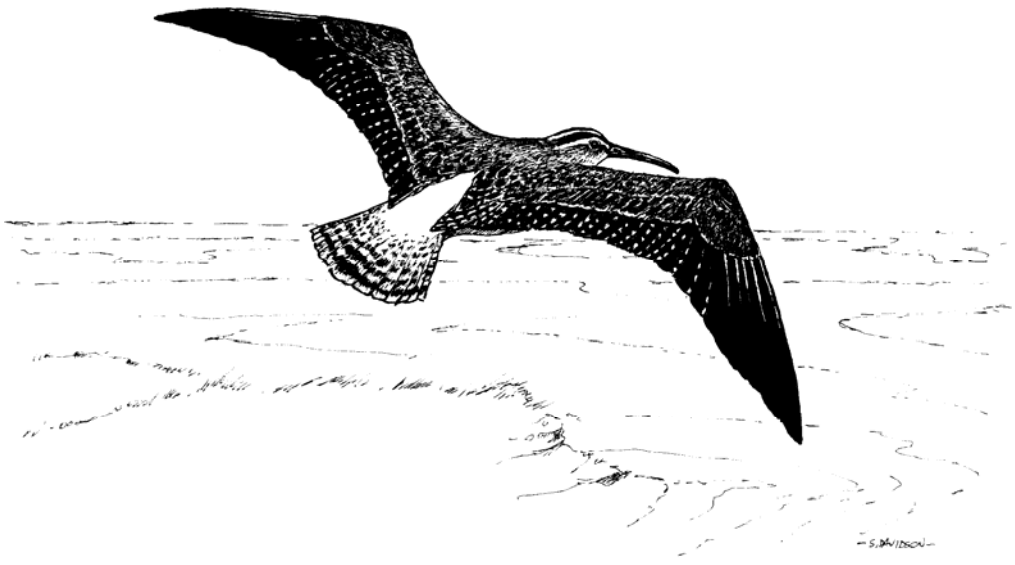
Gerasimov, N.N., A.M. Sokolov and P.S. Tomkovich 1992. Birds of the Bird Sanctuary "Moroshechnaya River", western Kamchatka Peninsula. Russian Journal of Ornithology 1: 157-208 (in Russian).

Gerasimov, N.N. and Yu.N. Gerasimov 1995. Investigation of Waterfowl Migration in Kamchatka. Geese Study 9: 1-7.

Gerasimov, N.N. and Yu.N. Gerasimov 1997. Shorebird Use of the Moroshechnaya estuary. Pp. 138-140. *In:* P Straw (Ed.) Shorebird Conservation in the Asia-Pacific Region. Australasian Wader Studies Group.

Gerasimov, Yu. N. 1991. Spring migration of shorebirds on West Kamchatka. Materials of the 10th All Soviet Union Ornithological Conference 2(1): 142-143 (in Russian).

Tomkovich, P. S. 1986. Geographical variability of the Dunlin in the Far East. Bull. Moscow Soc. Naturalists 91(6): 3-15 (in Russian).



THE AUSTRALIAN PAINTED SNIPE *ROSTRATULA (BENGHALENSIS) AUSTRALIS*: AN ENDANGERED SPECIES?

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ABSTRACT

In this paper we review the taxonomic and conservation status of the Australian population of Painted Snipe *Rostratula (benghalensis) australis*, a poorly known wader inhabiting inland wetlands. It differs from the nominate Painted Snipe *Rostratula benghalensis (benghalensis)* of Africa and Asia in many morphological characters; Australian birds are long-winged with proportionately short bill and tarsus, and can also be distinguished on several plumage features including some important in courtship. Painted Snipes of Africa and Asia have complex modifications of trachea and eosophagus allowing them to make an extremely distinctive advertising call; Australian Painted Snipes have almost never been heard to make this call, and it is possible that differences in trachea structure prevent them from doing so. We therefore recommend treating Australian birds as a full species: the Australian Painted Snipe, *Rostratula australis*.

Records of Painted Snipes in Australia have been reviewed from the RAOU Atlas database and several other sources. The reporting rate of Australian Painted Snipes has been declining steadily since the 1950s, this decline coinciding with extensive wetland degradation in its likely original stronghold, the Murray-Darling basin. Very few of these records have come from autumn and early winter months (April to July); the non-breeding areas of the Australian Painted Snipe are unknown. We recommend that this species be reclassified as "Endangered".

INTRODUCTION

In 1963, Vic Lowe published a paper in *Emu* describing the habits of breeding Painted Snipes at Mystic Park, in north-west Victoria (Lowe 1963). In this paper, he indicated that much remained to be learnt of its status and distribution. Twenty years later the situation was no different, even after the Atlas of Australian Birds (1977 – 1981) and the RAOU's wader studies program (1981 - 1986). For example, the wader studies program involved over 700 volunteer bird watchers visiting and censusing waders in many parts of Australia, yet there were only 8 records of the species during National Wader Counts, involving a total of 14 birds. It became clear that the Painted Snipe remained one of Australia's least-known shorebirds. Lane & Davies (1987) and Garnett (1992) both stated that the species' habitat was under threat from wetland drainage and water diversion for irrigated agriculture, a situation that remains today. Garnett (1992) classified Australian Painted Snipe as "Insufficiently Known".

Despite these indications that the bird was in urgent need of further research, little has been learned about it since Lowe's time. This stands in contrast to other threatened Australian waders, such as Hooded Plover *Thinornis rubricollis*, Beach Stone-curlew *Esacus neglectus* and Eastern Curlew *Numenius madagascariensis*, which have received some attention, including successful population management, since their conservation status became of concern.

Why has this handsome wader been overlooked? Perhaps part of the problem has been a perception that the bird is simply a subspecies of a widespread wader that is secure overseas. Hayman *et al*. (1986) and del Hoyo *et al*. (1996) have both implied or stated that differences between the Painted Snipes of Australia and rest of the Old World were negligible. We consider this view to be incorrect. The threat status for the Australian Painted Snipe of "Insufficiently known" may also have created an inadvertent and inaccurate perception that it was not as threatened as those species assigned the more precise categories of rare, vulnerable or endangered. In this paper we review available information on the Australian Painted Snipe, in an attempt to resolve its taxonomic and conservation status.

TAXONOMY

When it was originally discovered, the Australian Painted Snipe was described as a full species, *Rostratula australis* (Gould, 1838). Peters (1934) lumped Australian Painted Snipes with those of Africa and Asia, in a single species *Rostratula benghalensis*. No explanation of this step was given, but it has remained the traditional taxonomic treatment ever since (e.g. Condon 1975; Christides & Boles 1994).

Museum studies of Painted Snipes have been undertaken independently by Kees Roselaar (Cramp & Simmons 1983) and Danny Rogers (Marchant & Higgins 1993). This work shows Painted Snipes to be very uniform in plumage and measurements from Southern Africa, across the Middle East and southern Asia, to Indonesia. Both

studies agreed in finding Australian Painted Snipes to differ from those of Africa and Asia in a variety of characters; these are summarised in Table 1. No evidence was found for geographical variation within Australia (Marchant & Higgins 1993).

Some of the plumage differences between birds of Australia and the Old World are rather subtle, but consistent enough to allow reliable identification. However, in adult females there is a striking difference between *australis* and *benghalensis*: the latter bird has a predominantly rufous head, neck and upper breast, while in Australian birds these areas are deep chocolate-brown, with only a small rufous patch in the centre of the hindneck. In addition, measurements show that Australian Painted Snipes are proportionately long-winged, short-billed and short-legged (see Table 1 and Figure 1).

Adult female Painted Snipes in Asia and Africa are unusual in having a trachea that is capable of considerable enlargement (Wood-Mason 1878; Beddard 1901), and unique among waders in having an oesophagial crop (Lowe 1931). The crop plays no part in digestion; instead, in conjunction with the trachea it acts as a resonance chamber used in prolonged vocal displays (Niethammer 1966). The resultant call has been described as a prolonged sequence of "soft, metallic, drawn-out hooting calls" which can be heard from over a kilometre away. For most of the cycle this call is only given in the evening, but during the egg-laying and incubation periods, it is given almost continuously through the day and well into the night (Cramp & Simmons 1983 and references therein).

Table 1. Summary of differences between Australian Painted *Snipes Rostratula (benghalensis) australis* and those in Asia and Africa, Rostratula *(b.) benghalensis*. Measurements, given in the sequence mean (standard deviation; range, sample size) were taken from adult skins, the measuring methods and the data for *australis* coming mainly from Marchant and Higgins (1993; supplemented by unpublished data of D. Rogers), and the data for *benghalensis* from skins held in the Zoölogische Museum (Amsterdam) and the Rijksmuseum van Natuurlijke Historie (Lieden).

Character	Rostratula (b.) benghalensis (Old World)	Rostratula (b.) australis (Australia)
FEMALES:		
Head and neck	Mainly rufous: ginger chin to upper breast extend on to sides of neck and wrap around hindneck.	Mainly dark chocolate brown, with small rufous patch in centre of hindneck
Eyering	Pure white	Cream
Tail spots	Broad and flat, normally forming barring	Discrete and round
Wing	139.4 (3.77; 134–147; 27)	154.1 (3.74; 147–163; 25)
Bill	48.5 (1.42; 45.0–51.2; 26)	45.0 (2.22; 39.7–47.8; 21)
Tarsus	46.1 (1.80; 43.2–49.0; 27)	41.5 (1.36; 39.0–44.1; 20)
MALES:		
Upper wing-coverts	Look more barred, less spotted than in Australian males; spots of feathers smaller and 'flatter', only with black proximal border.	Boldly spotted; spots of feathers broad and round, cleanly bordered black.
Ground-colour of rump and tail	Medium-dark grey	Medium light-grey
Wing	130.1 (3.54; 125–138; 20)	145.3 (2.63; 141–149; 12)
Bill	45.4 (1.43; 43.4–48.2; 20)	43.2 (0.88; 41.9–44.4; 11)
Tarsus	43.5 (1.33; 40.3–46.0; 21)	39.2 (1.04; 37.7–40.6; 10)
GENERAL:		
Measurements:	Short wing, long bill and tarsus	Long wing, short bill and tarsus.
Mating call:	Deep loud hoots	Probably none.

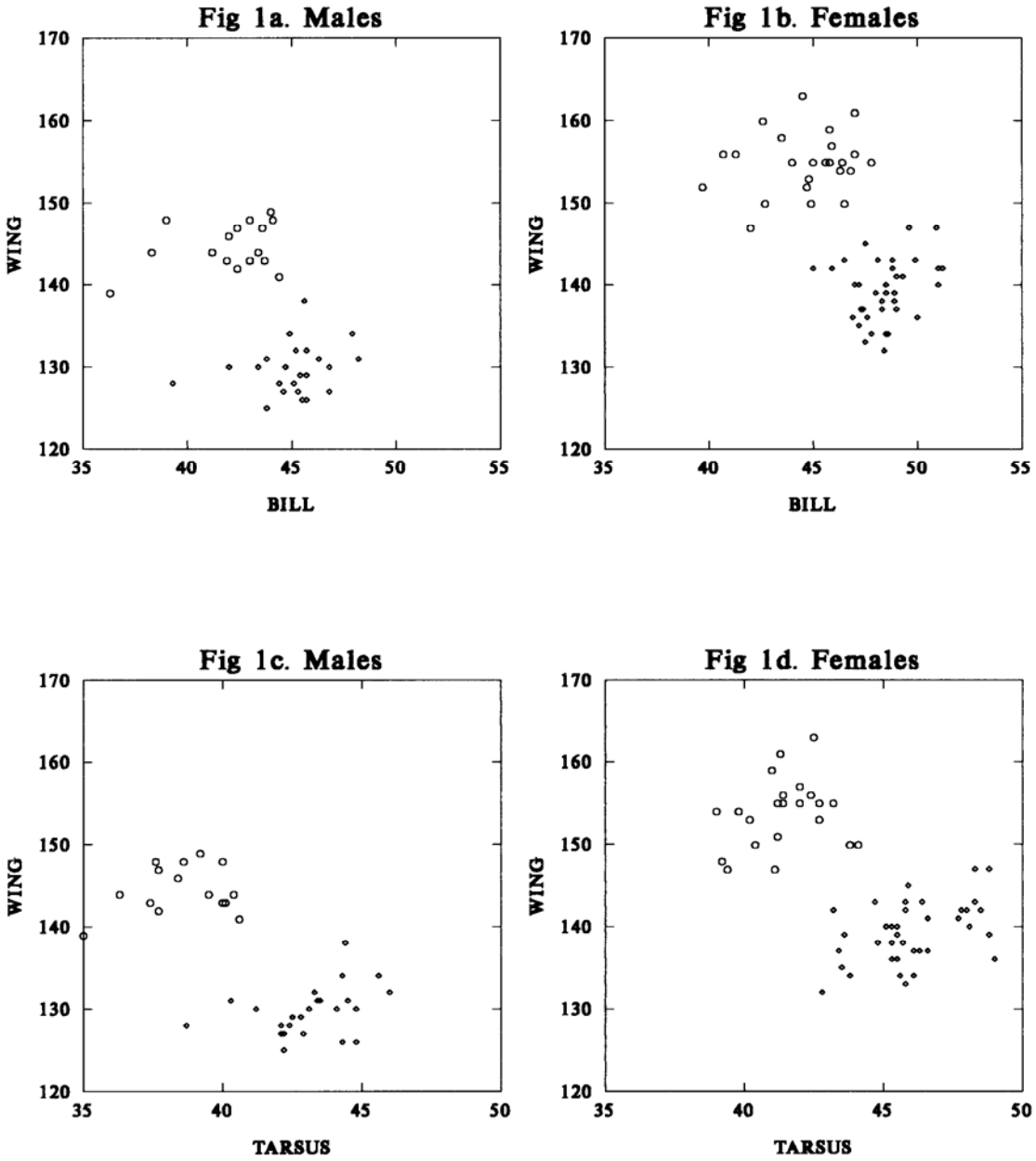


Figure 1. Measurements of adult Australian Painted Snipe (*australis*) are represented by an open circle and Indonesian Painted Snipe (*benghalensis*) by an open diamond.

This call has never been reported in Australia (Marchant & Higgins 1993), and it is unlikely that such a distinctive and loud call would have been overlooked[1]. Indeed it is possible that Australian Painted Snipes lack the morphological adaptations to make this call. When Gould (1848) performed what still appears to be the only dissection of a female Australian Painted Snipe, he reported that the trachea had four convolutions (cf. two or less in Africa and Asia) and did not report an oesophagial crop. Given that the amount of convolution of the trachea varies with age and decreases post-mortem (Wood-Mason 1878), and that Gould was probably not aware of the importance of the oesophagial crop, this cannot be considered conclusive evidence.

Nevertheless, there appears to be a clear vocal difference between Australian and Old World Painted Snipes that

[1] Since preparing this paper, it has come to our attention that Painted Snipe may utter a low booming call. This is not however like the call uttered by birds in Asia. If the call of Asian birds was given by birds in Australia, by its nature we believe it would have been detected by now. We are grateful to Peter Slater for providing additional information and to Jeff Davies for bringing this issue to our attention.

would probably inhibit or prevent interbreeding if they were not allopatric. The different colour of the head, neck and breast of the adult females of Australia may also act as an isolating mechanism during courtship. These regions are displayed prominently to prospective mates in the Frontal Spread-Wing display, which appears to be a most important element in courtship of Painted Snipes in both Australia and the Old World (Cramp & Simmons 1983, Marchant & Higgins 1993).

CONSERVATION

This section reviews the distribution, abundance and movements of the Australian Painted Snipe. Based on these data, its conservation status is reviewed.

Habitat and Distribution

Readily available information on the distribution of the species was compiled. This included the records of the Atlas of Australian Birds (1977 - 1984) (Blakers *et al.* 1984), unpublished data from the database of the Western Australian Museum (R. Johnstone, pers. comm.), unpublished data from the NSW Bird Atlassers Inc. database (1982 – 1999), published observations cited in Marchant & Higgins (1993), records from the South Australian Ornithologists Association (G. Carpenter pers. comm.), information from the archive of the Birding-aus mailing list, and unpublished observations (C. Hassell, A. Richardson, G. Swann, pers. comm.). The review was by no means comprehensive and we would welcome additional records that we have overlooked.

About 550 records of Australian Painted Snipes were located. Most Painted Snipe records come from shallow inland wetlands, either fresh or brackish. A large proportion of available records are from temporary or infrequently filled wetlands. Although Australian Painted Snipes have occurred at many sites, no site could be identified in which Australian Painted Snipes are resident, or even regular in occurrence. This may suggest the bird is nomadic but the extent to which its cryptic behaviour may contribute to this impression is unclear. Painted Snipes are certainly capable of remaining hidden in rank vegetation, but many available records are of birds which were not being particularly secretive; rather, they were in the open, but rather still and unobtrusive in daylight hours (e.g. Marchant & Higgins 1993).

Most records of the Painted Snipe are from south-eastern South Australia, the Riverina of Victoria and New South Wales, the northern NSW river basins west of the Great Dividing Range, the Queensland Channel Country, and the Fitzroy basin of central Queensland. The species is thought to once have been 'not uncommon' on the Swan coastal plain of south-western Australia, but there have been very few recent records from that area (Johnstone 1999). There are also sporadic reports of the bird in northern Western Australia, inland Northern Territory and inland and sub-coastal north Queensland. There are occasional records in coastal south-eastern Australia, particularly around population centres, including Adelaide, Melbourne, Sydney, Newcastle and Brisbane, where there are extensive sub-coastal plains with many shallow wetlands. The highest reporting rates in the Atlas of Australian Birds (number of records expressed as a percentage of the total number of Atlas sheets submitted for an area) came from the south-eastern inland parts of its range.

Breeding records during the field atlas (1977 – 1981) came from the southern part of its range (the Murray Valley and south-east South Australia). From earlier times, there are records in the Historical Atlas of breeding from as far north as 28° S (Blakers *et al.* 1984). In the south-western Kimberely region of Western Australia, nests have been found near Derby (Slater & Slater 1995), and at Taylor's Lagoon as recently as August 1999 (C. Hassell pers. comm.).

Since the mid-1980's, records have come from scattered parts of most of its earlier range, with perhaps a greater proportion from the Kimberley than before. This may reflect the increased accessibility of northern Australia (improved roads and more widespread use of four-wheel drive vehicles). A very significant change since this time has been the comparative paucity of records from the Victorian and NSW Riverina, a region where even during the 1977 – 1981 RAOU Field Atlas there were more records than anywhere else.

There has been one record of the bird from New Zealand, at Lake Ellesmere in August 1986 (Harrison & Mulligan 1987).

Movements

Blakers *et al.* (1984) analysed Field Atlas records and concluded that the species occurred in the southern part of its range more frequently during spring and summer. In the northern part of its range, they found no seasonal difference in frequency of occurrence. A more detailed review of the 229 precisely dated records (first and last date within the same month) in the RAOU Historical and Field Atlas database and in the NSW Bird Atlassers Inc. database was undertaken. (It may be of interest to the organisers of the new Atlas of Australian Birds that the way in which the data were recorded and stored in the previous Atlas meant that the majority (274, or 61%) of the records could not be precisely dated from the information in the database).

The collation of dated records (see Table 2) showed that most (>90%) Painted Snipe records occurred from August to March. It is not known where the species goes to in the late autumn and winter months. There is a scattering of winter records, particularly in southern and

northern Queensland. Blakers *et al.* (1984) suggested that it may leave the continent at this time, although they pointed out that there were no overseas records of the bird. Although the single record from New Zealand suggests Australian Painted Snipes are capable of long-distance movements, there is no evidence to suggest that the birds migrate outside Australia. Examination of large collections of Painted Snipes from Indonesia in the Museums of Amsterdam and Leiden (by D.I. Rogers & K. Roselaar), showed them all to be nominate *bengalensis*.

Abundance

It is possible that the Australian Painted Snipe has been overlooked during wader and other waterbird census projects (eg. RAOU Murray - Darling Basin Waterbirds Project - data not examined) because of its cryptic behaviour and regular occurrence in rank vegetation (Lane & Davies 1987). For the same reason, there are no reliable measures of its abundance. Watkins (1993) estimated the population size of the Australian Painted Snipe at 1,500 birds, although no explanation of the derivation of this estimate was provided.

The Atlas reporting rate (see above) has been used quite powerfully as a comparative index of abundance, both geographically (Blakers *et al.* 1984) and seasonally/monthly (Emison *et al.* 1987). We use it below to determine differences through time in the relative abundance of the Australian Painted Snipe.

All records (including imprecisely dated records) were extracted from the Field and Historical Atlas databases and from the NSW Bird Atlassers Inc. database (see Table 3). The reporting rate for the species was calculated by decade, with the exception of the earliest period (1800 to 1849), for which decades were lumped, and the latest period (1990 - 1998), which is not a complete decade. There are likely to be differences in bird watching effort between decades, particularly before the 1960's, that may bias results from particular areas or periods. To reduce this, Atlas records of the species were analysed separately from Victoria and New South Wales (see Tables 4 and 5). These states have the most consistent historical records of Australian Painted Snipe (total 273 records of a total 446, or 61%), probably because much of their area has been settled more densely for longer than elsewhere in the continent.

Tables 4 and 5 show that reporting rates steadily increased from 1900 to the 1950's. This period corresponded to rapid settlement of the bird's range and presumably increased observation of inland wetlands relative to other areas in the database. The rate then declined consistently. Whereas in the 1940's and 1950's, reporting rates corresponded to 6 to 8 records per 1,000 record sheets, in the 1960's and 1970's, this had declined to 2 to 4 per 1,000, then, from 1980 - 1984, to 7 to 8 per 10,000 record sheets. In New South Wales, the later data from the NSW Bird Atlassers Inc. database, revealed a reporting rate from 1982 – 1989 of just over 2 per 1,000 record sheets declining to above 1 per 1,000 record sheets from 1990 to 1998.

Table 2: Number of precisely dated records of the Australian Painted Snipe in the RAOU Bird Atlas and NSW Bird Atlassers Inc. database.

MONTH	Number of records
January	43
February	19
March	9
April	9
May	3
June	6
July	11
August	11
September	17
October	23
November	38
December	40
Total	229

This decline occurred during a period when the number of data sheets increased by an order of magnitude due to the Atlas project and the likely increase in numbers of birders and accessibility of areas within the species' range. The Atlas database contains 162 records from Victoria and New South Wales between 1970 and 1979, for 47,160 sheets submitted. From 1980 to 1984, 21,550 Atlas sheets were submitted with only 18 Australian Painted Snipes recorded. In the NSW Bird Atlassers Inc. database from 1982 to 1989, there were 37 records out of 18,246 sheets and from 1990 to 1998, 39 records out of 30,706 sheets.

We compiled records since the Field Atlas from a number of sources listed previously. This revealed a total of 107 records. By state, these included 76 from New South Wales (all but 8 from the NSW Bird Atlassers Inc. database, 1 from Victoria, 8 from South Australia, 5 from north-west Australia, and 9 from Queensland.

In the Historic and Field Atlas databases, there are 171 records (38% of the total) of Australian Painted Snipe in western New South Wales and Victoria, mostly in the Riverina. Among the records collected since this period, only 22 records (13% of the total) come from the same region (mostly in the NSW Field Atlassers Inc. database).

Table 3: Atlas reporting rates for the Australian Painted Snipe by decade based on data from the Historical and Field Atlases of the Royal Australasian Ornithologists' Union (1800 to 1984).

Period	Total records	Snipe records	RR (%)
1800-1849	3142	10	0.318
1850-1859	311	2	0.643
1860-1869	693	5	0.722
1870-1879	853	2	0.234
1880-1889	2761	5	0.181
1890-1899	6943	15	0.216
1900-1909	10647	18	0.169
1910-1919	12416	17	0.137
1920-1929	6469	13	0.201
1930-1939	4366	18	0.412
1940-1949	3274	13	0.397
1950-1959	6915	28	0.405
1960-1969	19667	62	0.315
1970-1979	93935	208	0.221
1980-1984	38015	33	0.087

DISCUSSION

Taxonomic Status

The definition of a species has been changing in recent times, with many taxonomists embracing the Phylogenetic Species Concept (McKitrick & Zink 1988). Under this concept, species represent terminal taxa of monophyletic assemblages (i.e. taxa, evolved from a common ancestor, which differ qualitatively from their nearest relations in one or more characters). By this measure, there is little doubt that the Australian Painted Snipe should be treated as a full species, as it has many morphological features not shared by Painted Snipes anywhere else in their extensive range through Africa to Eastern Asia.

Under the more traditional Biological Species Concept (Mayr 1970), reproductive isolation is used as the criterion for defining species. Australian and Old World Painted Snipes are geographically separate: *benghalensis* regularly occurs as close as Java, while *australis* occurs in north-western Australia). In such cases, it is notoriously difficult to assess whether two forms would interbreed if their ranges did overlap, and it is conventional for taxonomists to base their perceptions of species limits on a subjective assessment of the potential for interbreeding (Christides & Boles 1994). Some of the most striking differences between Painted Snipes of Australia and the Old World involve characters important in mate selection and breeding: these include the advertising calls, and the colours of plumage areas which the female displays to the male during courtship. It

Table 4: Reporting rates for Australian Painted Snipe in Victoria by decade, 1800 to 1984, from RAOU Bird Atlas database.

Period	Total records	Snipe records	RR (%)
1800-1849	436		0.000
1850-1859	71		0.000
1860-1869	71	1	1.408
1870-1879	115		0.000
1880-1889	351	1	0.285
1890-1899	1423	4	0.281
1900-1909	1645	4	0.243
1910-1919	1349	2	0.148
1920-1929	512	3	0.586
1930-1939	630	3	0.476
1940-1949	558	1	0.179
1950-1959	1623	9	0.555
1960-1969	3338	7	0.210
1970-1979	25680	31	0.121
1980-1984	14358	7	0.049

Table 5: Reporting rates for Australian Painted Snipe in New South Wales by decade, 1800 to 1998, from RAOU Bird Atlas and NSW Bird Atlassers Inc. databases.

Decade	Total records	Snipe records	RR (%)
1800-1849	75	3	4.000
1850-1859	31		0.000
1860-1869	116	1	0.862
1870-1879	250	1	0.400
1880-1889	496	3	0.605
1890-1899	1759	5	0.284
1900-1909	2110	2	0.095
1910-1919	1708	8	0.468
1920-1929	1022	4	0.391
1930-1939	594	3	0.505
1940-1949	473	5	1.057
1950-1959	1105	12	1.086
1960-1969	3273	21	0.642
1970-1979	21480	131	0.610
1980-1984	7200	11	0.153
1982-1989*	18246	37	0.203
1990-1998*	30706	39	0.127

* = NSW Bird Atlassers Inc. data.

is likely that these differences would inhibit or prevent hybridisation.

Based on the foregoing evidence, we argue that the Australian Painted Snipe should be considered a full species under both the Biological and Phylogenetic Species Concepts.

Conservation Status

There are clearly limitations in the dataset used here, including unevenness of both spatial and temporal coverage. Nevertheless, there appears to have been a consistent and dramatic decline in the number of sightings of the Australian Painted Snipe, especially since the 1970's. The decline appears to be most pronounced in the south-eastern part of its range from where most historical records have come, and in south-western Australia.

The dramatic decline of the Australian Painted Snipe in the Murray-Darling basin is particularly concerning. The basin was previously the stronghold of this species. It contains many westward-flowing rivers carrying water into otherwise dry areas. Shallow wetlands associated with these rivers fill and dry depending on river flows. Across the basin, they represent a network of habitats that has supported some of the largest populations of waterbirds in the country.

Coinciding with this decline have been dramatic changes in the condition and management of water resources in the basin. Of concern is the allocation of water extraction licenses for irrigated agriculture which represents much of the catchment yield of the basin. The development of more and more irrigated agriculture, has contributed significantly to a deterioration of water quality (increased nutrients and salinity), waterway health and flood frequency. In addition, many river-dependent wetlands now experience a highly regulated water regime which may meet the needs of irrigators but does not replicate the original cycle of winter-spring flooding and summer-autumn drying that characterised these ecosystems.

Groundwater levels in much of inland south-eastern Australia are steadily rising due to past vegetation clearing and irrigation. Vegetation clearance has removed deep-rooted forests and woodlands, reducing evapo-transpiration, and increasing infiltration. Irrigation has also caused groundwater levels to rise by increasing infiltration. These two processes have brought salt from underlying sediment to the surface, dramatically increasing soil salinity. This has also lead to increasing water salinity in many wetlands and to the loss of more than 2 million hectares of otherwise productive agricultural land. To manage salination in irrigation areas, drainage schemes have been developed and many previously freshwater to brackish wetland basins are now used to evaporate saline irrigation tail water, significantly elevating their salinity. This pollution also reduces the quality of potential habitat for the Australian Painted Snipe as well as many other waterbirds.

The decline in the species described in this paper, together with the well documented degradation of

wetlands across a large proportion of the species' range indicate that the official conservation status of the Australian Painted Snipe should be reconsidered. According to the criteria of the World Conservation Union (IUCN), a taxon is 'Vulnerable' if it faces a high risk of extinction in the wild in the medium-term future, and 'Endangered' if it faces a very high risk of extinction in the wild in the near future. The information presented above shows that the Australian Painted Snipe qualifies as 'Vulnerable', as reporting rates and probably habitat have undergone a reduction of 20% over the last 10 years (criteria A1b and A1c of the IUCN). It is indeed possible that the bird is 'Endangered', meeting criteria C1 of the IUCN (population less than 2500 mature individuals, with an estimated continuing decline of at least 20% in the next 5 years). There is uncertainty about whether the Australian Painted Snipe should be regarded as 'Vulnerable' or 'Endangered' based on the IUCN criteria. However, the scale of the decline in its original stronghold (possibly by as much as 90% based on the albeit rough measure of Atlas reporting rates) has been dramatic over the last 30 years. We believe this justifies a conservative approach in assigning threat status and recommend that its status in state and Commonwealth endangered species legislation be changed to 'Endangered' until a more comprehensive study is undertaken on their abundance and seasonal movements.

ACKNOWLEDGEMENTS

Our views on the taxonomy of Australian Painted Snipes arose through work performed by DR for the RAOU's HANZAB project, during which the mensural data presented in this paper were collected; subsequently, Kees Roselaar (Zoölogische Museum, Amsterdam) and Peter van Dam (Rijksmuseum van Natuurlijke Historie, Lieden) also provided access to museum specimens in their care. We are grateful to the following individuals for providing records or other information on Painted Snipes: Ron Johnstone (Western Australian Museum), Graeme Carpenter (South Australian Ornithologists Association), Rory Poulter (manager of the Birds Australia Atlas databases), Dick Cooper (manager of the NSW Bird Atlassers Inc. database), the many observers who have submitted records to these institutions and Chris Hassell, Bob Sothman, Adam Richardson and George Swann. The Australasian Wader Studies Group kindly provided financial support for the costs of extracting data from the Atlas databases.

REFERENCES

Beddard, F.E. 1901. Notes upon the Anatomy and Systematic Position of Rhynchea. Proc. Zool. Soc., London (1901): 587–596.

Blakers, M., S.J.J.F. Davies & P.N. Reilly 1984. The Atlas of Australian Birds. Royal Australasian Ornithologists Union & Melbourne University Press, Carlton, Victoria.

Christides. L. & W.E. Boles 1994. The Taxonomy and Species of Birds of Australia and its Territories. Royal Australasian Ornithologists Union Monagraph 2. RAOU, Melbourne..

Condon, H.T. 1975. Checklist of the Birds of Australia, Part 1. Non-passerines. Royal Australasian Ornithologists Union, Melbourne.

Cramp, S. & K.E.L. Simmons (Eds). 1983. The birds of the Western Palearctic. Vol. 3. Waders to Gulls. Oxford University Press, Oxford.

Del Hoyo, J., A. Elliott & J. Sargatal (Eds). 1996. Handbook of the Birds of the World. vol. 3. Hoatzins to Auks. Lynx Edicions, Barcelona.

Emison, W. B., C. M. Beardsell, F. I. Norman, R. H. Loyn, and S. C. Bennett 1987. Atlas of Victorian Birds. Department of Conservation, Forests and Lands and Royal Australasian Ornithologists' Union, Melbourne.

Garnett, S.T. (Ed). 1992. Threatened and Extinct Birds of Australia. ROAU Report 82. Royal Australasian Ornithologists Union and Australian Natinoal Parks and Wildlife Service, Canberra.

Gould, J. 1838. Synopsis of the Birds of Australia 4: Append: 6 NSW.

Gould, J. 1848. The Birds of Australia, Vol. 2. Published by the author, London.

Harrison, K.C. & S. Mulligan 1986. Painted Snipe (*Rostratula benghalensis*) at Lake Ellesmere. Notornis 34: 78–79.

Hayman, P., J. Marchant & T. Prater 1986. Shorebirds: An Identification Guide to the Waders of the World. Croom Helm, London.

Johnstone, R.E. 1999. Handbook of Western Australian Birds. Vol. 1., non-passerines (Emu to Dollarbird). Western Australian Museum, Perth.

Lane, B.A. & J. Davies 1987. Shorebirds in Australia. Nelson, Melbourne.

Lowe, P.R. 1931. On the relations of the Gruimorphae to the Charadrimorphae and Rallimorhpae, with special reference to the taxonomic position of Rostratulidae, Jacanidae, and Burhinidae; with a suggested new order (Telmatomorphae). Ibis, Ser 13, no 1: 491–534.

Lowe, V.T. 1963. Observations on the Painted Snipe. Emu 62: 221–237.

Marchant, S. & P.J. Higgins 1993. Handbook of Australian, New Zealand and Antarctic Birds. 2. Raptors to Lapwings. Oxford University Press, Melbourne.

Mayr, E. 1970. Populations, Species and Evolution. Belknap Press, Harvard University, Cambridge, Massachusetts.

McKitrick, M.C. & R.M. Zink 1988. Species concepts in ornithology. Condor 90: 1–14.

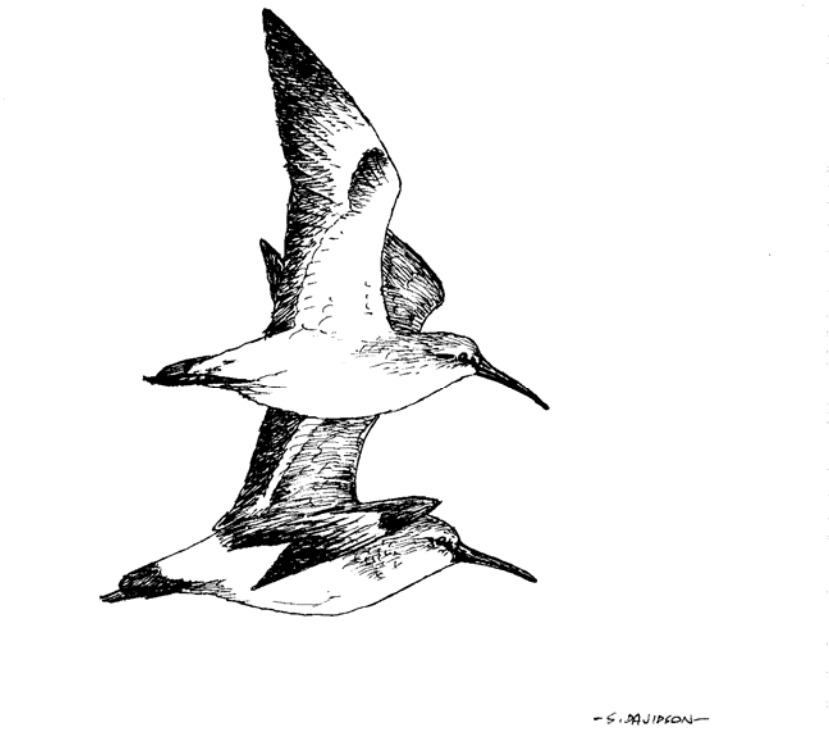
Neithammer, G. 1966. Sexualdimorphismus am Ösaphagus von *Rostratula*. J. Orn, Lpz. 107: 201–204.

Peters, J.L. 1934. Check-list of Birds of the World. Vol. 2. Harvard University Press, Cambridge, Massachusetts.

Slater, P. & R. Slater 1995. Photographing Australia's Birds. Steve Parish Publishing, Fortitude Valley Qld.

Watkins, D. 1993. A National Plan for Shorebird Conservation in Australia. Australasian Wader Studies Group, Royal Australasian Ornithologists Union and World Wide fund for Nature. RAOU Report No. 90.

Wood-Mason, J. 1878. On the structure and development of the trachea in the Indian Painted Snipe (*Rhynchea capensis*). Proc. Zool. Soc., London 1878: 745–751.



INFORMATION ON THE NORTHWARD MIGRATION OF GREAT KNOT *CALIDRIS TENUIROSTRIS* IN KAMCHATKA, RUSSIA

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METHODS

The data used in this article were collected by the authors on Kamchatka (Fig. 1) from 1975-1999. Initially, data on the migrations of Great Knot *Calidris tenuirostris* and other shorebirds were obtained opportunistically during extensive duck (Anatidae) migration studies which have been carried out since 1975. Specific counts for shorebirds during northward migration have been conducted since 1990.

The most complete data on northward migration of Great Knot have been obtained at the Moroshechnaya River mouth (56°50′N 156°10′E). However, recorded numbers were less than those actually passing through the area as the main objective at the time was to count waterfowl which migrate off the coast, whilst most Great Knot pass through the estuary. The first reasonably complete count of migrating shorebirds was carried out in 1990.

In the boreal springs of 1991 and 1992, observations were carried out at the Vakhil River mouth (53 15′N 159 34E′). In both years, observations commenced at the beginning of significant migration and were carried out during all daylight hours. Unfortunately, in both of the years counting ceased too early (May 22 and May 21, respectively).

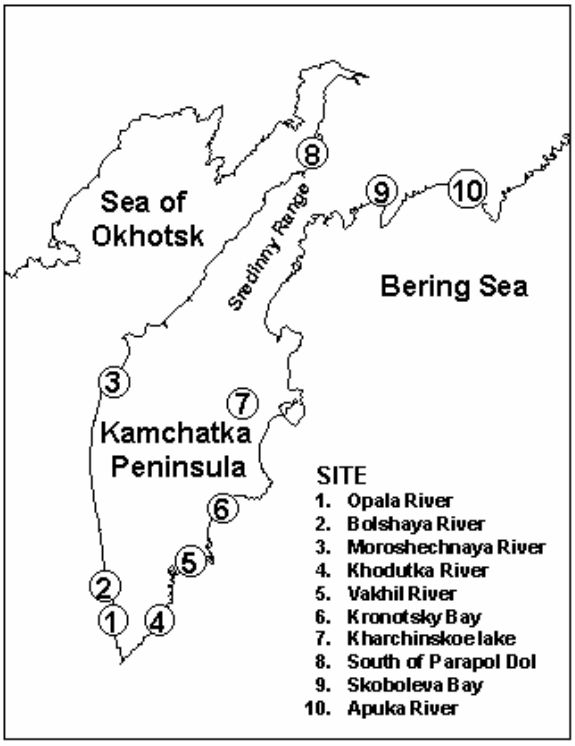


Figure 1. Locations of places mentioned in text.

In 1993, observations was carried out from April 30-May 27 at the Bolshaya River mouth (52°32′N 156°17′E) and in 1994 from April 29-May 25 at the Opala River mouth (52°00′N 156°30′E). Both places are located on the south-west coast of Kamchatka. In 1995, counts were carried out from April 29-May 20 at the Khodutka River mouth (south-east Kamchatka; 52°47′N 158°02′E).

In 1998, observations were made at two places in north Kamchatka. From May 5-20, counts were carried out in the southern part of Parapolsky Dol, 5 km from Rekinnikskaya Bay (60 56′N 163°50′E), and from May 21-23 at Skobeleva Bay (60°24′N 166°20′E). At Skobeleva Bay, the shorebirds were counted as they fed on mudflats and sandy beaches during low tide. The area of 3-5 km was free of ice.

In 1999, a waterfowl count was carried out from April 27-May 27 on Kharchinskoe Lake (56 32′N 160°11′E), in the centre of Kamchatka. We counted, mainly, flying birds during periods of active migration, which varied from 13-18 hours per day.

RESULTS

West coast

The most southerly point where observations of northward migration of shorebirds have been made is the Opala River mouth (Fig. 1, Site 1). A total of 343 Great Knot were observed between May 21-24 1994, which represented 0.8 % of the total shorebirds counted during this period (Gerasimov & Kalyagina 1995).

In 1993, Great Knot were not observed among 58,000 shorebirds counted at the Bolshaya River mouth (Fig. 1, Site 2) from 2-25 May (Gerasimov 1998). However, in 1975, mass migration of Great Knot through the Moroshechnaya River estuary (Fig. 1, Site 3) began on May 23, with flocks numbering from some tens up to 1,500 birds arriving from the south. Some birds continued migrating northwards, whilst others stopped to rest and feed. Very active migration continued during the

next two days. On May 25 between 7 and 8 am, about 12,000 shorebirds flew over the estuary, most of which were Great Knot. Less active migration continued from May 27-29.

In 1976, Great Knot migrated from May 16-31. In total, more than 18,000 birds were counted. The most active migration took place from May 21-24 (Fig. 2). On May 22-23, more than 5,000 Great Knot were observed feeding near the mouth of the estuary during low tide. About 60 birds remained on the morning of June 2.

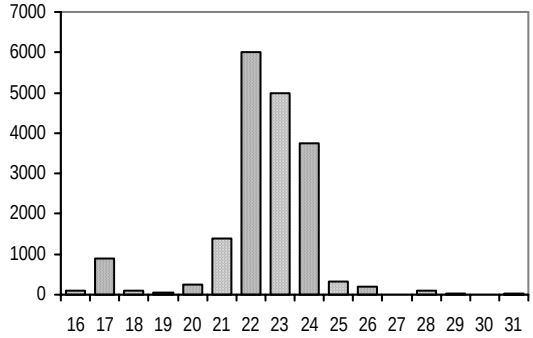


Figure 2. Daily numbers of Great Knot at the Moroshechnaya River estuary in May 1976.

In 1977, migration occurred from May 15-28. In total, about 10,000 Great Knot were counted. The smaller number compared to 1976 can be explained by less thorough counting. Most active migration took place from May 21-26 (Fig.3). Regular observations were not made in 1979. However, from May 20-23 about 7,000 Great Knot were counted. The most active migration was on May 20-21.

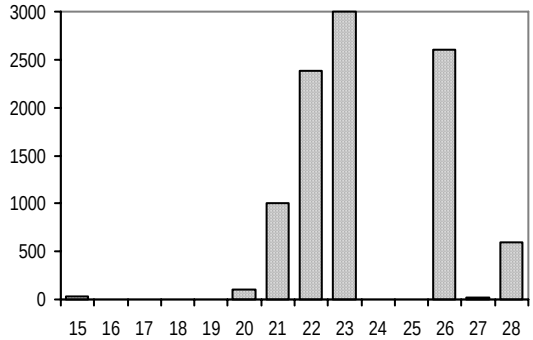


Figure 3. Daily numbers of Great Knot at the Moroshechnaya River estuary in May 1977.

On the basis of counts made during 1974-1978, it has been estimated that the total number of Great Knot using the Moroshechnaya River estuary during northward migration is 20,000 (Gerasimov 1980). However, further observations have shown that the actual numbers are much higher. In 1980, the thaw was extremely late. The first Great Knot flock (15 birds) was seen on May 15. On this date, the river, estuary and adjacent tundra were completely covered by ice. On the next day, two small flocks of 10 and 25 birds were observed. From May 22 onwards, migration became more active. Up to May 30, daily counts of Great Knot varied from 1,000 to 15,200 birds. In total, from May 15-31, 42,000 Great Knots migrated northwards. The most active migration took place from May 25-27 and on May 29 (Fig. 4).

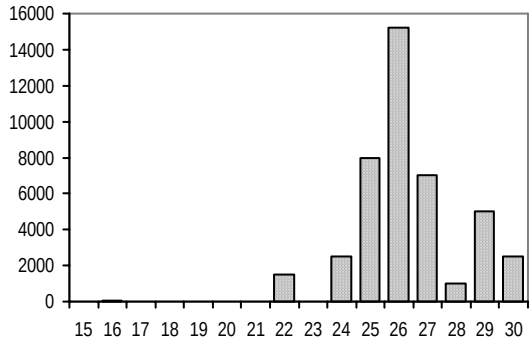


Figure 4. Daily numbers of Great Knot at the Moroshechnaya River estuary in May 1980.

In 1983, the first Great Knot was seen on May 18. The first large flock, numbering 3,000 individuals, arrived on May 20. The maximum number of birds counted, i.e. more than 10,000 individuals were observed on the estuary during the low tide of May 21. In 1983, daily shorebird counts were not made, yet the total number of Great Knot counted was more than 20,000 individuals.

The first birds seen in 1990 occurred on May 22. The most intensive migration was from May 25-26. A total of about 40,000 Great Knots were counted in that year (Fig. 5).

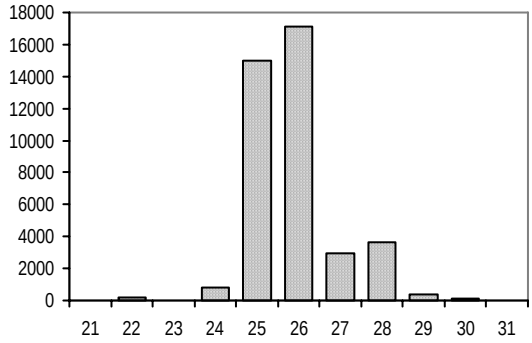


Figure 5. Daily numbers of Great Knot at the Moroshechnaya River estuary in May 1990.

East coast

The earliest observation of Great Knot on northward migration on the south-east coast of Kamchatka is May 7 1972 (Lobkov 1986). No Great Knot were observed during the period May 1-20 1995 at the Khodutka River mouth (Fig.1, Site 4). However, at the Vakhil River mouth (Fig. 1, Site 5), the first Great Knot in 1991 arrived on May 20, which was also the day of most

active migration of the species, with 283 individuals being counted (Gerasimov *et al.* 1998). All of them stopped to rest on the sand islands at the river mouth joining Whimbrel *Numenius phaeopus* and Bar-tailed Godwit *Limosa lapponica*. On May 21 and May 22, 13 and 71 individuals were counted, respectively. Observations finished on May 22, before migration stopped. In 1992, observations finished on May 21. On this day, the first six Great Knots were observed. Unlike other sites, at Kronotsky Bay (Fig. 1, Site 6), Great Knot usually occur in small flocks numbering from four to six individuals (Lobkov 1986).

Central Kamchatka

In 1999, the first flocks of Great Knot (3, 5 and 14 birds) were observed on Kharchinskoe Lake (Fig. 1, Site 7) on May 20. Further small flocks were observed during the following four days and no Great Knot were seen after May 25. In total, at least 30,000 shorebirds were counted, of which only 100 were Great Knot (Gerasimov 1999a).

North Kamchatka

In north Kamchatka, the 1998 spring was extremely late. Up to the end of the second week of May, the coastal area around Rekkinikski Bay was completely covered by ice and most of the area was under snow. In the south of Parapolsky Dol (Fig. 1, Site 8), small flocks of Great Knot appeared on May 20. However, this was the final day of observations and it was not possible to obtain additional data about migration. Great Knot were observed daily during studies carried out in Skobeleva Bay (northern part of Korf Bay; Fig. 1, Site 9) from May 23-31 1998. The maximum numbers were counted on May 29 (183 individuals) and May 30 (154 individuals) (Fig. 6). The flocks, each numbering up to 80 individuals, were observed feeding on mudflats. On May 29, a bird with a yellow flag on the right leg was observed (Gerasimov 1999b).

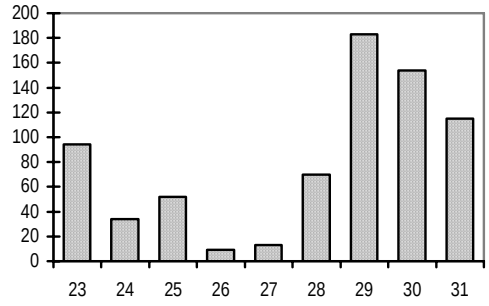


Figure 6. Daily numbers of Great Knot in Skobeleva Bay in 1998.

In the area near the Apuka River mouth (Fig. 1, Site 10), Great Knots were observed during northward migration from May 28 to June 6 1960 (Kistchinski 1980, 1988).

DISCUSSION

The area of major landfall of migrating Great Knot on Kamchatka is not known. No places are known where large concentrations of Great Knot occur in the southern part of the western coast. Probably, birds arrive on the peninsula at various points along the central part of western coast. The Moroshechnaya River estuary is the only known place where large concentrations of northward-migrating Great Knot have been seen. Studies over an extended period show that at least 35,000-40,000 Great Knot are moving through the area during northward migration. Most birds stop to rest and feed, but do not remain for more than two days. Thousands of Great Knots roost at the end of the spit separating the estuary from the sea during several days of the third week of May. Numbers on some nights reached 15,000. There is no information on northward migration of Great Knot along the west coast north of the Moroshechnaya River estuary.

The number of Great Knot occurring in the central area and along the east coast of Kamchatka during northward migration is insignificant and the total probably does not exceed a few hundred birds. The several hundred Great Knot observed in Skobeleva Bay have probably arrived there by crossing the northern part of the Sredinny from the west coast (see Fig. 1). Great Knots occurring in the central area and on the south-east coast presumably also cross the peninsula.

REFERENCES

Gerasimov, N.N. 1980. Spring migration of the Great Knot *Calidris tenuirostris* and Red Knot *Calidris canutus* along the west coast of the Kamchatka Peninsula. Pp. 96-98. *In:* V.E. Flint (Ed.) New studies of the Biology and Distribution of Waders. Moscow (in Russian).

Gerasimov, Yu.N. 1998. Spring migration of waders in the Bolshaya River mouth (Western Kamchatka). Ornithology 28: 222. (in Russian).

Gerasimov, Yu.N. 1999a. Wader counts in central Kamchatka. Tattler 21: 8-9.

Gerasimov, Yu. N. 1999b. The observation of the spring migration of waders in Korf Bay. Pp. 73-76. *In:* Poyarkov (Ed.) The biology and conservation of birds of Kamchatka. Moscow (in Russian).

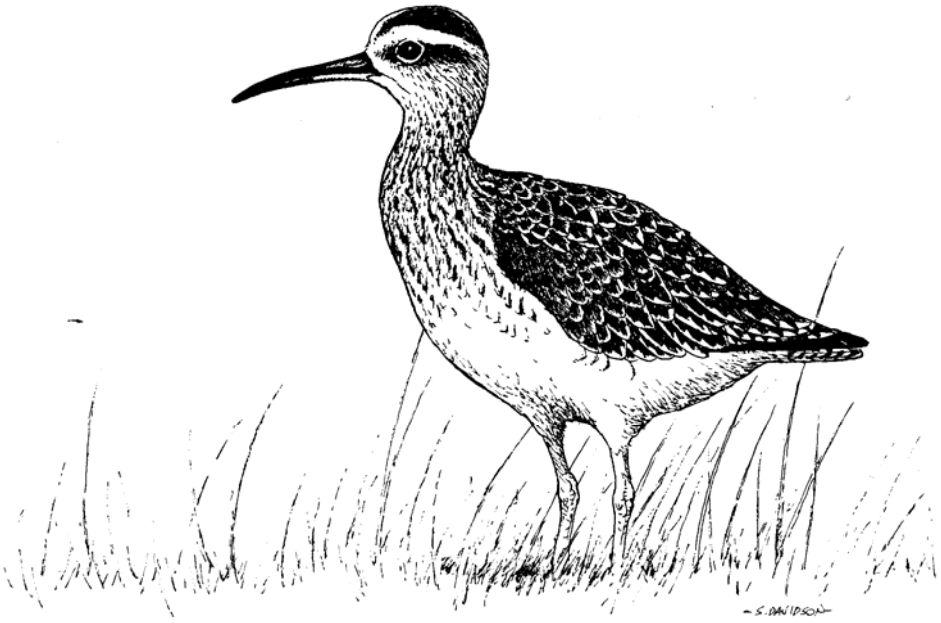
Gerasimov, Yu. and E.E. Kalyagina 1995. Observations of waders during spring migration in south-west Kamchatka. Russian Journal of Ornithology 4(3/4): 144-145. (in Russian).

Gerasimov Yu.N., A.I. Macina and Ryzhkov D.I. 1998. On spring migration of waders in the Vakhil' River mouth, south-eastern Kamchatka. Ornithology 28: 222-223. (in Russian).

Kistchinski A. A. 1980. Birds of Koryak Highland. Moscow: 1-336. (in Russian).

Kistchinski A. A. 1988. Avifauna of North-East Asia. History and Modern State. Moscow: 1-288. (in Russian).

Lobkov, E.G. 1986. Nesting birds of Kamchatka. Vladivostok (in Russian).



CORRECTIONS TO SIGHTINGS OF WADERS LEG-FLAGGED IN NORTH-WESTERN AUSTRALIA REPORT NUMBER 6

Clive Minton[1] and Rosalind Jessop[2]

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This is a corrected version of the yellow leg flag sightings (birds banded in NW Australia) previously published in *Stilt* 35: 52-58. The previous copy contains some errors in the date and times of sightings for the following species. The editor and authors apologise to the dedicated group of observers for the incorrect references to their sightings.

Bar-tailed Godwit

030397 2 birds	Miranda, Firth of Thames, New Zealand	S. Davies
120397	Kaipara Harbour, New Zealand	G. Pulham
18 to 280497	Sone Tidal Flat, Kitakyushu, Fukuoke, Japan. 33^0 49'N 130^0 58'E	Samoto Kazuo
300797	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jin-Young Park
100897 4 birds	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jin-Young Park
120897	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jin-Young Park
250897 5 birds	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jin-Young Park
010997 2 birds	Namyang Bay, Republic of Korea 37^0 05'N 126^0 45'E	Jin-Young Park
020997 3 birds	Asan Bay, Republic of Korea 36^0 54'N 126^0 54'E	Jin-Young Park
300997 2 birds	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jin-Young Park & Jeong-Yeon Yi
301197	Miranda, Firth of Thames, New Zealand	K. Woodley *et al.*
280298	Miranda, Firth of Thames, New Zealand	T. Harbraken
100498 4 birds	Mai Po Nature Reserve, Hong Kong 22^0 29'N 114^0 19'E	G. Carey & P. Leader
110498	Asan Bay, Republic of Korea 36^0 54'N 126^0 54'E	Ki-Seop Lee, Ok-Sik Jung, Kyung-Kyu Lee
180498	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jeong-Yeon Yi
240498	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	N. Moores
250498	Namyang Bay, Republic of Korea 37^0 05'N 126^0 45'E	Jeong-Yeon Yi
260498	Asan Bay, Republic of Korea 36^0 54'N 126^0 54'E	Jin-Young Park
280498 4 birds	Dongjin Estuary, Republic of Korea 35^0 49'N 126^0 42'E	Jin-Young Park
290498	Mankyung Estuary, Republic of Korea 35^0 52'N 126^0 43'E	Ok-Sik Jung
020598	Kochimam, Haenam, Republic of Korea 34^0 25'N 126^0 31'E	N. Moores
120598	Mankyung Estuary, Republic of Korea 35^0 52'N 126^0 43'E	Jeong-Yeon Yi
190598	Shuangtaizihekou Nature Reserve	M. Barter, J. Wilson

	Liaoning Province, China. 40^0 50'N 121^0 34'E	
190598 2 birds	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jin-Young Park

A nice selection of Bar-tailed Godwit leg flag sightings. New Zealand again features even though the races occurring there are thought to be different from those in NW Australia. The Mai Po birds were in a flock of 40 birds seen to arrive, presumably after a direct flight of 4500 km from NW Australia. The large number of Korean sightings (32) emphasises the key role of that country as a stopover site for NW Australian Bar-tailed Godwits.

Red Knot

140798	Barry Beach, Vic. Australia	P. Collins *et al.*
060298	Karewa, Te Whanga Lagoon, Chatham Islands, New Zealand 43^0 43'N 176^0 27'W	Mike Bell
200197	Miranda, Firth of Thames, NZ	R. Mavor
170997	"	K. Woodley
191097	"	T. Habraken
231097	Manawatu Estuary, New Zealand	I. Saville
161197	"	"
151197	Manukau Harbour, NZ	P. Agnew
280298	"	T. Harbraken
190598	Shuangtaizihekou Nature Reserve Liaoning Province, China. 40^0 50'N 121^0 34'E	M. Barter, J. Wilson
080598	Mai Po Nature Reserve, Hong Kong. 22^0 29'N 114^0 19'E	G. Carey & P. Leader
100598 2 birds	"	"

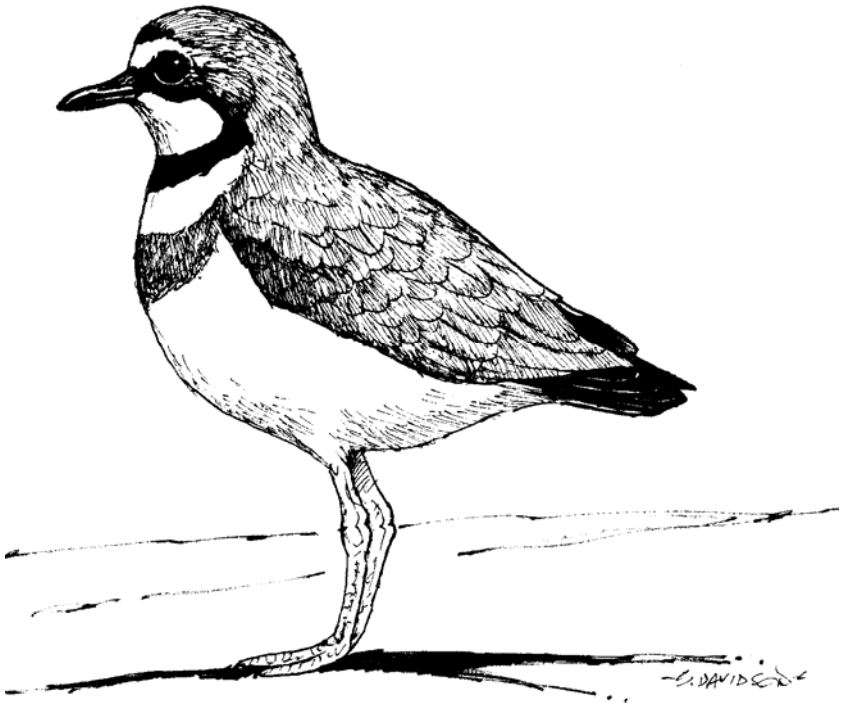
The number of New Zealand sightings continues to grow even though different races of birds from different origins are considered to occur in New Zealand and NW Australia. The sighting on the Chatham Islands is remarkable. The sighting in Victoria is the first of a Red Knot from NW Australia and presumably relates to an immature bird.

Great Knot

190598	Shuangtaizihekou Nature Reserve Liaoning Province, China. 40^0 50'N 121^0 34'E	M. Barter, J. Wilson
090797	near Magadan, Sea of Okhotok, NE Siberia. 59^0 52'N 154^0 13'E	A.V. Kondratyev
010597	Yellow River Delta, China. (Guangli/Zima River Mouths)	M. Barter, D. Tonkinson
120897	Kanghwa Island, Republic of Korea. 37^0 34'N 126^0 23'E	Jin-Young Park
020997	Asan Bay, Republic of Korea 36^0 54'N 126^0 54'E	Jin-Young Park
050997 4 birds	Dongjin Estuary, Republic of Korea 35^0 49'N 126^0 42'E	Jin-Young Park.
100498 15 birds	Mankyung Estuary, Republic of Korea 35^0 52'N 126^0 43E	Jeong-Yeon Yi & Jin-Young Park
290498 4 birds	"	Ok-Sik Jung & Jin-Young Park
110498 6 birds	Asan Bay, Republic of Korea 36^0 54'N 126^0 54'E	Kip-Seop Lee *et al.*
260498	"	Jin-Young Park Jeong-Yeon Yi

4 birds		
250498 3 birds	Namyang Bay, Republic of Korea 37^0 05'N 126^0 45'E	Jeong-Yeon Yi
280498 4 birds	Dongjin Estuary, Republic of Korea 35^0 49'N 126^0 42'E	Jin-Young Park
030498	Mai Po Nature Reserve, Hong Kong. 22^0 29'N 114^0 19'E	G. Carey & P. Leader
040498	"	"

A great series of sightings from South Korea, China, Siberia and Hong Kong. The 42 reports from South Korea illustrate its key importance as a stopover site for this species.



OCCASIONAL COUNTS NO 3.

WADER COUNTS ON EYRE ISLAND AND ST PETER ISLAND, SOUTH AUSTRALIA.

J.R.Wilson

13/27 Giles St, Kingston, 2604 ACT AUSTRALIA

Eyre Island (32°23´S 133°50´E) lies approximately 5 kms west of Smokey Bay township, and St. Peter Island (32°14´S 133°37´E) approximately 10 kms south of Ceduna in the Australian Bight. The two islands are approximately 15 kms apart. They are easily reached by boat from Smokey Bay township and Ceduna respectively. 1:50,000 maps indicate that both islands have extensive areas of tidal flats. Both islands are part of the Nuyts Archipelago Conservation Park. The AWSG have no records of any previous wader counts on these islands and it seems that they may never have been previously counted.

The islands were counted as part of the joint South Australian Ornithological Association and AWSG survey of the coasts of South Australia undertaken in January and February 2000. Eyre Island was not flown over, but was judged from a distance from the air to probably be a good wader site. It was visited by two wader counters on 4 February from 09:45 to 14:00 (high tide 13:10, height 1.1 m.). All the coasts of St Peter Island were flown by Peter Driscoll in his ultralight on 27 January starting at 06:55 (low tide 08:00, height 0.51 m.). The island was visited by six wader counters on 3 February from 09:30 to 14:30 (high tide 13:00, height 1.0 m.).

Eyre Island is shown in Fig 1. We landed on the island on the rising tide. The last feeding areas lay on northeast side of the island in front of the mangroves. Many waders gathered there and as the tide rose moved off to a sand bank between the island and the mainland. Most of these birds ended up roosting at Cape Missiessy, and just after high tide we landed on the Cape to count them.

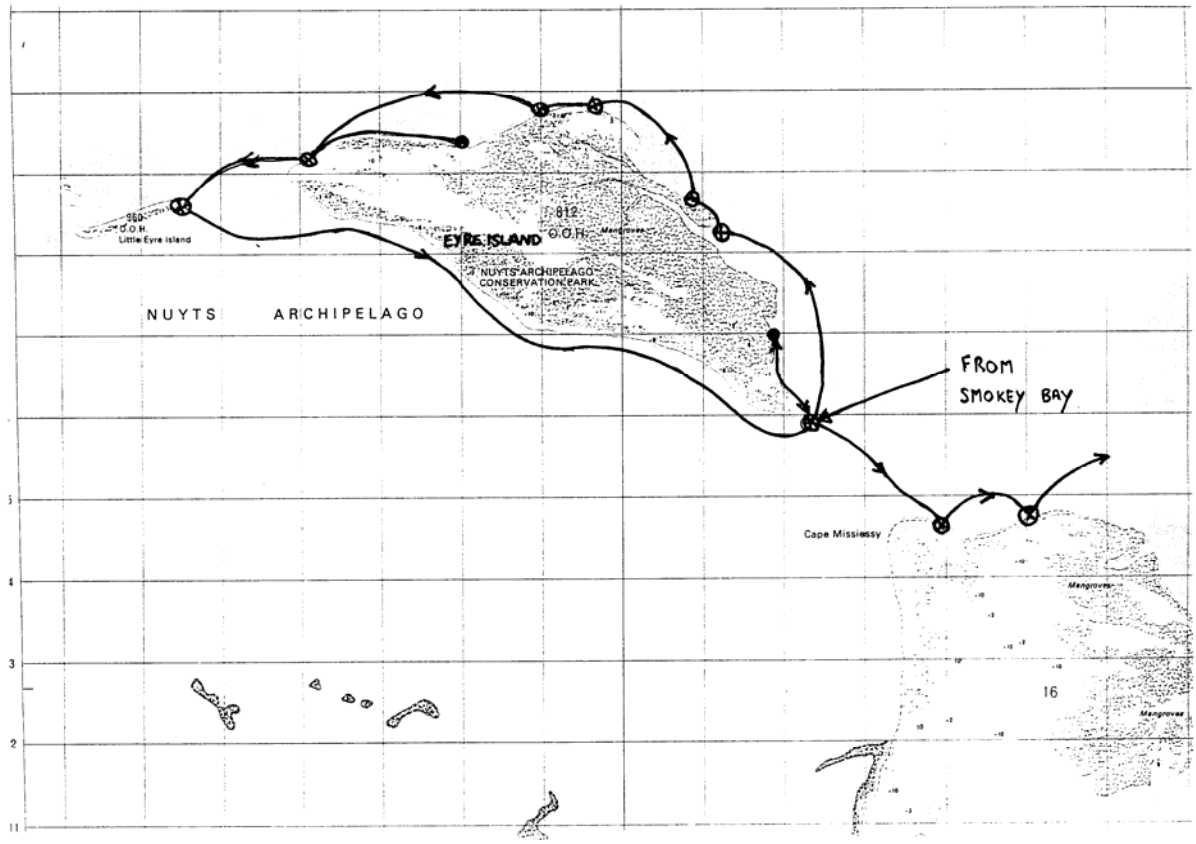


Figure 1. Eyre Island.

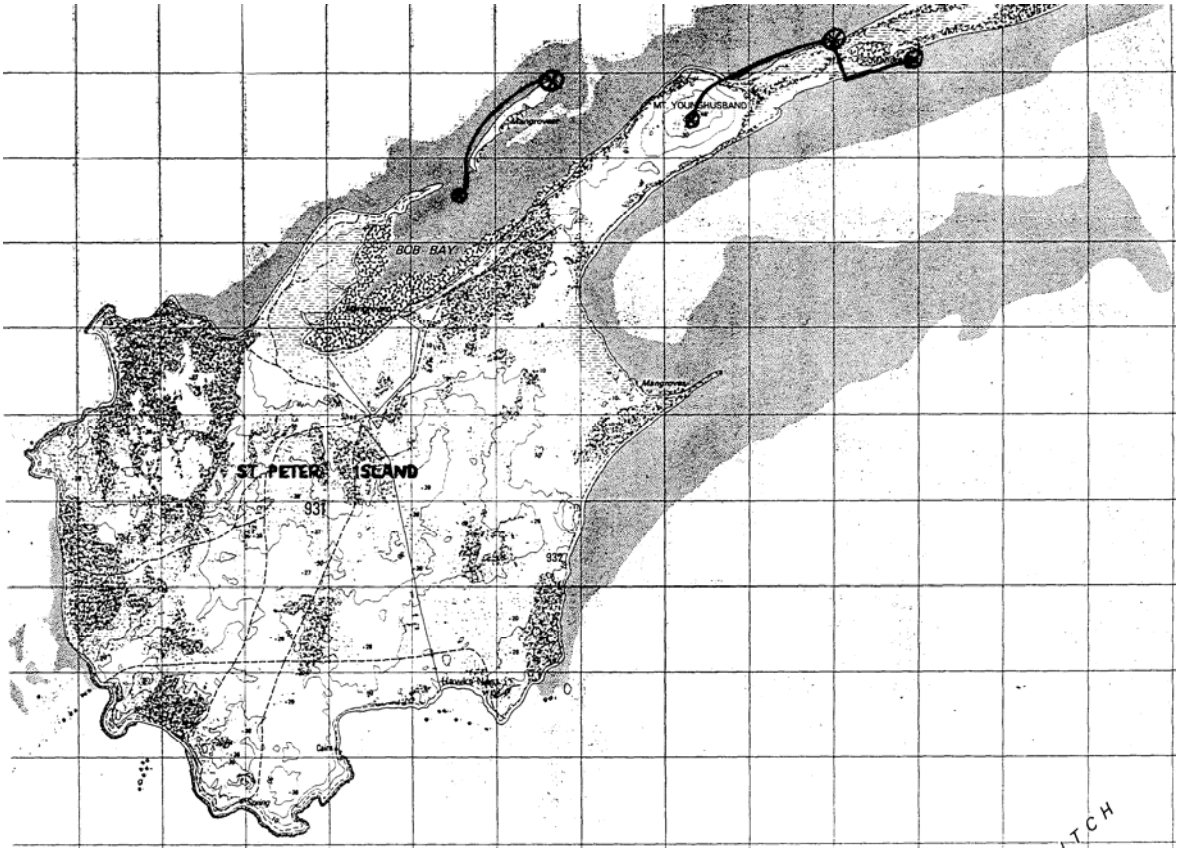


Figure 2.. St. Peter Island. One square represents one square kilometre.

Other roosts were located on a beach on the northwest end of the island and two small sand islands which lay to the west of Eyre Island (shown as one island on the map) The seven kilometre long ocean beach on the south side of the island had very few birds at high tide, although banks of suitable looking seaweed wrack lay on the shore. The water here was deep close to the shore and we were able to count the whole beach by motoring along it in a boat. All the coasts of the island were visited by boat and on foot. The coverage was probably complete.

St. Peter Island is shown in Fig 2. On the low tide count from the air good areas of tidal flat were recorded in all areas except the southern end of the island (in agreement with the 1:50.000 maps). We landed on the rising tide. Unfortunately four of the party were landed on a small sand island on the north side of the main island. Large numbers of waders were pushed by the tide into the back of Bob Bay adjacent to the island and roosted on sand spits in the bay which were not covered by the (neap) high tide. The main roosts could not be approached because of channels and we had to be satisfied with viewing at a about a kilometre range with a telescope, our boat having left us to take a party fishing. The other two of the party landed on the north side of the long eastern peninsula, and crossed this to the south side. They also climbed to the top of Mt. Younghusband, but because of heat haze and strong winds could not see any waders which might be expected to roost further to the south. Thus the high tide count was incomplete and the aerial count, which covered all the shores, was done at low tide.

RESULTS AND DISCUSSION

The counts from the two islands are shown in Table 1. By comparing the same sites counted by air and land in the South Australia study it was found that air counts generally underestimated wader numbers. For Oystercatchers and medium-sized waders air counts could be factored up by 1.4, and small waders by 1.8. As land counts were incomplete, these have been combined with the adjusted air counts to give a better estimate of the populations.

In Table 1 species with numbers of international (I) and national (N) significance according to the Ramsar 1% criteria and calculated after Watkins (1993) are shown. Each island had about 5,500 waders. Eyre Island was internationally important for four species (Pied Oystercatcher, Sooty Oystercatcher, Grey Plover, Oriental Plover) and nationally important for one (Greenshank). St Peter Island was internationally important for three species (Pied Oystercatcher, Sooty Oystercatcher, Grey Plover) and nationally important for one (Ruddy Turnstone). There are also important tern

Table 1. Wader numbers on Eyre Island and St Peter Island (I = international significant numbers; N = nationally significant numbers).

Species	Eyre Island	St Peter Island		
	land	land	air	Total estimate
Bar-tailed Godwit	590	147		147
Whimbrel	13	15		15
Eastern Curlew	25	32	1	33
Unidentified Curlew/Whimbrel			35	35
Greenshank	263 N	86	48	86
Ruddy Turnstone	75	161		161 N
Great Knot	21	4		4
Red Knot	1451	435		435
Knot species		100		100
Red-necked Stint	828	1720		1720 I
Sharp-tailed Sandpiper	352	80		80 I
Curlew Sandpiper	135	65		65 I
Pied Oystercatcher	251 I	180	78	180
Sooty Oystercacher	93 I	66	55	72
Banded Stilt	5			
Grey Plover	657 I	295		295
Red-capped Plover	82	76		76
Lesser Sand Plover	6			
Greater Sand Plover	1	6		6
Oriental Plover	600 I			
Masked Lapwing	5		131	131
Unidentified small wader			1825	1183
Unidentified medium wader			1175	664
Total waders	5453	3468	3348	5488

colonies on both islands and a Pelican colony on Eyre Island.

The sighting of 600 Oriental Plover found roosting on the small outer islands of Eyre Island seems to be most unusual for this inland species. However, the observation is not unprecedented. On the morning of 2 February 1984 Graham Carpenter and Jamie Matthew saw 27 on the sandflats on the south side of Tourville Bay near Ceduna. On the afternoon of the same day they saw 10 in east Tourville Bay and Graham Carpenter and Neil Cheshire saw 126 in the northeast corner of Tourville Bay. On 3 February 1984 David Close saw 12 in Murat Bay (AWSG records). Tourville Bay and Murat Bay are about 15 kms from Eyre Island. Hot weather probably forces the plovers out to the coast.

A Red Knot with a Victoria flag was seen on Eyre Island.

These two islands with the adjacent mainland coasts, including Smokey Bay, Murat Bay and Tourville Bay form an interesting unit with over 20,000 waders and 9 species of international importance spread over 50 kms of coastline. These data will be reported on further, together with the results of the 2000 South Australia wader studies. It is interesting to note undocumented wader sites of such importance still exist in Australia.

ACKNOWLEDGEMENTS

The South Australia surveys were supported through Natural Heritage Trust Funds. Peter Driscoll flew St Peter Island in his ultralight. The land party on Eyre Island consisted of Rob Schuckard and Jim Wilson. That on St Peter Island comprised Maureen Christie, Peter Collins, Ken Gosbell, Rob Schuckard, Doug Watkins and Jim Wilson. Thanks to Cherie, the girl in the cafe, for obtaining us a boat to visit Eyre Island and Collin Beattie for navigating us to all the places we wanted to go. Permission to land on St Peter Island was given by the Department of Environment, Heritage and Aboriginal Affairs, Ceduna Office. David Close copied all the previous count sheets from the surrounding coasts and was very helpful in providing contacts for the west Eyre Peninsula part of the South Australia surveys.

REFERENCES

Watkins, D. 1993. A national plan for shorebird conservation in Australia. RAOU Report No 90.

REPORT ON POPULATION MONITORING COUNTS - SUMMER 1999

Ken Harris, 59 Strickland Drive Wheelers Hill, 3150 Vic. Australia

Result of the Summer 1999 Wader Count	Cairns	Tnsvlle*	Mcky	Gldstn*	Moretn Bay	Lockyer Valley	Tweed Est	Richmnd Est	Clrnce Est	Hunter Est	Tuggerah Lakes	Parr Est	Botany Bay	Shlhvn Est	Shallow/ CnrInlet	Wstnpt Bay	East PtPhllp	Altona	Wrrbee Avalon
Latham's Snipe	N		N			N		2									17		
Black-tailed Godwit	O		O		680	O			152	150									
Bar-tailed Godwit	T	59	T	4	13233	T	67	164	443	1300	192		521	409	9587	463			12
Little Curlew																			
Whimbrel	C	2	C	1	854	C	65	18	110	50			45		35	27			
Eastern Curlew	O	6	O	14	2514	O	89	53	119	531			174	35	1467	1513			4
Marsh Sandpiper	U		U		57	U		5	50	184				2				50	43
Common Greenshank	N	1	N	1	289	N	3	25	3	120	6				216	262	18	92	168
Wood Sandpiper	T		T			T											3		1
Terek Sandpiper	E		E	4	112	E		70		83			5			1			
Common Sandpiper	D		D			D													
Grey-tailed Tattler		6		11	2070		53	90	83	27	12		64			3			
Wandering Tattler																			
Tattler sp.																			
Ruddy Turnstone					248			43	7		29		33		87	76			6
Great Knot		4			1195			16	286	8				1	100				
Red Knot				65	7									45	930	15			
Sanderling								51							72				
Red-necked Stint				230	1528			70	9		134		45	600	15292	5829		2340	7178
Pectoral Sandpiper																			5
Sharp-tailed Sandpiper					827			49	51		1			33	2	206	381	797	3661
Curlew Sandpiper					533			63		570	5		6		1398	4496		710	4299
Bush Stone-curlew																			
Beach Stone-curlew																			
Pied Oystercatcher		5			542		4	14	6		4		51	4	878	200			32
Sooty Oystercatcher					3				1		7				166				
Black-winged Stilt				41	905			58		100	18			12			155	583	330
Banded Stilt																			133
Red-necked Avocet					3					36								103	295
Pacific Golden Plover					579			99		39	12		18	49	22	114		48	95
Grey Plover				5	48										221				
Red-capped Plover		2		1	183			3			1			60	10	160	12	34	61
Double-banded Plover																7			3
Lesser Sand Plover				150	471			13	35				5		42	2			
Greater Sand Plover					47			65	31						5				
Oriental Plover																			
Black-fronted Dotterel					4												4		6
Hooded Plover															9				
Red-kneed Dotterel																	20		104
Banded Lapwing																			
Masked Lapwing				14	106		5	41	3	2	52				22	296	230	89	483
Long-toed Stint																			
Unidentified small																			500
Unidentified medium									100										
Unidentified large																			
Redshank																			
Broad-billed Sandpiper																			
Ruff/Reeve																			
Swinhoe's Snipe																			
Asian Dowitcher																			
Total Number	0	85	0	541	27038	0	286	1012	1489	3200	473	0	967	1250	30561	13670	840	4846	17419
Total Species	10	8	10	13	25	10	7	21	17	14	13	0	11	11	20	17	9	10	21

Result of the Summer 1999 Wader Count	BllmeP/* Mud Isl	EDerw Pittw	Marion Bay	Cape Portland	NWCst Tas	SECst SA	West EyrePen	StVinc Gulf	Albany	Swan	80 Mile	Broome	Dwin	TOTAL
Latham's Snipe	102				2		N	N					N	123
Black-tailed Godwit							O	O				4000	O	4982
Bar-tailed Godwit	2007	86	2	28	500	4	T	T	21	4	11690	8080	T	48876
Little Curlew														0
Whimbrel	9	2	1	7			C	C	2		5	45	C	1278
Eastern Curlew	116	89		36	200	3	O	O			135	52	O	7150
Marsh Sandpiper	77						U	U					U	468
Common Greenshank	485	25		38	110	61	N	N	40	17	760	50	N	2790
Wood Sandpiper							T	T					T	4
Terek Sandpiper					2		E	E			1145	305	E	1727
Common Sandpiper							D	D		4		5	D	9
Grey-tailed Tattler				3	6	9			24	1	860	1060		4382
Wandering Tattler														0
Tattler sp.														0
Ruddy Turnstone	60			164	1793	1887					70	206		4709
Great Knot					25				312	56	7115	9550		18668
Red Knot	238	5			804				89			560		2758
Sanderling					29	900					10			1062
Red-necked Stint	12349	1396	600	498	4485	2128			1000	595	1140	2300		59746
Pectoral Sandpiper					0									5
Sharp-tailed Sandpiper	1363				58	37			31	5				7502
Curlew Sandpiper	2410	253		83	622	160			110	36	215	580		16549
Bush Stone-curlew														0
Beach Stone-curlew														0
Pied Oystercatcher	62	894	89	49	1208	7			59	88	4	24		4224
Sooty Oystercatcher	1	43	3	28	475	1			2			29		759
Black-winged Stilt	695									53				2950
Banded Stilt	1200													1333
Red-necked Avocet														437
Pacific Golden Plover	5	45		147	382	202			3		20			1879
Grey Plover	42				200				51	49	205	168		989
Red-capped Plover	239	121	95	135	39	56			3	58	10	90		1373
Double-banded Plover		1	3	2	4	3								23
Lesser Sand Plover	6			3	11							5		743
Greater Sand Plover	4								26		3475	2740		6393
Oriental Plover											2			2
Black-fronted Dotterel	3	1												18
Hooded Plover	9	16	5	3	44									86
Red-kneed Dotterel	68													192
Banded Lapwing				14										14
Masked Lapwing	651	624	60	24	77	94								2873
Long-toed Stint														0
Unidentified small	500	5			500									1505
Unidentified medium											5935			6035
Unidentified large														0
Redshank														0
Broad-billed Sandpiper												15		15
Ruff/Reeve														0
Swinhoe's Snipe														0
Asian Dowitcher												4		4
Total Number	22701	3606	858	1262	11576	5552	0	0	1773	966	32796	29868	0	214635
Total Species	25	16	9	17	24	15	10	10	15	12	18	21	10	

* Count incomplete.
** Swan Is. not counted.

INSTRUCTIONS TO AUTHORS

The Stilt is the bulletin of the Australasian Wader Study Group and publishes original papers, technical notes and short communications on all aspects of waders (shorebirds) of the East Asian-Australasian Flyway and nearby parts of the Pacific region. Authors should send an original and one hard copy of any manuscript plus the document saved on a 3 1/2" computer disc to the editor, Dr David Milton, 336 Prout Rd., Burbank Qld 4156 or by e-mail: *david.milton@marine.csiro.au*. Material sent to *The Stilt* is assumed to be original and must not have been published elsewhere. Authors are asked to carefully follow the instructions in the preparation of manuscripts and to carefully check the final typescript for errors and inconsistencies in order to minimise delays in publication. Suitable material submitted before **1st March** or **1st September** will normally be published in the next issue of *The Stilt* in April or October respectively. Late submissions may be accepted at the editor's discretion and he should be contacted to discuss the situation. Articles, including tables should be in 11 pt Times Roman font typed in MS Word 6.0 for PC or a wordprocessing package readable by Word 6.0. A disc copy of the figures is also preferred and can be included if they have been produced in MS Powerpoint or Excel, Harvard Graphics 3.0 or less, or Grapher 2.0 software.

Full research papers of more than 6 typed double-spaced text should contain the following elements:
TITLE - in bold, capitalised type
Authors name and address - John Smith[1], Stephen Brown[2] and Max Well[3]

[1] 1 Main St., Melbourne 3001 Vic. AUSTRALIA
[2] Dept. Biology, Univ. Queensland, St Lucia 4068 Qld. AUSTRALIA
[3] Birds Singapore, National Univ., Jurong N4321 SINGAPORE

ABSTRACT - Usually less than 200 words summarising the most important findings of the study.
INTRODUCTION - This should be a short section of about half a journal page to "set the scene" and explain to the reader why the study was important. It should end with a clear definition of the aims of the study. The first reference to a species of bird should have the scientific name in *italics* after it.
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RESULTS - Highlights the key points that came out of the study in relation to the objectives set out in the introduction. Data should be presented in figures or tables.
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ACKNOWLEDGEMENTS - Recognises the contribution of others to the completion of the study.
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Single author papers: Smith, F.T.H. 1964. Wader observations in southern Victoria, 1962-1963. Aust. Bird Watcher 2, 70-84.

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Books: Kershaw, K.A. 1964. Quantitative and dynamic ecology. Edward Arnold, London.

Reports: Noor, Y.R. 1994. A status overview of shore birds in Indonesia. Pp. 178-88. *In:* Wells, D.R. & T. Mundur (Eds.) Conservation of migratory water birds and their wetland habitats in the East Asian-Australia Flyway. Asian Wetland Bureau, Malaysia.

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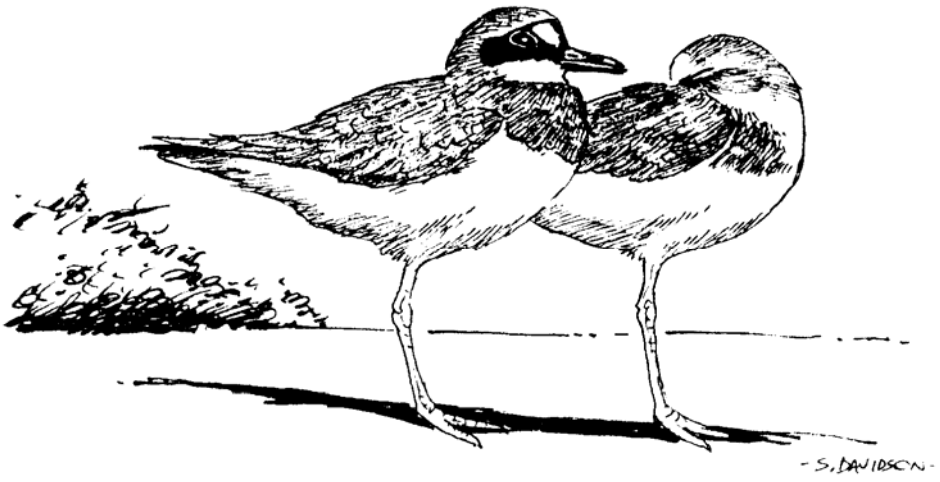
REFERENCES

Christidis, L., & W.E. Boles 1994. The Taxonomy and Species of Birds of Australia and its Territories. RAOU monogr. 2. 112pp.

Hayman, P., J. Marchant & T.Prater 1986. Shorebirds: An Identification Guide to the Waders of the World. Christopher Helm, London.



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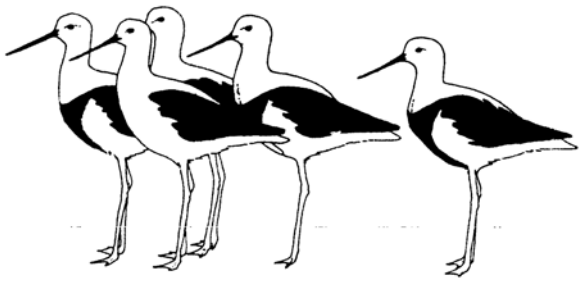

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