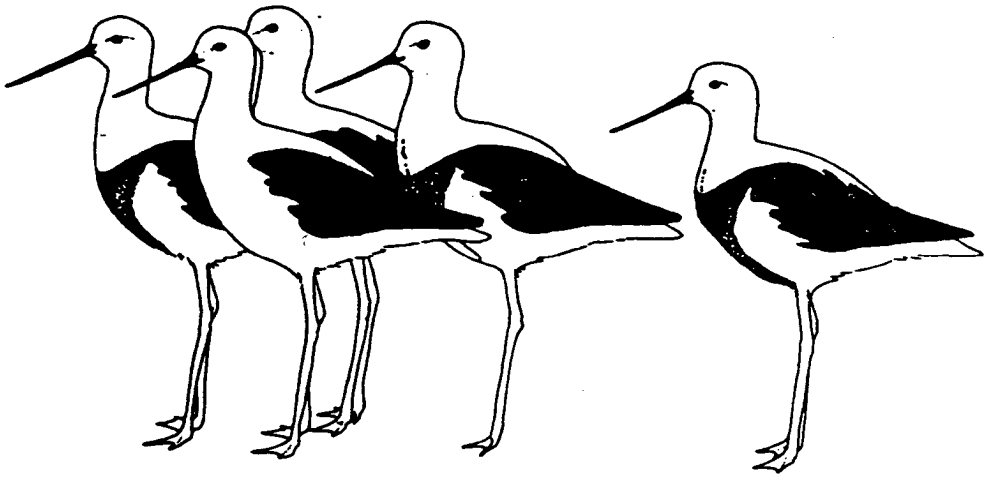
The Stilt



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BULLETIN OF THE AUSTRALASIAN WADER STUDIES GROUP

OF THE

ROYAL AUSTRALASIAN ORNITHOLOGISTS UNION

Number 14 **April 1989**

OBJECTIVES OF THE
AUSTRALASIAN WADER STUDIES GROUP
OF THE
ROYAL AUSTRALASIAN ORNITHOLOGISTS UNION

1 To develop or assist with plans for wader research in Australasia in conjunction with other interested bodies.

2 To co-ordinate and encourage counting, banding, feeding studies and other scientific programmes involving amateur and professional skills.

3 To encourage and assist with the publication of results.

4 To maintain effective communication between wader enthusiasts within Australasia and with similar groups overseas.

5 To formulate and promote policies for the conservation and management of waders and their habitat.

SUBSCRIPTIONS FOR 1989:

AUSTRALASIA	AUS $15
OVERSEAS	AUS $20
LIBRARIES	AUS $25

ALL ENQUIRIES SHOULD BE DIRECTED TO BRENDA MURLIS, ADMINISTRATIVE SECRETARY.

EDITORIAL

In producing this, my first Stilt, my main aim is to maintain the high standard set by my predesessor, Eric Woehler. I have been fortunate that Eric has been available to provide me with guidance and assistance which have made my task so much easier and for which I am most grateful. My thanks are also due to Mark Barter for his enthusiastic encouragement.

Although there will be no change in editorial policy this issue sees one major innovation and two minor changes. An arrangement has been made between the AWSG and the Wader Study Group for the reprinting of articles of major interest in the respective journals of each other's journal. It is with great pleasure that the first article to be reprinted from the WSG Bulletin ("Hop, skip or jump? Constraints on migration of arctic waders by feeding, fattening, and flight speed" by Theunis Piersma) appears in this issue. The first paper to be reprinted in the WSG Bulletin will be "Biometrics and moult of Lesser Golden Plovers *Pluvialis dominica fulva* in Victoria" by Mark Barter which appeared in Stilt 13.

The Stilt publishes papers and articles on all aspects of wader (shorebird) studies - from biometrics, moult and banding recoveries to feeding ecology, breeding biology and habitat ecology. Contributions on these, and any other, aspects are sought from AWSG members and particularly from those who have not yet contributed to *The Stilt*. Would be contributors are urged to consult the most recent additions with regards to format and style, with particular attention to the presentation of "REFERENCES".

The two minor changes referred to above are the discontinuance of "Wandering Waders" and re-naming "Open Notebook" Short Communications. The former is, I hope, only temporary. Unfortunately, too few observations are being received to continue "Wandering Waders". If this situation changes I will be pleased to re-introduce this section.

David Thomas.

CHAIRMAN'S REPORT FOR 1988

1988 was another good year for the AWSG. The ongoing projects continued successfully, new and important projects were started, assistance was given with conservation issues and the *The Stilt* went from strength to strength.

The Regular Count and Population Monitoring Projects continued to accumulate important information for migration and conservation purposes and reports on both studies have appeared in *The Stilt* during the year. A new project on Resident Waders commenced during 1988 with the appointment of David Thomas (based in Hobart) as Co-ordinator. This study fills an obvious gap in the AWSG's study programme and during the initial stages is directed at providing information on the breeding biology of resident waders for the Handbook. As a complementary activity Groups catching waders are collecting detailed plumage and bare parts information for the Handbook.

We have been involved in a number of conservation issues concerning threats to important wader habitat during 1988, including Logan's Lagoon in Tasmania, and the Williamstown Rifle Range and Swan Bay in Victoria. Last year I mentioned that we planned to get underway a major study on the conservation status of waders throughout Australia. After unavoidable delays, we hope to get the project going in 1989.

The AWSG expedition to north-western Australia in March/April was a resounding success with a record number of more than 6600 waders being caught. An associated organisation, the Victorian Wader Study Group, also had a record year catching over 10,500 waders. Hopefully, the resulting large increase in the pool of banded birds, together with the expanding catching and banding activity in south-east Asia and China, will lead to more overseas recoveries. Incidentally, 1988 was a record year for notification of overseas recoveries (some rather historical in nature), particularly from Russia and China. There are hopeful signs that wader banding may start in Moreton Bay, Brisbane, but plans to commence cannon-netting in Adelaide have not yet borne fruit.

A successful Hooded Plover count of virtually the whole Victorian coastline was conducted in October and concurrent counts were also held in adjacent parts of South Australia and New South Wales. Indications are that Hooded Plover numbers are holding up well.

The Stilt maintained a high standard under the stewardship of Eric Woehler and the large number of articles provided a diverse fare for members. Eric's multiplying interests have unfortunately forced him to resign the editorship but, like all good managers, he has arranged for a successor and David Thomas will take over the role in 1989. I am confident that David will continue Eric's good work and add further value to *The Stilt*. Eric Woehler deserves our grateful thanks for the significant part that he has played in elevating our publication to the world role that it now holds.

Other publications by the members of the Group included four RAOU Research Reports covering Coorong and Kakadu waders, the 1986 northern Australian expeditions and conservation of birds in Swan Bay. The latter report played an important part in setting the brief for the development of a management plan for Swan Bay. This success raises an important point. That is, the need to take a pro-active role where wader habitat is under, or maybe will come under, threat. The Group can play its part by bringing together in reports all the available wader related information on specific sites - numbers, species, usage, importance in an Australian context, etc. Authorities welcome publications which have all the relevant information in one place. In many cases we have sufficient data to produce detailed, well documented reports which will ensure that the waders' case is properly put. The alternative is to continually put out bush fires as and when they arise which is, in the end, a more time consuming process.

Membership expanded during the year from 299 to 312. We lost 37 members but gained 50. Rewardingly, our overseas membership continues to expand and there are now 14 foreign Museums and Universities which subscribe to *The Stilt*.

We are extending the level of co-operation with the Asian Wetland Bureau and the Wader Study Group (Europe), and can now arrange for members to join these Groups through the AWSG. This is not only convenient but also cheaper.

Plans are well in hand for the 1989 RAOU Scientific Day which will feature talks covering the results of wader studies during the last ten years of intensive activity in Australia. Overseas speakers will also be involved. Following the Scientific Day we will be holding a Workshop which will review the progress of Australasian wader studies to date and map out a plan for the next 5 years and beyond.

It is generally acknowledged as invidious to thank specific people for their efforts, but I wish to publicly acknowledge the Group's debt to two

willing and tireless members who beaver away quietly and very effectively to keep the wheels turning - Brenda and Mick Murlis. We're not the only organisation that makes demands on their time as they carry out a similar function for the Victorian Wader Study Group.

My thanks also go to the other Committee Members for the important parts that each of them played in our successes and to all our members and *The Stilt* contributors for their support during 1988.

Mark Barter.

TREASURER'S REPORT FOR 1988

Raising the subscription to $15 seems to have had little effect on our membership numbers and our end-of-year balance is the highest ever, despite the transfer of $500 to the Research Fund, necessary to maintain the minimum balance now required to earn interest.

Production costs for "Stilt" this year were almost identical to those for 1987, so now we are in a much sounder position to finance projects such as the Resident Wader Study.

Early renewal of subscriptions is partly responsible for our healthy financial position - this is much appreciated as it helps us to budget more effectively for the coming year.

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE PERIOD 1ST JANUARY 1988 - 31ST DECEMBER 1988

RECEIPTS		PAYMENTS	
Balance B/F	2602.18	"Stilt": typing	600.00
Subscriptions	4126.69	: printing	1400.00
Sale of "Stilt" back numbers	101.19	: envelopes	164.88
		: postage	645.41
Donation	10.00	Other print. costs	239.00
IPT/AWB Subs.	344.40	Subs. to IPT/AWB	406.45
Wader Study Group (UK)subs.	276.60	Secretary's exp.	239.13
		Chairman's exp.	79.67
Bank Interest	333.65	Res. Wader Study	283.00
		Purchase of Franking Machine	20.00
		Purchase of Naturalists Colour Guide	46.00
		State Govt. Tax	2.58
		Bank Charges	27.25
		Tfr. to Research Fund	500.00
		Balance C/F	3141.34
	$7794.71		$7794.71

RAOU RESEARCH FUND (AWSG)
STATEMENT OF RECEIPTS AND PAYMENTS FOR THE PERIOD 1ST JANUARY 1988 - 31ST DECEMBER 1988

RECEIPTS		PAYMENTS	
Balance B/F	408.08	M. Hewish: exp.	66.08
Donations	320.00	Use of RAOU computer	35.00
Bank Interest	73.50	State Govt. Tax	0.57
Tfr.from AWSG	500.00	Bank Charges	6.05
		Balance C/F	1193.88
	$1301.58		$1301.58

David Henderson

20TH INTERNATIONAL ORNITHOLOGICAL CONGRESS 1990

Final Notice

The 20th International Ornithological Congress will take place in Christchurch, New Zealand, on 2-9 December 1990. The Congress programme will include 7 plenary lectures, 48 symposia, contributed papers (spoken and poster), workshops, discussions and films. There will be a mid-Congress excursion day. Longer tours are planned to interesting ornithological sites in New Zealand before and after the Congress, including the post Congress cruises to sub-antarctic islands.

The Second and Final Circular of the Congress will be available from 1 October 1989 and will include the registration papers and forms for submitting papers. In late 1990 New Zealand will also host the 20th World Conference of the International Council for Bird Preservation in Hamilton on 21-27 November 1990 and a Pacific Festival of Nature Films in Dunedin on 27 November-1 December 1990. Requests for this Final Circular, which includes information on the above events, should be sent to:

Dr. Ben D. Bell, Secretary-General,
20th International Ornithological Congress,
School of Biological Sciences,
Victoria University of Wellington,
P.O. Box 600, Wellington, New Zealand
[Telex NZ30882 VUWLIB; Facsimile NZ 64-4-712070]

CONSERVATION NEWS

Although many issues relating to conservation of wader habitat have been dealt with since the last report it is my intention to mention just a few matters, in more detail, in this issue.

Comments are currently being prepared on the proposed management plans of the Lacepede and Meningie District Councils for the Coorong (SA) beachfront. Unfortunately the SA government has recently rejected a proposal for the SA National Parks and Wildlife Service to take over management of the beach adjacent to the Coorong. The District Councils' plans do however include the closure of one section of the beach to vehicles between 24 October and 24 December. This period is considered by the Councils to be sufficient to protect breeding Hooded Plovers. Research shows however that this is probably not the case and it would appear that the cut off date for the beach closure has been fixed for the convenience of holiday makers who drive on the beach rather than for the birds.

A submission has been sent on a draft report on strategies for the future use of Trinity Inlet, Cairns (Qld). The report lists three options for this area which is of importance not only because of the numbers of waders which use the area but also because of its potential for education purposes. The three strategies are: priority given to conservation objectives; to port/harbour industry objectives; and to tourist/residential development objectives. Obviously the AWSG submission recommends the first of these options although it was pointed out that conserving the site could lead to increased tourist potential.

Comments supporting the proposal to establish a Northern Moreton Bay Marine Park (Qld) have also recently been sent.

It is of interest that the last of these matters have come from Queensland. A recent television programme stated that over 120 coastal wetlands in that state are proposed to be 'developed' and that areas of undisturbed mangroves in particular are rapidly disappearing. In response to a recent

letter the Director of the Queensland NP&WS has stated that it is not intended to nominate any areas as Sites of International Importance under the Ramsar Convention in the state as "matters relating to the environment are the ultimate responsibility of the individual states rather than the Commonwealth". It is a pity therefore that birds do not recognise state, let alone international, boundaries!

Jeff Campbell.

LEG-BANDED DOUBLE-BANDED PLOVERS

The co-operative work of New Zealand and Australian ornithologists over the past few years has revealed the main migration patterns of DBPs. The birds most likely to migrate to Australia are:

1. South Island birds, especially from southern South Island;
2. Those breeding well inland or;
3. Those breeding coastally but with poor local wintering habitat.
4. Birds that fledge early not late in their natal season.

We're still hazy about the pattern in the northern South Island, because only small samples have been banded there. We know that some birds there are sedentary, some migratory within NZ and some cross the Tasman, but we do not know the proportions yet.

Despite the lousy weather in the 1988 breeding season we banded a few hundred more DBPs throughout NZ, including many in northern South Island and southern North Island. That was our final major banding season, so 1989 is the last year for extensive band-spotting. We're hoping for another big effort (and decent weekend weather!) both sides of the Tasman. Please try to have details of band combinations confirmed by a second person before sending details of sightings to:

Dr. R.J. Pierce
Banded Dotterel Study Group
P.O. Box 5521
Auckland, NEW ZEALAND.

This year won't see the end of the migration questions. In future years observers can help by keeping a check on regular wintering birds. This will enable a comparison of longevity of birds with different wintering behaviour - sedentary, migration within NZ, trans-Tasman migration. Ideal places for monitoring these regulars in Australia would seem to include Derwent-Pittwater, Cape Portland, Pt. Phillip Bay and Botany Bay, and probably other areas too.

Ray Pierce.

RECENT LITERATURE

The following is a selection of publications dealing with shorebirds from periodicals published in 1987 and 1988.

Am. Birds 41(5) 1987, Pectoral Sandpiper and Sharp-tailed Sandpiper (K. Kaufman), 1356-1358, First Northern Hemisphere record and first juvenile plumage description of the Cox's Sandpiper *Calidris paramelanotos* (M.J. Kasprzyk; R.A. Forster and B.A. Harrington), 1359-1364, Juvenile Cox's Sandpiper *Calidris paramelanotos* in Massachusetts, a first New World occurrence and a hitherto undescribed plumage (P.D. Vickery; D.W. Finch and P.K. Donahue), 1366-1369.

Australian Wildl. Res. 14(4) 1987, Aerial surveys of Waders (Aves:Charadriiformes) along the coast of north-eastern Australia (Stephen T. Garnet), 521-528.

Corella 12(1) 1988, Some notes on a Beach Thick-knee runner (D.J. Geering), 22-24.

No tornis 35(1) 1988, Breeding of the Banded Dotterel *Charadrius bicinctus* on the Cass River Delta, Canterbury (M. Bomford), 9-14.

S.Aust. Ornithologist 30(5) 1988, Some South Australian Records of the Little Stint (J.B. Cox), 113-116, Broad-billed Sandpipers at Clinton Conservation Park (J. Hackett and M. Hackett), 117, First record of Baird's Sandpiper in South Australia (R.G.T. Snell), 118-119, Some records and notes on the identification of the Oriental Plover (J.B. Cox), 120-121.

S.Aust. Ornithologist 30(6) 1988, Common Sandpiper running under water (J. Seymour), 157.

Sunbird 18 (3)1988, Counts of inland waders in the Brisbane Region, 1972-83, and their relation to rainfall (P.F. Woodall), 76-82.

Jeff Campbell.

WADER TITLES RECEIVED IN RAOU LIBRARY - 1988

Bamford, Michael, Kakadu National Park: a preliminary survey of migratory waders, Oct-Nov.1987, Melb., RAOU, 1988 (RAOU report No. 41).

Barker, M., J. Campbell & B. Lane. Swan Bay: conservation of birds, Melb., RAOU, 1988. (RAOU report No. 50).

Bransbury, J. Status and distribution of the Hooded Plover in South Australia. Report for S.A. Dept. of Environment and Planning, 1987.

Chalmers, C.P. & P.J. Woods, Broome coastal management plan. W.A. Environmental Protection Authority Bulletin 252, June 1987.

Dann, P., The status of the waders in relation to other areas in coastal Victoria. Revised April 1981, Westernport Bay Environmental Study - Victorian Ministry for Conservation, (Environmental studies series No. 350).

Earthwatch. Expedition briefing - Australian passage. Earthwatch 1986.

Jaensch, Roger P, and M.A. Barker, Waders in the Coorong, South Australia in February 1987. Melb., RAOU, 1988, (RAOU report No. 39).

Lane, Brett, Wader expeditions to Northern Australia in 1986. Melb., R.A.O.U., 1988. (RAOU report No. 42).

Martindale, J.D., B.A. Lane, A.E. Jessop, & J.R. Starks, RAOU Wader Studies Programme, National Wader Counts - reports for participants. Melb., RAOU, 1981-85.

Pringle, J.D., The Shorebirds of Australia, N. Ryde, Angus & Roberston, 1987. (National Photographic index of Australian Wildlife series).

Schulz, M. & M. Bamford, The Hooded Plover - an RAOU Conservation Statement, Melb. RAOU, 1987. (RAOU report No. 35).

Urban Land Authority. Merrett Rifle Range Development, Williamstown. Environment Effects Statement - December 1987. Main report and appendices A-Q.
Trish White.

BACK ISSUES OF *THE STILT*

Backcopies of *The Stilt* are available from Brenda Murlis (see inside back cover for address).

Prices are: $3.50 each within Australia,
$5.00 each when posted overseas.

Only limited quantities of Nos. 5 and 6 are available.

Stilt No.7 contains the Index for Nos. 1-6 and *Stilt* No. 13 for Nos. 7-12.

Brenda Murlis

RAOU 1989 ANNUAL SCIENTIFIC DAY, SATURDAY 27TH MAY 1989, MELBOURNE

Waders

Australia is home to over 70 species of waders. Of these, 16 are resident species, 45 are regular migrants and over 20 are rarities. They represent 10 percent of the Australian avifauna and are one of the most significant components of wetland bird communities. The RAOU has actively promoted wader research over the last decade through its Wader Studies Programme and the Australasian Wader Studies Group (AWSG).

The AWSG has organised this year's Scientific Day and the programme covers a range of topics. This includes the waders of specific areas, such as Moreton Bay in Queensland, the results of studies of particular species, for example Pied Oystercatchers, and the findings of the almost annual expeditions to north-western Australia.

A feature of the programme will be papers from elsewhere in the East Asian-Australasian flyway, specifically on waders in New Zealand and wader research in south-east Asia. People attending the day should leave with a clear picture of the scope and methods of wader research currently being conducted in Australia and elsewhere in the flyway.

Venue

The Scientific Day this year will be held at the Marie Mill Community Centre in Randall Street, Maribyrnong. This can be reached off Raleigh Road. Public Transport to the venue includes two tram routes: Number 57 from Elizabeth Street in the city to West Maribyrnong; and Number 82 from either Footscray Railway Station or Moonee Ponds. Alight at tramstop number 43. Parking will be available at the centre or in nearby parts of Randall Street. The Melway reference for the centre is Map 28, A7.

Cost

The registration fee for the Scientific Day will be $35.00 per person. This will include morning and afternoon teas and a light lunch.

To register, fill out the form attached to the brochure enclosed with this issue of *Stilt*.

AIR YOUR VIEWS ON THE AWSG'S RESEARCH PROGRAMME

On Monday, 29th May, 1989, following the RAOU's Annual Scientific Day, the AWSG is holding a workshop entitled "Wader Research in the 1990's". The aim of the workshop is to review the progress of the AWSG's co-operative research projects and to develop objectives and guidelines for its projects into the 1990's. A programme is given below. The Population Monitoring Project and the Regular Wader Count Project were initiated following the completion of the RAOU Wader Studies Programme. Both projects were to finish in 1990, subject to a review of their findings. This review will be done at the workshop.

The number of participants will be limited so that the workshop is as effective as possible. Participation will be by invitation. However, the AWSG is keen to have the comments and input of members and project participants. If any people wish to provide their views on the current approach taken in the projects, on the topics to be covered in the workshop sessions and/or on where they believe the group should be taking its research in the coming years, they should send their comments in a letter to the Research Co-ordinator no later than the first week in May. The letters will be circulated to all workshop participants before the event so that they can be considered.

The success of the group's efforts in conservation depends on the availability of appropriate and good quality data on wader distribution, status and habitat needs. It is important that the AWSG's research programme addresses these problems and involves its membership in the most effective way possible. Please help by letting us know your views.

Write to: Brett Lane,
Research Co-ordinator,
12/262 Barkly Street,
NORTH FITZROY, Vic. 3068.

PROPOSED PROGRAMME FOR THE AWSG WORKSHOP "WADER RESEARCH IN THE 1990'S", MONDAY, 29TH MAY, 1989

0845 - 0915	Registration
0915 - 0930	Introduction to the Workshop (B. Lane)
0930 - 0950	AWSG Population Monitoring Counts (M. Hewish)
0950 - 1010	Banding Results from the AWSG Population Monitoring Project (C. Minton)
1010 - 1030	AWSG Regular Wader Counts Project (R. Alcorn)
1030 - 1100	Morning Tea
1100 - 1120	AWSG Resident Wader Study (D. Thomas)
1120 - 1140	Data Requirements for Wader Conservation (ANPWS)
1140 - 1200	Overseas Developments in Wader Research and Conservation (To be determined)
1200 - 1215	Introduction to Workshop Sessions
1215 - 1330	Lunch
1330 - 1445	Workshop Sessions a) International Co-operative Studies (Chairman: Clive Minton) b) Studies of Resident Waders (Chairman: Peter Dann)
1445 - 1515	Afternoon Tea
1515 - 1630	Workshop Sessions c) Feeding Studies and Community Organisation (Chairman: To be appointed) d) AWSG Monitoring and Movement Studies (Chairman: Mark Barter)
1630 - 1720	Reports from Workshop Sessions (10 mins. each)
1720 - 1730	Summing Up
1730	Close of Workshop

Brett Lane.

RAOU REPORT OF INTEREST TO MEMBERS

The following report may be of interest to members:

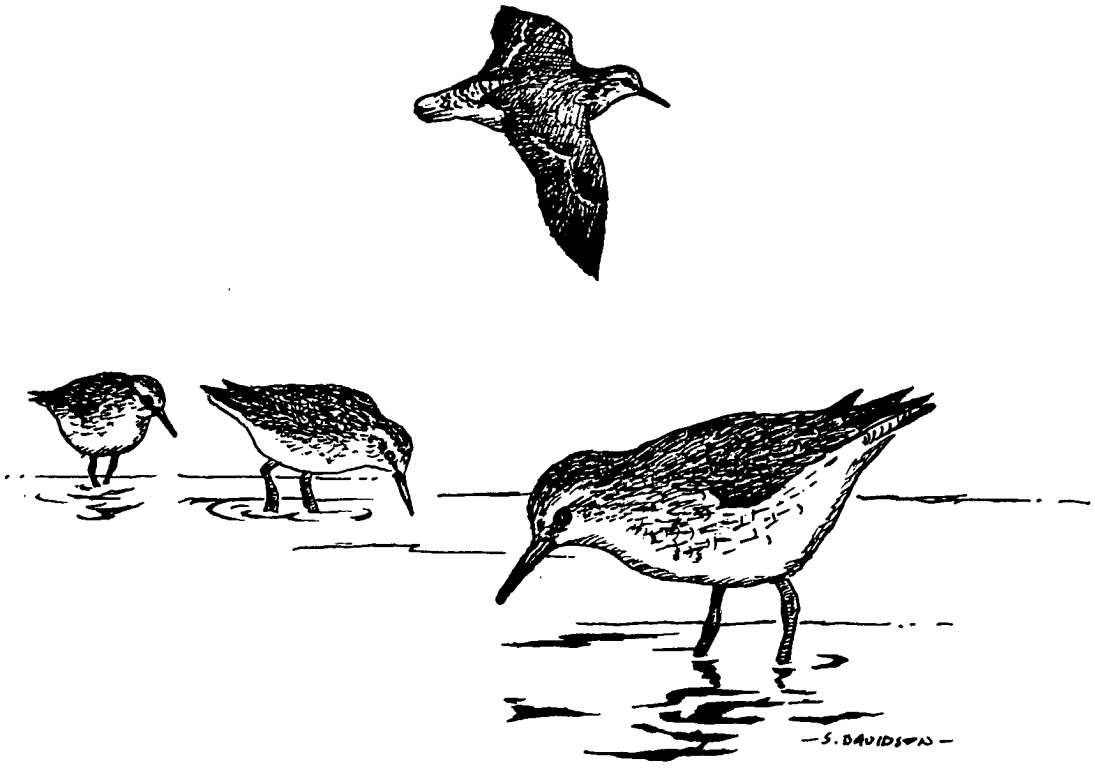
RAOU Report No. 50 Swan Bay: Conservation of Birds

The Report, whilst covering all species regularly using Swan Bay in Victoria, is mainly concerned with waterbirds. Subjects covered include: significance of Swan Bay for birds, critical habitats, impact of human activities and management issues. Detailed recommendations for conservation actions are given.

The Report can be obtained for $10 from the RAOU at

21 Gladstone Street,
Moonee Ponds,
VIC 3039.

Mark Barter.



N.W. AUSTRALIA WADER EXPEDITION MARCH/APRIL 1988

Clive Minton, 165 Dalgety Road, Beaumaris, Vic. 3193.
Doug Watkins, Lot 25, Kinley Road, Banjup, W.A. 6164.

SUMMARY

The 1988 N.W. Australia Wader Expedition was the most successful - and enjoyable! - of the series of expeditions made to the Broome/80 Mile Beach/Port Hedland area almost annually since 1981. The number of birds caught (6638) was more than 50% above any previous expedition, with particularly good numbers of ten different species and a total of 25 species of waders (and 7 species of terns/gulls) handled overall. Two foreign banded birds were captured and some newly banded birds were recovered in China and Taiwan within a few weeks of banding.

Much additional biometric and moult data were collected, weight data being particularly interesting because of a hold up in migratory depatures due to unsettled weather in late March. Radar data were collected over an extended period (7 March to 7 May) and in the earlier half of this period revealed that birds may be forced on occasions to depart on their northwestward migration even when the weather conditions are less than ideal. Successful ground observations of departing migrants were regularly made for the first time, with the new Broome Bird Observatory proving to be a particularly suitable location. Further count data were obtained, including daily counts at Broome from 7-31 March.

The expedition greatly added to our understanding of the waders in N.W. Australia and further confirmed its position as one of the top five wader areas in the world. It is possibly the most suitable of all for extensive and intensive wader studies. Now that the Broome Bird Observatory is in operation it is recommended that a comprehensive long term study programme of wader ecology in N.W. Australia be drawn up and initiated.

OBJECTIVES

The principal objectives of the 1988 expedition were:

(a) To catch, band and obtain biometric measurements on large samples of as many species of waders as possible in the period prior to their departure on northward migration;

(b) To carry out radar observations of emigrating waders at Broome over an extended period, and to attempt to correlate these with daily count data;

(c) To obtain, if possible, additional banding and count data on special species which can occur in large numbers in N.W. Australia in March/April, specifically Little Curlew, Oriental Pratincole and White-winged Black Tern.

PARTICIPANTS

The team was the most experienced - and compatible - ever to take part in a N.W. Australia wader expedition. The 'core' of 24 people consisted of specialised wader banders from several countries - 13 Australia, 6 U.K., 2 Thailand, 1 Malaysia, 1 New Zealand, 1 Canada - who were in the field from 18th March to 10th April (24 days). They were supplemented at times by additional short term participants - mainly from Broome, Perth and other parts of Western Australia.

A separate team of three experienced persons from Melbourne (who had been on several previous N.W. Australia expeditions) carried out daily radar observations and high tide wader counts at Broome from 7th to 31st March. This programme was then continued until 7th May by the wardens from Broome Bird Observatory with the assistance of other local enthusiasts.

Overall, 40 people participated in the fieldwork programme.

ITINERARY

The dates on which fieldwork was conducted by the main team at the various locations are given in the itinerary below:

18th March	Assemble at Port Hedland
19th - 21st March	Port Hedland Saltworks
22nd March	Travel to Broome
23rd - 27th March	Broome
28th March	Travel to 80 Mile Beach
29th March - 3rd April	80 Mile Beach
3rd April (p.m.)	Travel to Broome
4th - 7th April	Broome
8th April	Travel to Port Hedland Saltworks
8th (evening)-10 April	Port Hedland Saltworks
10th April	Depart from Port Hedland

CATCHING AND BANDING

A total of 6638 birds was caught in 13 cannon net catches (5852 birds) and 4 night-time mist netting sessions (774 birds). This total far exceeded that of any earlier expedition - the previous best being 4148 in Mar./Apr. 1985. A catch was made on every occasion on which the cannon nets were set. One potential catching opportunity was lost due to torrential rain on 30th March (200mm in 24 hours), though even this was turned to advantage with 12 birds being dazzle-netted! The planned programme was recovered by instituting a catch on 3rd April prior to moving back from 80 Mile Beach to Broome that evening.

Most of the cannon net catches were in the 200-700 range (range 15-860). The average, at 450, was higher than on previous expeditions and was made possible by the extremely experienced team and the relatively cooler weather (30-35° - 40°C) during the main cannon netting period.

As usual the nets sometimes could not be fired because of <u>too many</u> birds in the catching area - particularly Bar-tailed Godwits where an upper target of 100 birds for any catch was set - and efforts had to be made to 'twinkle' birds <u>out</u> of the catching area. A notable feature of catches was that nearly all contained a good variety with worthwhile numbers (say greater than 40) of between 4 and 7 different species. The top two individual species totals in catches were both of Terek Sandpipers - 275 on 24th March and 268 on 6th April (both at Broome).

The 4 mist netting sessions at Port Hedland Saltworks were all productive, the highlight being the large variety of species (18 one night) and the exceptional catch of 236 Broad-billed Sandpipers in 4 hours on the 8th April (after an all day journey transferring camp from Broome!). 85 Little Terns on another night were also an unusual feature.

Altogether 25 species of waders (6500 birds) and 7 species of terns/gulls (138 birds) were caught (Table 1). The top ten species totals were:-

Terek Sandpiper	1005
Bar-tailed Godwit	995
Great Knot	856
Curlew Sandpiper	802

Table 1. N.W. Australia Wader Expedition 1988 (19 Mar - 10 Apr) - Summary of Catches.

Species	Port Hedland 19-21/3		Broome 23-26/3		80 Mile Beach 29/3-3/4		Broome 4-7/4		Port Hedland 8-9/4		Total	
Grey Plover	9		1		3						13	
Lesser Golden Plover	1										1	
Mongolian Plover	11		3		2		26	(3)	16	(1)	58	(4)
Large Sand Plover	2		227	(30)	202	(3)	86	(20)	3		570	(58)
Oriental Plover					1						1	
Red-capped Plover									1		1	
Black-winged Stilt	7										7	
Banded Stilt	9										9	
Red-necked Avocet	55	(1)									55	(1)
Ruddy Turnstone			13		11		116	(18)			140	(18)
Whimbrel			3		1						4	
Grey-tailed Tatler			29	(1)	174	(4)	375	(20)	1		579	(25)
Greenshank	3				3						6	
Marsh Sandpiper	1										1	
Terek Sandpiper	2		278	(18)	323	(8)	399	(69)	1		1003	(95)
Asiatic Dowitcher	1										1	
Black-tailed Godwit					3						3	
Bar-tailed Godwit	41		402	(11)	219	(3)	252	(47)	41	(3)	955	(64)
Red Knot	1		147	(8)	454	(14)	119	(27)	1		722	(49)
Great Knot	1		372	(13)	385	(4)	98	(25)			856	(42)
Sharp-tailed Sandpiper			3								3	
Red-necked Stint	15		268	(22)	5		72	(14)	11		371	(36)
Curlew Sandpiper	56	(3)	320	(27)	267	(22)	139	(25)	21	(1)	803	(78)
Sanderling					2						2	
Broad-billed Sandpiper	50	(2)			1				285	(20)	336	(22)
TOTAL WADERS (25 species)	256	(6)	2116	(130)	2056	(58)	1682	(268)	381	(25)	6500	(487)
Silver Gull	12										12	
Whiskered Tern			1								1	
Gull-billed Tern					3						3	
Common Tern	1										1	
White-winged Black Tern			3								3	
Crested Tern	4				3						7	
Little Tern	96	(3)	15								111	(3)
TOTAL TERNS/GULLS	113	(3)	19		6						138	(3)
Totals include retraps. Retraps indicated by brackets.									TOTAL CAUGHT		6638	(490)

Table 4. Wader Counts on 80 Mile Beach, 30 March 1988.

	Distance south of Anna Plains				
	0-5 km	5-10 km	10-15 km	15-20 km	Total
Pied Oystercatcher	1				1
Grey Plover		2	40	195	237
Mongolian Plover		1			1
Large Sand Plover	130	650	700	2500	3980
Oriental Plover			1		1
Red-capped Plover	1	10			11
Ruddy Turnstone	5	90	70	110	275
Eastern Curlew		15	30	40	85
Whimbrel				1	1
Grey-tailed Tatler	350	400	850	3300	4900
Greenshank			1	10	11
Redshank			1		1
Terek Sandpiper	20	180	1900	4000	6100
Black-tailed Godwit	20	30		40	90
Bar-tailed Godwit	4000	6300	12500	11500	34300
Red Knot	1300	2800	3000	1500	8600
Great Knot	3000	6500	10000	2500	22000
Red-necked Stint	10	60	20	80	170
Curlew Sandpiper		5	150	250	405
Sanderling	2	40		40	82
	8839	17083	29263	25956	81141

Table 2. Waders caught on N.W. Australia Expeditions 1981-88

	Newly Banded	Retraps	Total
Masked Lapwing	1	-	1
Grey Plover	20	-	20
Lesser Golden Plover	2	-	2
Red-kneed Dotterel	1	-	1
Mongolian Plover	153	9	162
Large Sand Plover	2140	148	2288
Oriental Plover	80	-	80
Red-capped Plover	218	4	222
Black-fronted Plover	1	-	1
Black-winged Stilt	79	-	79
Banded Stilt	90	-	90
Red-necked Avocet	69	1	70
Ruddy Turnstone	456	37	493
Eastern Curlew	4	-	4
Whimbrel	8	-	8
Little Curlew	347	-	347
Grey-tailed Tatler	1172	42	1214
Common Sandpiper	1	-	1
Greenshank	14	-	14
Redshank	1	-	1
Marsh Sandpiper	13	-	13
Terek Sandpiper	1407	106	1513
Asiatic Dowitcher	5	-	5
Black-tailed Godwit	16	-	16
Bar-tailed Godwit	1230	65	1295
Red Knot	1627	65	1692
Great Knot	2959	64	3023
Sharp-tailed Sandpiper	298	2	300
Red-necked Stint	3159	158	3317
Curlew Sandpiper	3193	135	3328
Sanderling	7	-	7
Broad-billed Sandpiper	615	25	640
Red-necked Phalarope	1	-	1
33 Species	19387	861	20248

Table 3. Wader Recoveries from N.W. Australia Expeditions

Large Sand Plover				
051 15876	Adult	2. 9.81	Broome	
		12. 8.82	Beihai, Kwang-Si, CHINA	4604 km NNW
051 24631	Adult	3.11.83	Anna Plains, 80 Mile Beach	
		4. 8.85	Beihai, Kwang-Si, CHINA	4702 km NNW
Ruddy Turnstone				
051 26822	Adult	25. 3.85	Broome	
		7. 6.86	Verkhoyansky, Yakut, USSR (68°33'N 136°32'E)	9666 km N
Grey-tailed Tatler				
051 00412	2nd Year	30. 8.81	Broome	
		21. 5.82	Guangdong, CHINA	4532 km NNW
061 70864	Adult	7. 4.88	Broome	
	Recaptured	15. 5.88	Kuanto, TAIWAN	4772 km N
Terek Sandpiper				
Japan	Adult	18. 5.83	Kitakyushu-Shi, JAPAN	
5018682	Recaptured	24. 3.88	Broome	5807 km S
Bar-tailed Godwit				
071 53051	Adult	18.11.82	Port Hedland Saltworks	
		24. 5.84	Verhnekolymsh Region, Yakut, USSR (65°46'N 150°56'E)	9906 km N
071 63253	Adult	22.10.83	Broome	
		-. 5.84	Shanghai, CHINA	5479 km N
071 63298	Adult	31.10.83	Anna Plains, 80 Mile Beach	
		12. 4.88	Shanghai, CHINA	5544 km N
071 63333	Adult	31.10.83	Anna Plains, 80 Mile Beach	
		7. 4.84	Shanghai, CHINA	5544 km N
082 43509	2nd Year	2. 9.81	Broome	
		-. 5.85	Shanghai, CHINA	5500 km N
082 43511	Fullgrown	2. 9.81	Broome	
		12. 4.88	Shanghai, CHINA	5410 km N
DR 53416	Juvenile	12. 9.87	HONGKONG	
Brit.Mus.	Recaptured	24. 3.88	Broome	4569 Km S
Red Knot				
051 28105	Juvenile	18. 4.85	Broome	
		21. 5.86	Shanghai, CHINA	5399 km N
051 38886	Adult	3. 4.88	Anna Plains, 80 Mile Beach	
		3. 5.88	Shanghai, CHINA	5540 km N
Great Knot				
061 00276	Fullgrown	30. 8.81	Broome	
		8. 4.83	Shanghhai, CHINA	5413 km N
061 31238	Fullgrown	30. 8.81	Broome	
		1. 4.83	Shanghai, CHINA	5413 km N
061 37953	Fullgrown	30. 8.81	Broome	
		2. 4.83	Shanghai, CHINA	5413 km N
061 38111	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		5. 4.85	Shanghai, CHINA	5536 km N
061 38139	Adult	24. 8.82	Anna Plains, 80 Mile Beach	
		-. 7.85	Chkalow Island, USSR (53°25'N 141°12'E)	8274 km N
061 38145	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		30. 3.83	Shanghai, CHINA	5544 km N
061 38231	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		4. 4.88	Shanghai, CHINA	5544 km N
061 38245	Adult	24. 8.82	Anna Plains, 80 Mile Beach	
		-. 9.87	Shanghai, CHINA	5611 km N
061 38249	Adult	24. 8.82	Anna Plains, 80 Mile Beach	
		16. 4.86	Shanghai, CHINA	5627 km N

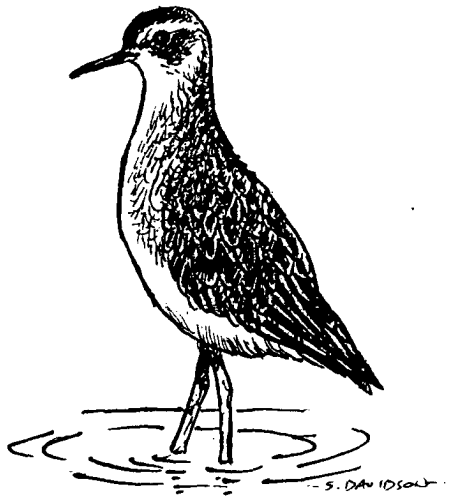
061 38253	Adult	24. 8.82	Anna Plains, 80 Mile Beach	
		-	Shanghai, CHINA	5611 km N
061 38266	Adult	8. 9.82	Anna Plains, 80 Mile Beach	
		29. 8.83	Kamchatka Ust-Khayryuzovo, USSR (57°7'N 156°45'E)	9079 km NNE
061 38311	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		-. 5.85	Shanghai, CHINA	5631 km N
061 38342	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		8. 4.87	Shanghai, CHINA	5536 km N
061 38347	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		-. 9.87	Shanghai, CHINA	5611 km N
061 38354	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		1. 4.83	Shanghai, CHINA	5544 km N
061 38418	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		-. 4.84	Shanghai, CHINA	5536 km N
061 38504	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		26. 3.86	Luhua, Fujian, CHINA	4981 km N
061 38528	2nd Year	24. 8.82	Anna Plains, 80 Mile Beach	
		8. 4.83	Shanghai, CHINA	5544 km N
061 39485	Fullgrown	30. 3.82	Broome	
		16. 4.86	Shanghai, CHINA	5486 km N
061 39638	Fullgrown	30. 3.82	Broome	
		-	Shanghai, CHINA	5468 km N
061 41066	Adult	27.10.83	Broome	
		17. 4.87	Shanghai, CHINA	5406 km N
061 41973	Adult	8.11.83	Port Hedland Saltworks	
		28. 3.85	Shanghai, CHINA	5646 km N
061 44278	Juvenile	25. 3.85	Broome	
		-. 4.86	Shanghai, CHINA	5472 km N
061 44521	Juvenile	13. 4.85	Anna Plains, 80 Mile Beach	
		14. 4.88	Shanghai, CHINA	5544 km N
061 44751	Adult	18. 4.85	Broome	
		11. 4.87	Shanghai, CHINA	5432 km N
061 44896	Juvenile	18. 4.85	Broome	
		-. 4.88	Shanghai, CHINA	5472 km N
061 69592	Adult	23. 3.88	Broome	
		-. 4.88	Shanghai, CHINA	5472 km N
061 70158	Adult	31. 3.88	Anna Plains, 80 Mile Beach	
		25. 4.88	Shanghai, CHINA	5627 km N
061 00287	2nd Year	30. 8.81	Broome	
	Recaptured	24. 8.82	Anna Plains, 80 Mile Beach	170 km SW
061 39448	Adult	30. 3.82	Broome	
	Recaptured	31.10.83	Anna Plains, 80 Mile Beach	170 km SW

Red-necked Stint

032 37405	2nd Year	22. 8.82	Anna Plains, 80 Mile Beach	
	Recaptured	4. 9.82	Broome	170 km NE
032 37441	2nd Year	28. 8.82	Port Hedland Saltworks	
	Recaptured	4. 9.82	Broome	480 kn NE
032 22790	Juvenile	22.11.79	Hobart, Tasmania	
	Recaptured	7. 9.82	Anna Plains, 80 Mile Beach	3600 km NW
	Recaptured	10.10.82	Hobart	3600 km SE
032 14105	Adult	30. 8.81	Broome	
		22.12.83	Guangdong, CHINA	4543 km NNW
Moscow	Juvenile	7. 9.84	Kyzl, Tuva, USSR (51°18'N 94°36'E)	
P729029	Recaptured	19. 4.85	Broome	8140 km SSE
032 52541	Adult	8.11.83	Port Hedland Saltworks	
	Recaptured	24. 1.87	Albany, W.A.	1639 km S
032 37294	2nd Year	19. 8.82	Broome	
		-. 9.86	Hebeisheng, Tanggu, CHINA	6336 km N

Curlew Sandpiper

040 96206	Adult	30.11.79	Werribee SF, Victoria	
	Recaptured	27. 3.82	Port Hedland Saltworks	3200 km NW
Moscow	Juvenile	28. 8.82	Kyzl, Tuva, USSR (51°18'N 94°36'E)	
55331	Recaptured	3.11.83	Anna Plains, 80 Mile Beach	8242 km SSE
041 13697	Adult	2.11.83	Anna Plains, 80 Mile Beach	
	Recaptured	19. 1.86	Yallock Creek Westernport, Victoria	3134 km SE
041 13864	Adult	5.11.83	Anna Plains, 80 Mile Beach	
041 14089	Adult	8.11.83	Port Hedland Saltworks	
		18. 8.85	Shirinsky, Khakassky, USSR (54°43'N 90°05'E)	8741 km NNW
041 43023	Adult	2. 1.88	Werribee SF, Victoria	
	Recaptured	25. 3.88	Broome	3096 km NW



Red Knot	722
Grey-tailed Tatler	579
Large Sand Plover	570
Red-necked Stint	391
Broad-billed Sandpiper	336
Ruddy Turnstone	140

The most significant improvements in totals of individual species in comparison with the cumulative numbers caught on the 1981-1986 expeditions were in Terek Sandpiper (1005 compared with a total of 510 previously), Bar-tailed Godwit (955 vs. 340), Broad-billed Sandpiper (336 vs. 304) and Grey-tailed Tatler (579 vs. 635). Altogether 20,248 waders of 33 species have now been caught on N.W. Australia expeditions (Table 2).

The 1988 banding programme was not able to make any significant catches of three target species - Little Curlew, Oriental Pratincole and White-winged Black Tern. The absence of the usual Jan/Feb 'wet' meant that Roebuck Plains and the grazing land around Anna Plains were very dry and few Little Curlews were present. Then the tropical downpour of 29-30th March created numerous shallow inland lagoons and the large numbers of Oriental Pratincoles and White-winged Black Terns became widely dispersed, with no significant roosting concentrations. Progress on studying these species will have to await a future expedition with a more normal season.

RECAPTURES AND RECOVERIES

1988 Expedition

487 recaptures of banded waders were made. 25% of these related to birds banded on previous expeditions at the same locations, with some dating back to the first visit in 1981. The remainder were mainly recaptures of birds banded during the expedition, with a number providing particularly useful information on the pattern of weight gain immediately prior to departure on northward migration.

There were 3 'controls' of birds banded elsewhere. A Bar-tailed Godwit banded as a juvenile in Hong Kong in Mid-September 1987 (when Mark Barter was visiting there!) was recaptured on the beach beside the new Broome Bird Observatory. Hong Kong uses bands from the British Bird Ringing Scheme and this particular bird was extracted from the cannon net by Jacqui Clark, the manager of the banding office at the headquarters of the British Trust for Ornithology in the U.K. She could hardly believe her eyes when she saw the British address on the band! In the same catch was a Terek Sandpiper which had been banded in Japan on its northward migration in May 1983.

The third control was of a Curlew Sandpiper banded at Werribee Sewage Farm, near Melbourne, less than 3 months earlier. This is the first direct proof that some of the waders spending the non-breeding season in S.E. Australia make the 3000 km overland migration to N.W. Australia on their way back to their Siberian breeding grounds. There is significant evidence of the converse, i.e. birds stopping off in N.W. Australia on their southward migration in Aug./Sept. before crossing the Continent to Victoria and Tasmania.

A number of birds banded on the 1988 Expedition was reported overseas within a few weeks. Most exciting of these was a Grey-tailed Tatler banded at Broome on 7th April and recaptured in Taiwan (4800 km. away) on 15th May by Doug Watkins, one of the members of the expedition who had then gone on to S.E. Asia to assist in the training of further wader banders. Another rapid movement was of a Red Knot banded on 80 Mile Beach on 3rd April and recovered on 3rd May at Shanghai, China (5500 km). The fastest recoveries were however two Great Knots, also found in Shanghai, one banded on 80 Mile Beach on 31st March and reported on 25th April and the other banded at Brome on 23rd March and found in April (date not specified).

GENERAL RECOVERIES

During 1988 a good number of further reports of birds banded on previous expeditions was received, particularly from China and the U.S.S.R. A complete list of all recoveries and controls relating to N.W. Australia Wader Expeditions is attached (Table 3).

The most striking recoveries are those of Great Knots with 26 reports from China and 2 from the U.S.S.R. It seems amazing that when the counting and banding studies in N.W. Australia began in 1981 nothing was known about this species. Its world population was thought to be no more than 10,000 (counts have now revealed over 200,000), only six nests had ever been found, and only a handful of birds had been banded (with no recoveries reported). There have now been more overseas recoveries than of any other species of wader banded in Australia!

The heavy concentration around Shanghai (25 out of the 26 Chinese recoveries) clearly points to that area (Hangzhou Bay, Chongming Island, and the Yangtze River Estuary) being a major stop-over point on the northward migration. The timing of recoveries, mainly in late March and early April, ties in well with peak departures from N.W. Australia. This, coupled with weight gain data* and the lack of sightings at intervening locations, suggests that Great Knots normally make the 5,500 km journey from N.W. Australia to Shanghai in China in one direct flight. At an estimated still air flight speed of 75 km/hr this would take 73 hours (i.e. 3 days), but this would be reduced if the tail winds in which they normally depart were maintained throughout the journey.

It is interesting that the two overseas recoveries of Red Knots were also in China, the May dates corresponding with the departure from N.W. Australia being observed to be later than that of Great Knots and Bar-tailed Godwits.

Bar-tailed Godwits also appear to use the Shanghai area in China in April/May as a major refuelling point on their northward migration (5 recoveries there so far). With the breeding grounds only another 4-5,000 km away (1 recovery) it could be that the Bar-tailed Godwit is only making one refuelling stop on its northward migration from N.W. Australia to Arctic Siberia. The importance of conserving such critical locations is obvious.

Recoveries in the sparsely populated areas of Siberia are few and far between so it is nice to have had a Ruddy Turnstone from Broome recovered on its breeding grounds at 68°N.

The two Large Sand Plover recoveries are notable for both being on the southward migration in early

* Typical Great Knot 'take-off' weights from N.W. Australia are probably a minimum of 220g. The average weight of six Great Knots caught near Shanghai in early April was 139g (Wang Tianhou, via Doug Watkins), close to the 'fat free' weight. Assuming these birds were newly arrived this gives a fat consumption of c.80g for the 5500 km journey - equivalent to nearly 60% of the fat free journey - equivalent to nearly 60% of the fat free weight. This weight decrease corresponds closely with formulae currently used to relate flight range to fat content (e.g. Summers and Waltner's method gives a calculated flight range of 5400 km using the above weight data).

August (most recoveries of other species have been on northward migration) and for being further south in China than other recoveries.

WEIGHT AND OTHER BIOMETRIC DATA

The majority of the birds caught on the expedition were fully "processed". All were aged, weighed and examined for moult of the primaries and some 75% had other relevant parameters measured (e.g. bill length, total head length, wing length as appropriate for each species). This high level of ancillary data collection was possible because of the experienced team, the moderate-sized catches, and the not-too-hot weather.

Graham Fry, a member of the expedition, has subsequently undertaken a detailed analysis of the weight data. The principal conclusions - both generally and for individual species - are given below.

General

(a) Adult birds were generally carrying significant quantities of fat (up to 50% addition to lean body weight).

(b) Mean adult weights were either being maintained at high levels or were showing gradual increases to a high level.

(c) Juvenile/1st Year birds were of much lower weight - largely fat free - and relatively constant.

(d) Peak average adult weights generally preceded major departures.

(e) For a number of species peak weights were reached around 1st April. This was the result of a hold up of several days duration in the migratory departures as a result of the rain depression which created extensive cloud cover with widespread heavy rain on 28-29th March. Massive departures took place on the night of 1st April as the weather cleared and mean weights dropped (because it was the heaviest birds which departed).

(f) There is a suggestion that the weights of birds of several species were higher at 80 Mile Beach than at Broome. This may have been an artefact of timing. It needs further investigation in the future.

(g) Mean weights of adult birds of many species were generally higher than in 1985 (covered from 24 March to 19 April). This was probably because the regular occurrence of favourable weather conditions for migration in 1985 allowed the immediate departure of birds which had reached 'take-off' weight. In contrast, in 1988, weather conditions were much less favourable causing some fat birds to remain for several days even after they had attained their departure weight.

Individual species (mean weights of adult birds, unless stated)

(a) **Mongolian Plover.** Sample sizes were small. However a steady weight increase occurred - from 78g on 19 March to 90g on 8-9 April. (1985 peak 74g).

(b) **Large Sand Plover.** Weights were consistently high, reaching a peak on 31 Mar/1st Apr. (108 and 106g respectively). Few adults remained after this. (1985 peak 102g).

(c) **Ruddy Turnstone.** Weights typically 130-138g, with females being 5-7g heavier than males. Peak on 31 Mar/1st Apr. at 149g (1985 peak 140g).

(d) **Grey-tailed Tatler.** Steady weight increase from 116g on 23-25 Mar. to 135g on 1 Apr. Thereafter 125-128g from 3-7 Apr. (1985 peak 122g).

(e) **Terek Sandpiper.** Rapid weight increase from 80g on 24 March to 95-98g on 31 March-3 April (peak 98.5g on 3 April). Maximum weight gain by an individual bird was 16g - average was 8g (1985 peak 89g).

(f) **Bar-tailed Godwit.** Males averaged 340-360g and females 400-420g throughout the period. There were few adults left after the massive departures on 1 Apr. The peak Godwit emigration is clearly in the second half of March.

(g) **Red Knot.** Weights rose steadily to a peak of 152g on 1 Apr. and fluctuated thereafter. (1985 peak 124g).

(h) **Great Knot.** Highest weight was 228g on 23 Mar. Thereafter weights fluctuated between 202g and 215g (31 Mar.) with most adults having departed by the end of March. Like the Bar-tailed Godwit, the main emigrations normally take place in the second half of March. (1985 peak 192g).

(i) **Red-necked Stint.** Weight increased steadily from 31g on 19 Mar. to 38g on 8-9 Apr. Departures were probably only just commencing at the end of this period. (1985 peak 33g).

(j) **Curlew Sandpiper.** At Port Hedland Saltworks weight increased from 70g on 19-20 Mar. to 81g on 8-9 Apr. Elsewhere weights fluctuated, mainly in the 74-78g range. It would appear that departures were taking place throughout the period. (1985 peak 74g).

(k) **Broad-billed Sandpiper.** Weight increased from 50g on 19 Mar. to 55g on 8-9 Apr. Four birds gained 6-11g in this period; two others maintained high weights. It is probable that there were no significant departures in this period.

Other Data

Much additional biometric and moult data were collected on all species. This will be utilised in the course of Australia-wide individual species analyses currently in progress or to be commenced in the future when the quantity of data is sufficient.

Detailed information was also obtained on the colour of the soft parts of adult and immature birds of twelve species of waders. This is to aid the artist (Jeff Davies) preparing the colour plates for the forthcoming "Handbook of the Birds of Australasia".

RADAR STUDIES

The radar set in the Broome Meteorological Station was manned from 5-7 p.m. every day from 9th March to 7th May in order to look for departures of waders on migration. Experience in 1985-1987 had shown that emigration usually commenced around dusk (c. 6.15 p.m.). Polaroid photographs of the radar screen were taken at 10-15 minute intervals throughout the two hour observation period to facilitate quantitative analysis of the migration.

Counts of waders, and estimates of the proportion of adults of each species, were made daily at Quarry Beach and weekly along the whole stretch of shore from Dampier Creek to Crab Creek (the north

side of Roebuck Bay). It was hoped that these would correlate with departures seen on the radar screen and help determine the period during which each species was migrating.

A preliminary analysis of the results by Mick Murlis has already been published in the Victorian Wader Study Group Bulletin (Number 12, July 1988). The main conclusions were:

(a) Peak departures occurred on 12th, 25th and 26th March, 1st, 7th, 13th, 14th, 20th and 21st April and 2nd May.

(b) The unusual weather pattern in 1988 (no January/February 'wet', and an unsettled March) held up migration and even resulted in some departures in less than perfect weather conditions.

(c) It was difficult to correlate count data/proportion of adults with departures observed on radar due to tidal and weather conditions also affecting high tide roosting number/habits.

(d) The Broome Bird Observatory is ideally situated for visual observations of waders departing on migration from the northern shores of Roebuck Bay. Significant movements were noted on 10th, 13th, 15th and 16th April, though observations were not made every day. Some of these departures were in the afternoon, well before the radar observations began at 5 p.m.

(e) Departures were in a predominantly north-west direction, as in previous years.

The main expedition was at 80 Mile Beach when the huge migratory departure of birds held up by unsettled weather finally took place in clearing skies on the late afternoon/evening of 1st April. Wader populations there dropped noticeably - by an estimated 25% - with virtually all the adult Bar-tailed Godwits and remaining adult Great Knots leaving. Red Knots and Curlew Sandpipers also decreased markedly and the last of the adult Large Sand Plovers disappeared (many of these went earlier, in March). On the other hand Grey-tailed Tatlers, Terek Sandpipers, Ruddy Turnstones and Red-necked Stints did not appear to leave in any numbers and these species probably formed the bulk of the departures observed in mid April or later on the radar screen at Broome.

COUNTS

The main expedition carried out counts of waders at high tide on a 30 km stretch of 80 Mile Beach on 30th March. The total wader numbers in the area to the south of the camp site (where the road from Anna Plains station reaches the shore) were -

0- 5 km	6,000
5-10 km	15,000
10-15 km	18,000
15-20 km	20,500
20-25 km	12,500
25-30 km	12,000
	84,000

As usual the heaviest concentration in the Anna Plains sector of 80 Mile Beach was 10-20 km south of Anna Plains. This coincides with a slightly higher section of intertidal mudflats in front of the steeper sand/shell beach used for roosting. Waders can feed longer in this area and the higher mudflats also form a convenient pre-roost collecting area.

A second team following behind the first team made a more detailed estimate of the numbers of each species of wader in the first 20 km (Table 4). Absolute numbers in each section differed from above due to observer variation and also as a result of the redistribution of birds caused by the passage of the first count team.

Wader numbers in total, and the relative proportions of each species, were comparable with counts in March/April 1985 and 1987. It is also interesting that the proportions of the two main species in the population at Broome and 80 Mile Beach are very similar. The "Broome team" counts showed 40% Bar-tailed Godwits and 23% Great Knots in the flocks of 30-40,000 birds roosting between Crab Creek and Dampier Creek in the latter half of March. The 80 Mile Beach count on 30th March was 42% Bar-tailed Godwits and 27% Great Knots in a population of c. 80,000 birds counted on a 20 km. stretch of beach.

Tern numbers were low - not more than 25 of any species - in contrast to previous years when many thousands of Whiskered Terns and White-winged Black Terns were present on the shore. In 1988 these had dispersed inland by 30th March to the widespread freshwater lagoons caused by the heavy rains of 28/29th March.

The wader population at Port Hedland Saltworks changed markedly between the two visits. On 19-21 March wader numbers were high (c.25,000) and few species had departed (except most Oriental Plovers). As usual Red-necked Stints, Curlew Sandpipers and Broad-billed Sandpipers of the migrant waders were the most numerous but there were also plenty of Bar-tailed Godwits and Mongolian Plovers, as well as up to 20 Asiatic Dowitchers and 3 Redshanks. Because of the absence of the normal 'wet' there were also several thousand Red-necked Avocets and Banded Stilts and hundreds of Black-winged Stilts.

When the expedition returned on 8-10 April water levels throughout the Saltworks were exceptionally high (Port Hedland received 400mm rain on 28/29 March!) and wader numbers exceptionally low. The avocets and stilts had all left. It is interesting that 70 Red-necked Avocets appeared on the flooded grassland at Anna Plains - 300 km north - on 31st March, only 3 days after the rain. The mangrove-lined intake area was the only section with exposed mud suitable for waders and here Broad-billed Sandpipers (2,000) predominated, with smaller numbers of Bar-tailed Godwits and Mongolian Plovers. The remaining migrant waders had presumably been forced to adjourn to the nearby tidal shores.

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(g) the Meteorological Station at Broome for use of their radar facilities;

(h) Polaroid Australia for assistance with film for the radar camera;

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Above all, thanks are due to the 40 people who participated at some time in the fieldwork during the expedition. They undertook a great deal of hard physical work, in difficult climatic conditions (hot, humid, wet - or all three!), over long hours. They financed their own travel costs to N.W. Australia (including 6 people from the U.K. and 1 from Canada) and their own living costs during the expedition. Only the operating costs of the expedition in N.W. Australia were covered by outside assistance, grants and donations. They made a marvellous team, with terrific spirit, which it was a pleasure to participate in.

CONCLUSIONS AND RECOMMENDATIONS

The 1988 expedition was highly successful in achieving its principal objectives of banding many more waders in N.W. Australia and in obtaining a complete radar coverage of the northward migratory departures. Some of the data contrasted markedly with that of the only previous major expedition at the same time of year (in 1985) due to the unusual climatic conditions in 1988.

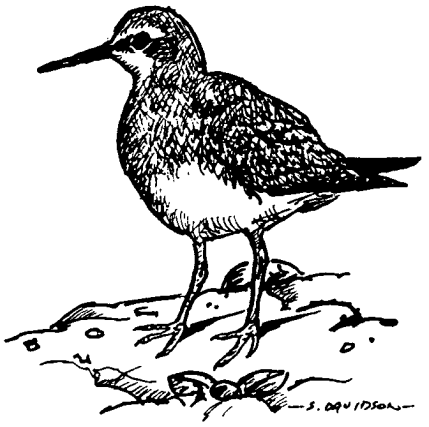
The picture of wader numbers and movement patterns in N.W. Australia is gradually coming together. It is also particularly pleasing that the number of recoveries overseas is beginning to show an outline of the routes used by different species on their migrations to/from their Siberian breeding grounds.

Much work remains to be done. Firstly, N.W. Australia remains the only part of the Continent where most species of migratory waders can be banded and studied in depth. Species which are numerous and accessible in N.W. Australia, but less common or insufficiently accessible elsewhere, include Great Knot, Red Knot, Bar-tailed Godwit, Terek Sandpiper, Grey-tailed Tatler, Ruddy Turnstone, Large Sand Plover, Oriental Plover, Little Curlew and Broad-billed Sandpiper. Considerable opportunities also exist for banding Oriental Pratincoles and Whiskered and White-winged Black Terns - conditions were unfortunately not right in March/April 1988 to further such studies.

The value of radar for recording wader migration was further demonstrated. Greater co-ordination with visible migration counts is needed - now that a suitable location has been identified by Broome Bird Observatory - with an expansion of radar observations to other times of the day (especially afternoons) when weather conditions appear suitable for emigration.

The new Broome Bird Observatory will be a most valuable foundation for furthering wader studies in N.W. Australia. Hopefully in due course it may be possible for it to develop into a base for professional research into wader feeding ecology in this most prolific wader area - one of the top five in the world. Just why are there such huge numbers of waders in Roebuck Bay, on 80 Mile Beach and at Port Hedland Saltworks? What can man do - or, more likely, what should man not do - to ensure the present situation is maintained (or even enhanced)? These are the sorts of questions which need to be answered.

Meanwhile wader banding, counting and radar studies - which are developing the base for subsequent ecological studies - should continue via the wardens/visitors to the Broome Bird Observatory, supplemented by periodical larger scale expeditions. It is tentatively recommended that the next major expedition should be in March/April 1990 - to capitalise on the growing understanding of wader behaviour at that time of year and to fill in gaps resulting from the unusual weather conditions encountered in 1988.



THE SUMMER 1988 POPULATION MONITORING COUNT: BANDED STILTS AT MONITORED SITES IN SOUTH-EASTERN AUSTRALIA

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The summer 1988 wader count was held on the weekends of 6-7th and 13-14th Feb. Wader species and numbers at the 23 monitored sites are given in Table 1. A total of 107 count sheets was returned, listing 41 wader species and 199,824 individuals. The count included 150,066 migratory waders from the northern hemisphere, 48,271 resident waders, 44 Double-banded Plovers and 1,443 unidentified waders.

This count was lower than those in summer 1986 (260,489) and summer 1987 (224,684). Table 2 shows summer counts in 1986, 1987 and 1988, and indicates that the decrease in the total counts from 1986-1988 was mainly attributable to a steady decrease in the count of migratory waders at the monitored sites. While the count of resident waders in 1986 has not been matched since, the counts appear to be more variable from year to year than for migratory waders.

Table 3 shows the summer counts, 1986-1988, for the six most common species of resident waders at the monitored sites. Banded Stilts were by far the most numerous, and accounted for 75%, 65% and 79% respectively of the count totals for resident waders in the three years. Banded Stilts occur both inland and coastally (Lane, 1987). Our monitored sites are all coastal, and include a few sites where great concentrations of Banded Stilts may occur. The large variations in the summer counts of resident waders observed in the last three years have predominantly reflected variations in the counts of Banded Stilts at these sites.

Table 4 shows the counts of Banded Stilts at monitored sites where the species has been counted in substantial numbers (>1,000 birds) during the RAOU and AWSG counts. These sites include five saltworks (Moolap, Avalon, Laverton, ICI, and Price), two shallow salt lakes (Lake George, Freshwater Lake), and an area of saltmarsh adjacent to the sea (Clinton Conservation Park). This indicates the birds' preference for shallow expanses of saline or hypersaline water, where they gather in large (sometimes huge) numbers to feed. The predominance of saltfields has arisen from the concentration of monitored sites on the coast, and the inclusion of Port Phillip Bay and Gulf St. Vincent. Large numbers of Banded Stilts have also been found at inlets, coastal lagoons, coastal and inland salt lakes, and, in some areas, on intertidal mudflats (Blakers *et al*, 1984; Lane 1987; Jaensch *et al* 1988). All eight sites are in South Australia or Victoria, which hold many important areas for the species (Lane 1987): the other major area for Banded Stilts is Western Australia (Lane 1987; Jaensch *et al*. 1988), but none of the important sites there is being monitored for this project.

The presence of birds appears to be a regular occurrence at some sites, especially at some saltworks (e.g. Moolap, ICI and Price), and high numbers were often present. The regularity of usage may have arisen because water levels and salinities at saltworks are artificially maintained, so that suitable habitat for Banded Stilts is consistently present. Banded Stilts were also regularly present at Clinton Cons. Pk.. Birds roost at this site and feed in the sea (Close & McCrie 1986), which would also provide a consistent feeding habitat. Even at sites used regularly, numbers have fluctuated considerably: in some counts, birds were absent (e.g. Moolap Saltworks, summer 1984; Price Saltfields, winter 1984); in others, present in numbers greatly exceeding those in other years (e.g. ICI Saltfields, summer 1986; Price Saltfields, summer 1988).

At the other saltfields, numbers have been high, but only for periods spanning a few counts, e.g. Laverton Saltworks, from winter 1985 to winter 1986, and Avalon Saltworks, from summer 1986 to summer 1987. Moolap, Avalon and Laverton Saltworks and Freshwater Lake all lie along the western side of Port Phillip Bay, and there may be some interchange of Banded Stilts between these sites. On the three occasions when high counts were obtained at Laverton and Avalon (summer 1986, winter 1986, summer 1987), the total counts for these four sites considered as one system were higher than for any other years (7854, 6963, and 4801 respectively). It may be that Banded Stilts have a general preference for Moolap Saltworks in this area, but when numbers are high there is some overflow to other nearby saltworks. This may also account for the single high count at Freshwater Lake in winter 1986. For the rest of this paper, the four sites (Moolap, Avalon, Laverton Saltworks, Freshwater Lake) will be treated as one system, and called Port Phillip Bay.

The single highest count for any monitored site was obtained at Lake George, but while the lake was regularly used by Banded Stilts, numbers were very variable. Enclosed natural lakes, such as Lake George and Freshwater Lake, provide suitable habitat less consistently than saltworks. Water level and salinity vary depending on rainfall and evaporation, and numbers of birds may fluctuate unpredictably and dramatically as large flocks move from wetland to wetland (Lane 1987). The count of 50,000 at Lake George in summer 1985 followed unusual late rains, which maintained water levels and increased the area of shallow water suitable for feeding (A.J. McArthur, notes on count sheet). A similar temporary influx occurred at Mitre Lake, Vic., which held 50,000 Banded Stilts on 29 Sept. 1985, but was deserted 7 days later (Alcorn 1985). Occurrence of Banded Stilts on inland lakes, which fill only seasonally or infrequently, is even more irregular.

No Banded Stilt sites in inlets or coastal lagoons connected to the sea are being monitored in this project, but they may be used in a regular way like saltworks. Although depth and salinity may vary with rainfall, inflow from streams and rivers, and evaporation, such fluctuations would be limited and drying out would not occur because of the connection with the sea. Data from the RAOU's South-west Waterbird Project (Jaensch *et al*. 1988) indicate that Peel Inlet, W.A., regularly held high numbers of Banded Stilts (1800-4000 birds) in Feb. counts from 1982-1985, which supports this suggestion.

The construction of saltworks has provided large areas of habitat, which is consistently suitable for Banded Stilts, unlike some of their natural haunts. It is therefore not surprising that Banded Stilts use saltworks in large numbers, and that they are the most numerous of the resident waders at our monitored sites. The maximum counts at Price Saltfields (31,455 birds) and ICI Saltfields (29,110 birds) compare favourably with the highest counts reported elsewhere in Australia: 77,000 at the Coorong, S.A., in Feb. 1982 (Lane 1987); 53,000 at Lake MacLeod, W.A., in Sept.-Oct. 1987 (Jaensch 1988); 50,000 at Mitre Lake, Vic., in Sept. 1985 (Alcorn 1985); 30,000 at Lake Eyre, S.A., in July 1984 (Lane 1987); 24,000 at Lake Wyn Wyn, Vic., in Dec. 1983 (Alcorn 1985). The maximum count at Lake George (50,000 birds) is also noteworthy.

Banded Stilts are able to use unpredictable resources because of their extreme mobility (Lane 1987). Thus the wide fluctuations in numbers at our monitored sites arose largely from movement rather than from changes in population levels. At

Table 2. Summer Counts at 23 Monitored Sites, 1986-1988.

	1986	1987	1988
Total Count	260489	224685	199824
Resident Waders	60586	34075	48271
Migratory Waders (N. Hem.)	199024	189069	150066
Double-banded Plovers	92	6	44
Unidentified Waders	787	1535	1443

Table 3. Summer Counts of the Six Most Numerous Resident Wader Species at 23 Monitored Sites, 1986-1988.

	1986	1987	1988
Pied Oystercatcher	2295	1880	2326
Masked Lapwing	2317	1990	2213
Red-capped Plover	4556	3018	3219
Black-winged Stilt	2404	1532	1267
Banded Stilt	45667	22071	37975
Red-necked Avocet	2789	3249	801

Table 5. Average Counts of Banded Stilts at Selected Sites from 1982-1983 (pre-1984) and from 1985-1988 (post -1984).

Site	Average Count	
	Pre-1984	Post-1984
Port Phillip Bay	1355	3767
ICI Saltfields	3168	9340
Price Saltfields	6486	10287
Clinton Conservation Park	920	307
Lake George	610	9495

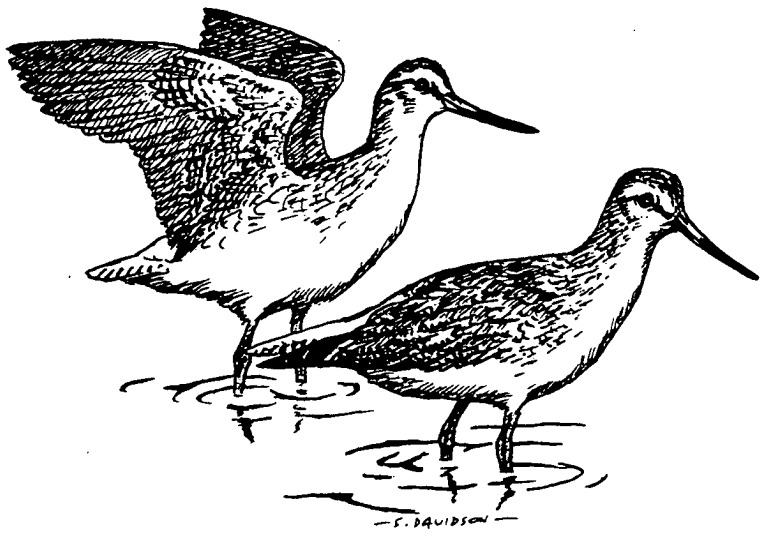

Table 4. Summer (S) and Winter (W) Counts of Banded Stilts, 1982-8, at Monitored Sites Holding >1000 Birds in any Count.

	1982		1983		1984		1985		1986		1987		1988
	S	W	S	W	S	W	S	W	S	W	S	W	S
Moolap Saltworks (Bellarine Pen., Vic)	1950	100	1379	1051	0	640	906	113	3300	1153	2505	45	3500
Freshwater Lake (Bellarine Pen., Vic)	0	0	0	0	0	0	0	3	0	2000	3	0	0
Avalon Saltworks (Werribee, Vic)	0	147	0	0	0	0	27	0	2388	160	2243	4	2
Laverton Saltworks (Altona, Vic)	500	3	287	1	0	0	4	2150	2166	3650	50	0	0
ICI Saltfields (Gulf St. Vicnent, SA)	-	1057	-	5279	2629	-	-	-	29110	9269	5369	450	2500
Price Saltfields (Gulf St. Vincent, SA)	12936	4460	7091	1458	2344	0	-	-	4372	5178	6396	4034	31455
Clinton Conservation Park (Gulf St. Vincent, SA)	1600	500	1050	530	1	0	-	-	650	-	276	40	260
Lake George (South-east SA)	8	45	1633	75	20	-50000		0	1967	0	5000	0	-

- not counted

many coastal sites in SA, Vic. and WA, numbers are higher in spring-summer than in autumn-winter, and this is thought to arise from seasonal movement to the more permanent wetlands of the coast as inland wetlands dry, and back again as they fill (Jones 1945; Wheeler 1955; Storr 1965; Close & McCrie 1986). The single exception noted in the literature is Clinton Cons. Pk., SA, where May-Aug. counts were higher than Sept.-April counts from 1982-1985 (Close & McCrie 1986).

At all the monitored sites, including Clinton Cons. Pk., summer counts have been in general higher than winter counts. Average summer counts (1982-1988) and winter counts (1982-1987) respectively were: Port Phillip Bay, 3030 and 1870: ICI Saltfields, 9902 and 4013; Price Saltfields, 10,765 and 3026; Clinton Cons. Pk., 640 and 268; and Lake George, 9771 and 166. Our results for Clinton Conservation Park appear to contradict those of Close & McCrie (1986). However, reference to their data indicates that their Feb. counts were on average higher than June-July counts, which is in agreement with our findings. The peak in numbers in May and fall from Sept.-Oct. is of course not detectable in our less-detailed study, and may be related to feeding conditions in the sea nearby. It is also possible that there is some movement of birds between Price Saltfields and Clinton Cons. Pk., confusing the seasonal count pattern. The two sites are only 21 km apart, and Grey Plovers and Bar-tailed Godwits are known to move between them (Close & McCrie 1986).

The summer-winter decrease was, on average, less for the saltworks and for Clinton Conservation Park than for the natural lake, Lake George. This may be because feeding areas in saltworks and in the sea (where Clinton Cons. Pk. birds feed) remain consistently attractive to Banded Stilts, while rainfall in winter may decrease the salinity and raise the level of natural coastal lakes, so that recently-filled inland wetlands become more attractive. It is possible therefore that the construction of saltworks has altered the movement patterns of Banded Stilts in some areas by inducing more birds to stay at coastal sites in winter.

At monitored sites, summer counts were on average higher than winter counts, but Table 4 shows that at some sites and in some years winter counts exceeded summer counts (e.g. Port Phillip Bay, 1984, 1985). Low summer counts in these years were thought to arise from movement of Banded Stilts to the interior of Australia, which in Jan. 1984 experienced heavy rains, filling Lake Eyre. A dramatic decrease in counts at coastal sites corresponded with counts of up to 30,000 birds at the lake in 1984 (Close & McCrie 1986; Lane 1987). It appears that, in dry years inland, the southern climatic pattern dominates the movements of Banded Stilts, and there is a regular seasonal variation in numbers at coastal sites. This regular pattern is broken by heavy rainfall inland, and there is a mass movement of Banded Stilts to the interior (Close & McCrie 1986). For the eastern states (SA, Vic.), it was heavy rainfall over the Lake Eyre basin which triggered this movement in 1984 (Close & McCrie 1986; Lane 1987). Flooding in the Darling and Cooper basins did not affect coastal numbers (Lane & Jessop 1984). In WA, disruption of the seasonal pattern at the coast appears to be triggered by heavy rainfall in inland WA, where large numbers of birds gather to breed at inland lakes (Storr 1965; Serventy & Whittell 1976).

If counts from only a few monitored sites are available, it is probably preferable to concentrate on saltworks: such mass movements as occurred in 1984 show up well at saltworks sites where Banded Stilt occurrence is regular and numbers consistently high. Heavy rain fell inland from 8-15 Jan. 1984, Lake Eyre had filled by 25 Jan. (Close & McCrie 1986), and Banded Stilts had left Port Phillip Bay sites by 12 Feb. (summer 1984 count, Table 4). The response to inland rainfall was therefore rapid and complete. In SA, birds had also left Clinton Cons. Pk. by the time of the summer 1984 count, but were still present at ICI and Price Saltfields. However, some birds may have left by Feb. 1984, as the summer 1984 count at Price was lower than any other recorded from 1982-1988. By winter 1984 (mid-July), all birds had left Price. This suggests that some SA birds responded rapidly to the inland rainfall, but that the main departure occurred later than from Vic. sites. Close and McCrie (1986) recorded unusually low counts at Price from Feb.-June 1984 and at Clinton Conservation Park from Feb. 1984-1985. It is surprising that the major departure was more rapid in Port Phillip Bay than at Price, which is considerably closer to the area of inland flooding. The most intriguing riddle of how birds can know that conditions hundreds of kilometres away have become suitable is as yet unsolved.

Lake Eyre was almost completely dry by Dec. 1984 (F.J. Badman, in Close & McCrie 1986). The return of birds to Port Phillip Bay was gradual, unlike the abrupt departure. By the winter 1984 (mid-July) count, 640 birds had returned, although Lake Eyre was still suitable for the species, and held 30,000 birds. Through the two counts in 1985, numbers increased, to peak in summer 1986. It therefore seems that there was a gradual retreat to the coast as inland wetlands dried, and the normal seasonal pattern of movement to and from coastal districts was not evident from counts until 1986. Unfortunately, counts are not available for 1985 for Price and ICI Saltfields, and Clinton Cons. Pk., and so the return of birds to these sites cannot be followed from our data: most birds had however returned by summer 1986. Close and McCrie (1986) reported that birds had returned to Clinton Conservation Park in large numbers by May 1985. Banded Stilts returned to the Coorong, SA, and the western district and Wimmera Lakes, Vic., by winter 1985 (Lane & Starks 1985).

Numbers at Clinton Cons. Pk. in May 1985 after return from the inland were 150% higher than numbers in the two years before 1984 (Close & McCrie 1986). Table 4 indicates that numbers at our other monitored sites were also higher after birds returned. At Port Phillip Bay, a gradual increase through 1985 culminated in a record high count of 7854 in summer 1986. It was during this period that birds were present in thousands at Laverton and Avalon Saltworks, where previously they had been present in hundreds. Shortly after, in winter 1986, 2000 birds were counted at Freshwater Lake, where previous counts had never exceeded 3 birds. There was also a record high count at ICI Saltfields in summer 1986. Table 5 shows the average counts at the sites listed in Table 4, from 1982-1983 (pre-1984) and from 1985-1988 (post-1984). This suggests that numbers were greater after 1984 at most sites. Clinton Cons. Pk. was the exception, where the increased numbers noted in May 1985 (Close & McCrie 1986) were not maintained from 1986 onwards. However, we do not count Clinton Cons. Pk. at the time of peak numbers (May), which decreases our chances of detecting population changes. The increased counts, post-1984, at other sites are particularly noteworthy because the floods of 1984 were preceded by a severe drought, when numbers of Banded Stilts at the coast would be expected to be at a maximum. They probably represent a real population increase.

In WA, when birds leave the coast, this often indicates that they have moved inland to breed. Breeding has been recorded at several inland lakes in WA from 1930 to the present day (for summary, see Blakers *et al.* 1984). In WA, Banded Stilts breed on sandy shores, islands and spits in inland salt lakes recently filled by rain (e.g. Kolichis 1976; Burbidge & Fuller 1982).

Table 1. Results of the Summer 1988 Wader Count at 23 Selected Sites

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
Bush Thick-knee													2											2
Beach Thick-knee																								
Painted Snipe																								
Pied Oystercatcher	17			23	17	878	385		2	17	60		122	31	4	7	8	11	5	566	144	28	1	2326
Sooty Oystercatcher	11			1	8	224					1		3			2		1		3	20	27		301
Masked Lapwing	76	17	8	3	30	21	398	137	77	203	372	45	11	33	8	343	90			298	11	25	7	2213
Banded Lapwing																								
Grey Plover	1					855					113		78		200		303	79	35				1	1665
Lesser Golder Plover	149	220	10	102	206		39		5	64	128	3	18	151	3	113		50		319		223		1803
Red-kneed Dotterel			4					7		10							49							70
Hooded Plover					4	1										4				9	15	15		48
Mongolian Plover	18	16			3	42					21	160	1575	125	8	1	1					3		1973
Double-banded Plover				5	3		2			7				12						10	2	3		44
Large Sand Plover	69					20						11	10	3			9	14						156
Oriental Plover																								
Red-capped Plover	17	20		47	40	16	40	1	27	44	373	1	58	17	60	71	1959	202	4	93	27	98	4	3219
Black-fronted Plover	1		3		2			12		22	5			2		2								49
Black-winged Stilt	104	72	27	16				45	145	137	232		8	108			298	29	16				30	1267
Banded Stilt										2	3500				8		34215	250						37975
Red-necked Avocet										5	28						768							801
Ruddy Turnstone	50	13	2	40		160	50				67		190	152	75	458	104	3				244		1608
Eastern Curlew	240	240		111	236	1252	887		1	14	9	27	169	337	6	9	104	2		116	5	2		3767
Whimbrel	99	25			11	80						127	98	193			1			1			1	636
Little Curlew																						1		1
Wood Sandpiper								6									3							9
Grey-tailed Tattler	162	35		30				10		1	1	41	16	12	122	8	22	14				2		479
Wandering Tattler																								
Tattler Sp.													250	2				8						260
Common Sandpiper		1						1		2		1					1						28	34
Greenshank	51	58				75	50	1	51	74	509	10	12	61	25	31	516	366	4	79			1	1974
Marsh Sandpiper	1	2							28	21	132			117			89							390
Terek Sandpiper	41	110		25								30	72	79			8							365
Latham's Snipe	2							6		1	57			1										67
Snipe sp.																								
Black-tailed Godwit		100			10					2			60	15			150							337
Bar-tailed Godwit	811	2400	221	1067	1228	11760	350			20	589	120	1728	2516	72	12	368	30	28	99	3		17	23439
Red Knot	8	9				3335	40				256			197			694	420	4	4			550	5517
Great Knot	174	1				760					69	24	1879	1100			62	7	39				2300	6415
Sharp-tailed Sandpiper	73	12	12	197	39	101	673	80	2147	3405	5366	37	102	176	100	179	8799	170		42		6		21716

Pectoral Sandpiper			1					2											1				6
Red-necked Stint	157	140	33	286	490	6351	3787	1	1694	3045	10682	200	700	249	225	1674	18376	2965	1	1993	55	1420	4	54528
Long-toed Stint										2														2
Curlew Sandpiper	135	1600	234	144	2	2205	2839	2	753	2543	6166	20	21	524	40	223	3597	87		1345		64		22644
Sanderling	34					184												1					50	269
Ruff or Reeve										2										1				3
Broad-tailed Sandpiper		3					1																	4
Oriental Pratincole																								
Australian Pratincole																								
Little Stint																				1				1
Buff-breasted Sandpiper																				1				1
Unidentified small							450				30												500	980
Unidentified large														100										100
Unidentified wader									350		13													363
TOTAL	2501	5094	555	2097	2325	28323	10002	301	5281	9645	28819	832	7178	6443	842	3151	70686	4695	136	4981	282	2161	3494	19982

Site Codes:

NSW	1. Clarence/Richmond	Qld	12. Cairns Area
	2. Hunter Estuary		13. Mackay Area
	3. Paramatta River		14. Moreton Bay
	4. Botany Bay	SA	15. Western Eyre Peninsula
	5. Shoalhaven Estuary		16. South East Coast
Vic	6. Corner/Shallow Inlets		17. Gulf St Vincent
	7. Westernport	WA	18. Albany Area
	8. East Port Philip Bay		19. Swan Coastal Plain
	9. Altona	Tas	20. East Derwent/Pittwater
	10. Werribee/Avalon		21. Marion Bay
	11. Bellarine Pen./Mud Island		22. Cape Portland
		NT	23. Darwin Area

The departure of birds from Vic. and SA after inland rain in 1984, followed by a return in increased numbers, suggests that breeding occurred in this instance as well. But there has been only one confirmed record of breeding in the eastern half of Australia, in 1930 at Lake Callabonna, an inland salt lake in SA (McGilp & Morgan 1931). Where do eastern birds breed? The site used at Lake Callabonna was typical for the species, and there should be abundant suitable habitat after rain over the salt lake country of northern SA. Two possibilities exist: either Banded Stilts breed regularly in eastern Australia, but nest sites have not been found because of their remoteness and inaccessibility; or eastern birds move to WA to breed, and return afterwards. The latter possibility seems unlikely. Jones (1945) discussed the possibility that the Nullarbor Plain and Victoria Desert could be crossed during wet years, noting that Banded Stilts are strong fliers and adapted to crossing large tracts of arid land. He considered, however, that this barrier effectively limited interchange between eastern and western populations of Banded Stilts. I think that events in 1984 provide a good argument against an east-west movement for breeding. Mass movement in WA is triggered by rainfall in inland WA, and birds move there to breed. In SA and Vic, mass movement in 1984 was triggered by rainfall in the Eyre basin, which was therefore their probable destination, and, although it has not been proven that breeding occurred, it seems likely. Breeding was not confirmed at Lake Eyre itself, but there are innumerable other salt lakes in the Eyre Basin.

Perhaps breeding locations in eastern Australia will be found by accident, as the Lake Callabonna site was: it was discovered by a station manager "wading about in Lake Callabonna in search of Swans' eggs, with culinary intent" (McGilp & Morgan, 1931). If an organised search is ever mounted, a very low count from the saltfields around Port Phillip Bay and Gulf St. Vincent, especially in summer, would be the best indicator that work should begin. The history of our knowledge of the Banded Stilt in Australia has been one of unanswered questions. The first breeding record of the Banded Stilt was not confirmed until 114 years after the species' scientific naming (Serventy & Whittell 1976). The feeling then was that a mystery had been solved: but Banded Stilts have not yet given up all their secrets, and that is what makes them so fascinating.

I flew around the shores of Lake Eyre in September 1984 as part of the AWSG team which counted almost 24,000 Banded Stilts: I wonder now if I was seeing some of the birds which I have observed with so much pleasure at Moolap Saltworks before and since as part of the RAOU and AWSG counts. I also wonder if I didn't blink at some stage on the 700 km survey and miss the spit or island with the shallow scrapes and the fluffy white chicks of the Banded Stilt.

ACKNOWLEDGEMENTS

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- the wader counters.
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- the Dept. of Conservation, Forests and Lands, Victoria, for providing boats and personnel for the Corner Inlet and Mud Is. counts.
- the RAOU for setting up the Research Fund to support the project, and providing a computer for data analysis.
- members of the AWSG Committee and Scientific Committee.
- Mark Barter for morale-boosting when finishing the report on time seemed a difficult task.

Lastly, I thank regional organiser, Margaret Cameron, for allowing me to arrange the counts at Moolap Saltworks, so that I can assign myself the sections where Banded Stilts concentrate. Although I feel I know the birds well after 7 years, they remain beautiful and mysterious.

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REGULAR WADER COUNTS PROJECT REPORT: RED-NECKED AVOCET

INTRODUCTION

The Regular Wader Counts project is now more than three years through its five-year life-span, having commenced in January 1986. Up until June 1988, the period covered by this report, 34 sites had been counted over at least 15 months. Currently 34 sites are being regularly surveyed.

This report aims to:

a) describe and map the changes in Red-necked Avocet numbers at each site;

b) determine correlations between sites, and to identify and describe correlation groups,

c) describe and graph the changes in numbers occurring in each region.

Reports on other resident wader species will appear in future editions of The Stilt.

Sites included in this report are listed by region in Table 1, and displayed in Figure 1.

METHOD

Since sites may be counted at any time of the month, the data were reduced to average monthly counts (AMC) of Avocets at each site.

a) AMC Maps

To display the changes in numbers across Australia, maps were drawn for each month, and symbols drawn for each site counted.

If Avocets were present a square symbol was plotted. The size of the square was determined by comparing the AMC with the largest AMC over all sites for the report period, and then selecting one of five symbol sizes as follows:

AMC as a percentage of largest AMC	Dimension of square
20% or less	1 unit
over 20% - 40%	2 units
over 40% - 60%	3 units
over 60% - 80%	4 units
over 80%	5 units

If the species was not observed during the month a plus symbol (+) was plotted.

b) Regional summary graphs

Bar graphs displaying the sum of AMC data for all sites for each month were drawn for several regions. Regions were selected if Avocets were recorded in more than one site in the region (South-eastern Inland, Eastern Coastal and South-western Coastal).

c) Site correlations

An important question is whether geographical groups of sites can be identified which consistently show corresponding changes in Avocet numbers, i.e. do Avocet numbers at these sites rise and fall in unison?

To measure this, AMC data were correlated using product-moment correlations (Sokal & Rohlf 1981). All pairs of sites where counts occurred during the same 15 months or more were included in the corelation calculations. Only significant correlations (i.e. those not likely to result from chance alone $P<0.05$) are shown in the correlation table. A positive correlation between two sites means that numbers of Avocets generally rise and fall at the same rate at the two sites in question: a negative correlation means that as the numbers of Avocets rise at one site they generally fall at the other.

Correlation groups were identified. A correlation group is a group of sites in a region in which each site positively and significantly correlates with at least one other site. For example, if site A correlates with site B, and site B correlates with site C, then A, B and C form a correlation group.

RESULTS

The AMC maps for Red-necked Avocets are shown in Figure 2, regional summary graphs in Figure 3 and site correlations in Table 2.

In general, sites which correlate do not fall into specific geographical regions. Hence the results are for each of the broad geographical regions listed in Table 1 rather than for each correlation group. Within these regions some correlation groups can be identified.

South-eastern Inland region (Fig.3a)

Avocets were present in the region during the report period, but numbers fluctuated considerably. Very few were present in January 1986, and in the periods March to April 1987 and April to June 1988. Peak numbers occurred in the period August to September 1986 and again in January 1987. Changes in numbers did not appear to follow a regular seasonal cycle.

Lake Merreti (F8), Parkes Sewage Farm (N6), Five Bough Swamp (N24) and Dubbo Sewage Ponds (N30) formed a correlation group (Table 2). Changes in numbers within this group closely matched those of the region as a whole.

Avocets were not recorded from Tasmanian sites.

South-eastern Coastal region

The only site that recorded Avocets was Port Parham (F11), where very small numbers were recorded.

Eastern Coastal region (Fig.3b)

Historically, Avocets have been rarely recorded east of the Great Dividing Range (Blakers et al., 1984). However they appeared on coastal wetlands in New South Wales and Queensland in late 1984 (Lane 1987), and were recorded frequently over the period of this report.

Avocets were reported in substantial numbers over two distinct periods - March to October 1986, and January to December 1987. A peak occurred at several sites in the period May to June 1987. Few Avocets were reported in the first half of 1988.

Two correlation groups occurred, each comprising a pair of sites (Table 2). The correlation group of Deception Bay (R20) and Lake Bathurst (N15) was characterised by the appearance of substantial numbers of Avocets over the winter of 1986, and again in May 1987. Reeves Lake (S9) and Fitzroy St. (R29) correlated because of the brief appearance of small numbers in February 1987.

Central region

Avocets were present at Alice Springs (U2 and U6) for all surveyed months (February 1987 to April 1988) except the last.

South-western Coastal region (Fig.3c)

Table 1. AWSG Regular Counts Project, January 1986 for 30 months for Sites by Region.

Site		Lat. °S	Long. °E
	South-eastern inland		
A 6	Hattah Lakes	34.45	142.15
A 7	Lake Wyn Wyn	36.40	141.54
A20	Bitter Swamp	37.05	141.46
A21	White Lake	37.04	141.45
F 8	Lake Merreti	34.01	140.45
N 6	Parkes Sewage Farm	33.10	148.12
N17	Barrenbox	34.12	145.49
N24	Five Bough Swamp	34.32	146.26
N30	Dubbo Sewage Ponds	32.14	148.36
O 1	Nericon Swamp	34.13	146.02
	South-eastern coastal		
A 9	Powlett River	38.35	145.32
A22	Spectacle Lake, Point Cook	37.55	144.46
F 7	Pelican Lagoon	35.48	137.46
F11	Port Parham	34.25	138.15
F12	Port Prime	34.00	138.00
I 1	Pipeclay Lagoon	42.58	147.32
I 2	Lauderdale	42.55	147.29
I 3	Mortimer Bay	42.58	147.28
I 4	Clear Lagoon	42.56	147.31
I 5	Orielton Lagoon	42.48	147.32
I 6	Sorell - Iron Creek	42.48	147.35
I 7	Barilla Bay	42.49	147.29
I 8	Marion Bay	42.49	147.52
I 9	South Arm Neck	43.02	147.27
I11	Sorell	42.48	147.35
	Eastern coastal		
N 1	Prospect Estate	28.51	153.34
N15	Lake Bathurst	35.03	149.42
N22	Jerrabomberra wetlands	35.18	149.07
N25	Red Rock Estuary	29.59	153.15
N26	Dangars Lagoon	30.41	151.30
N27	Lake Zot	30.29	151.38
N28	Suamarez Ponds	30.29	151.36
N29	Pelican Island south end	32.25	152.54
O 2	Hadrih	N.R.	N.R.
O 3	Old Bar	31.55	152.35
R 4	Cairns mudflats	16.55	145.46
R11	Finlayson Point	20.53	148.57
R17	Ross River mouth	19.16	146.51
R18	Bushland Beach Mt Low	19.12	146.41
R20	Deception Bay	27.10	153.05
R22	Bakers Creek / Far Beach	21.08	149.12
R23	Armstrongs Beach	21.26	149.18
R24	Toomba Lake	21.01	145.35
R26	Young Ave, Kinka Beach	23.25	150.08
R27	Thorneside site 1	27.29	153.12
R28	Thorneside site 2	27.29	153.12
R29	Fitzroy Street	27.32	153.16
R30	Woolwash (Serpentine Lag)	23.26	150.31
S 1	Murray Lagoon	23.24	150.29
S 2	Bowen Town Beach	20.00	148.15
S 3	Bowen Salt Works	20.00	148.15
S 4	Blakeys Crossing	27.25	153.10
S 5	Moreton Bay (Lytton - 1)	27.25	153.10
S 6	Nanango Sewage Ponds	26.40	152.00
S 7	Moreton Bay (Lytton - 2)	27.29	153.12
S 8	Kinka Beach & creek	23.25	150.08
S 9	Reeves Lake	21.01	145.35

S10	Thorneside site 3	27.29	153.12
S12	Boonooroo	25.40	152.46
S13	Merinda meatworks	20.00	148.15
	Central		
U 2	Alice Springs Sewage Farm	23.44	133.50
U 6	Forestry Trial Lagoons	23.44	133.50
	South-western coastal		
X 1	Kanidal Beach	32.15	126.13
X 2	Lake Forrestdale	32.09	115.56
X 3	Lake Yangebup	32.07	115.50
X 4	Banjup Swamp	32.08	115.52
X 9	Woodmans Point	32.08	115.44
X18	Wilson Inlet	35.00	117.24
X19	Bibra Lake	32.06	115.49
X20	Rottnest Island	32.00	115.31
X29	Oyster Bay	34.57	117.54
	South-western inland		
X21	Roules Lagoon	30.26	120.51
	North-western coastal		
X23	Cooke Point	20.20	118.37
X24	South Hedland Sewage Pond	20.15	118.35

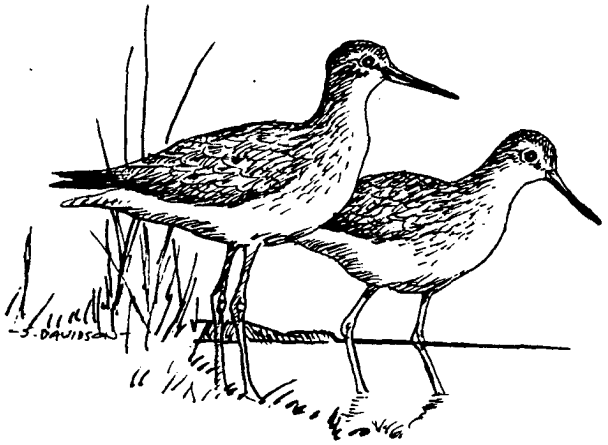


Figure 1.

AWSG Regular Count Project sites from Jan 1986 for 30 months.

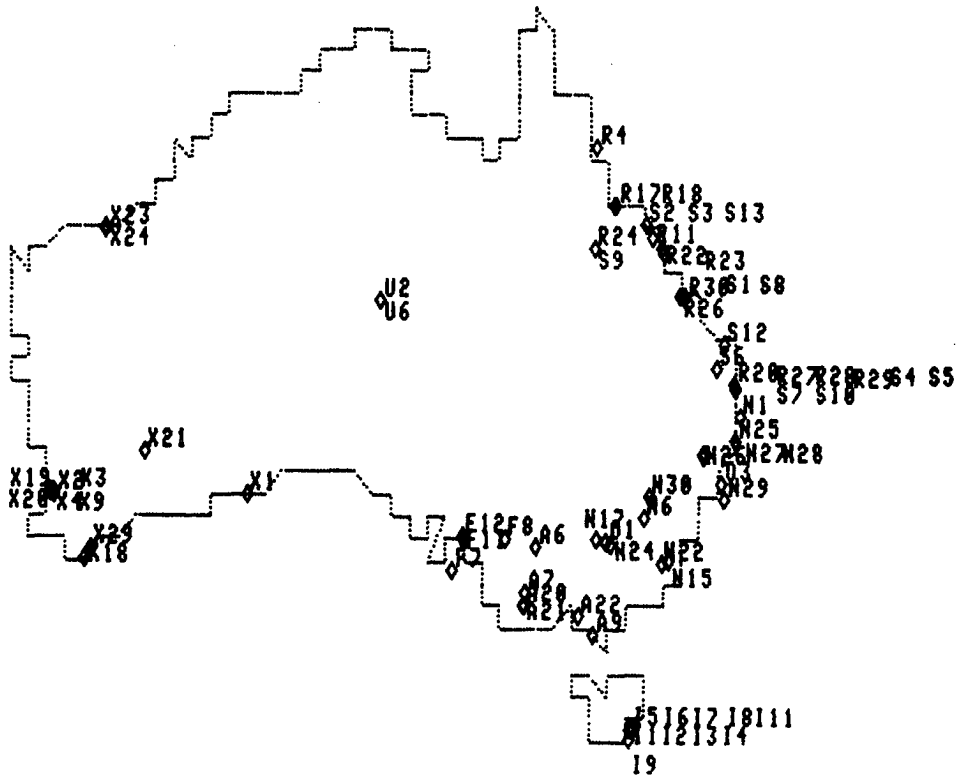


Table 2. Red-necked Avocet sites from Jan 1986 for 30 months. Product-moment coefficients.

\- Minimum count overlap of 15 months not obtained
* Correlation not significant

	A 6	A20	A21	F 8	F11	N 6	N15	N24	N30	O 1	R20	R26	R29	S 3	S 5	S 9	X 1	X 2	X 3	X18
A 6	1.00	*	*	*	*	*	*	*	*	*	*	*	0.47	*	-	*	*	*	-	*
A20	*	1.00	*	*	-	*	*	*	*	0.57	*	*	*	*	-	-	0.95	*	-	*
A21	*	*	1.00	*	-	*	*	*	*	*	*	*	*	*	-	-	*	*	-	*
F 8	*	*	*	1.00	-	0.41	-	0.69	*	*	-	*	*	*	-	-	*	*	-	0.49
F11	*	-	-	-	1.00	*	-	*	*	-	-	-	*	*	-	*	*	*	-	*
N 6	*	*	*	0.41	*	1.00	*	0.50	0.77	*	*	0.53	*	*	-	*	*	*	*	*
N15	*	*	*	-	-	*	1.00	*	-	-	0.82	*	*	-	-	-	*	-	-	-
N24	*	*	*	0.69	*	0.50	*	1.00	*	*	*	*	*	*	*	*	*	*	*	*
N30	*	*	*	*	*	0.77	-	*	1.00	*	-	0.77	*	*	-	*	*	*	-	*
O 1	*	0.57	*	*	-	*	-	*	*	1.00	-	*	*	*	-	-	0.54	-	-	*
R20	*	*	*	-	-	*	0.82	*	-	-	1.00	8	8	-	-	-	8	-	-	-
R26	*	*	*	*	-	0.53	*	*	0.77	*	*	1.00	*	*	-	-	*	*	-	*
R29	0.47	*	*	*	*	*	*	*	*	*	*	*	1.00	*	*	0.99	*	*	*	*
S 3	*	*	*	*	*	*	-	*	*	*	-	*	*	1.00	-	-	*	*	-	*
S 5	-	-	-	-	-	-	-	*	-	-	-	-	*	-	1.00	-	*	-	-	-
S 9	*	-	-	-	*	*	-	*	*	-	-	-	0.99	-	-	1.00	*	*	-	*
X 1	*	0.95	*	*	*	*	*	*	*	0.54	*	*	*	*	*	*	1.00	*	*	*
X 2	*	*	*	*	*	*	-	*	*	-	-	*	*	*	-	*	*	1.00	-	*
X 3	-	-	-	-	-	*	-	*	-	-	-	-	*	-	-	-	*	-	1.00	*
X18	*	*	*	0.49	*	*	-	*	*	*	-	*	*	*	-	*	*	*	*	1.00

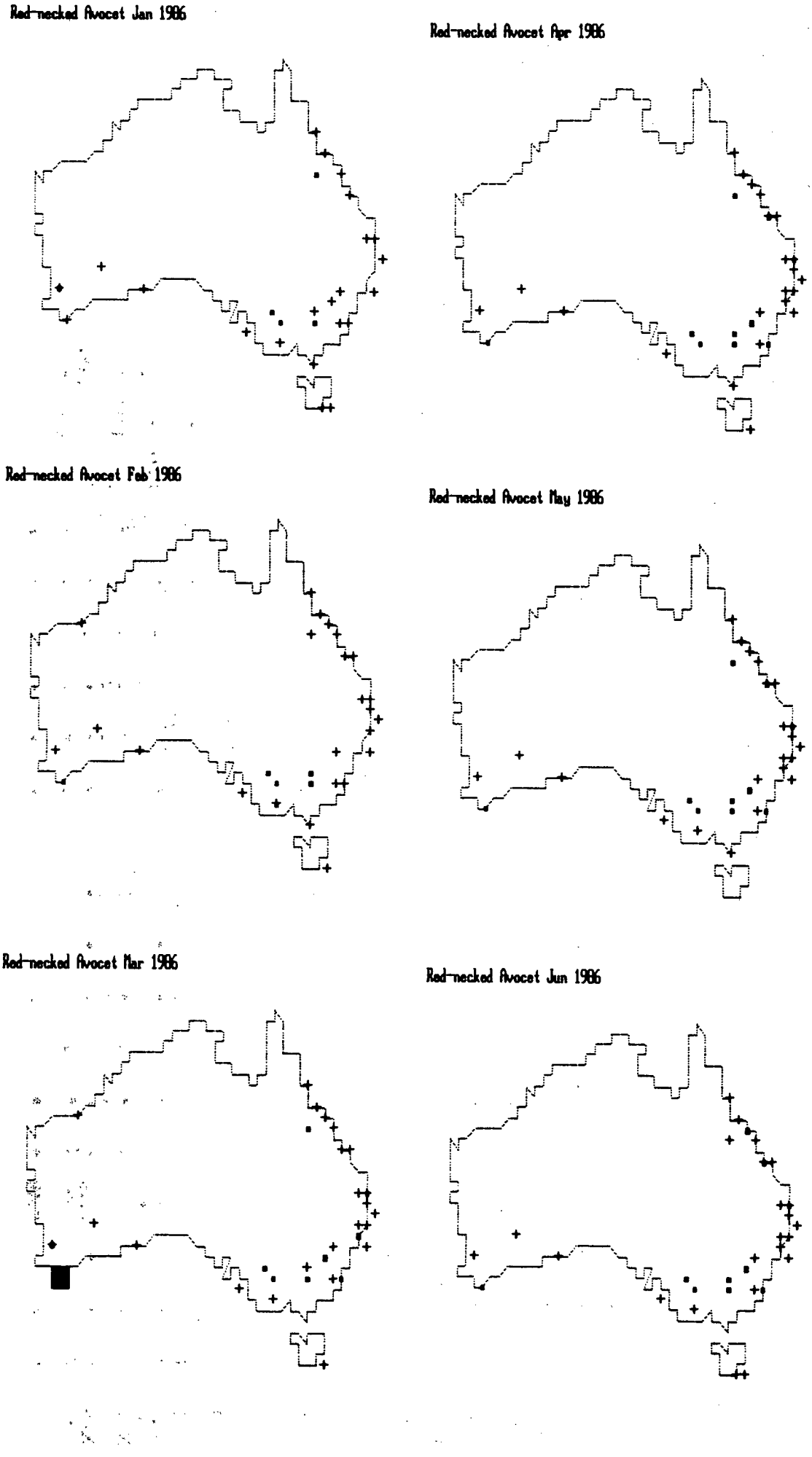
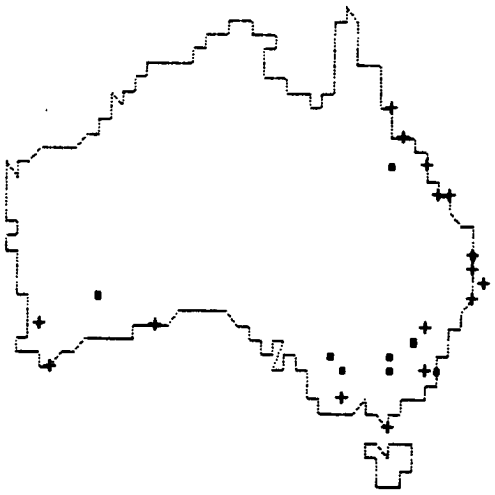
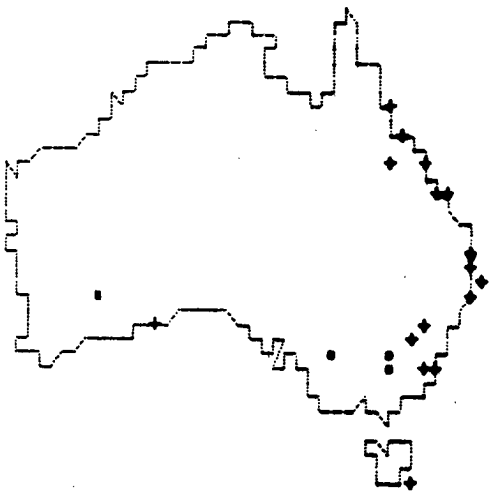


Figure 2. AMC maps for Red-necked Avocet

Red-necked Avocet Jul 1986



Red-necked Avocet Oct 1986



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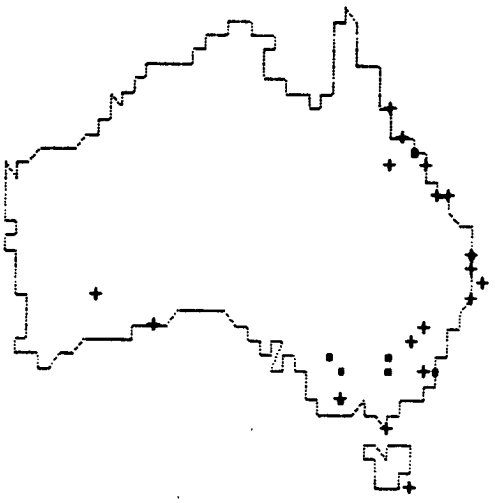

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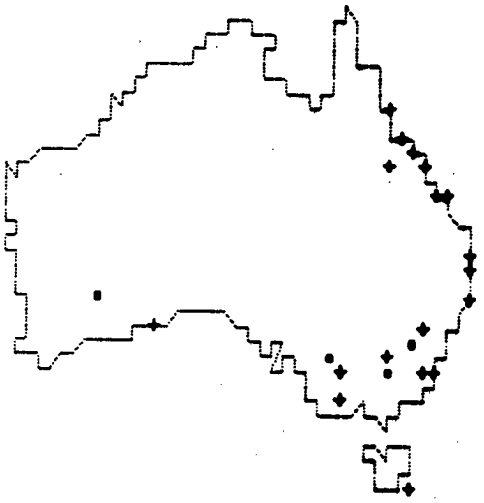

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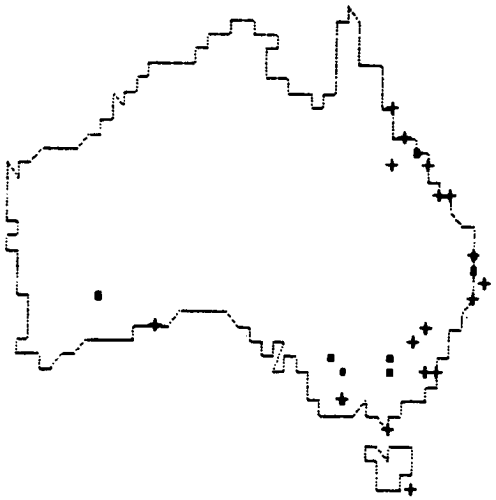

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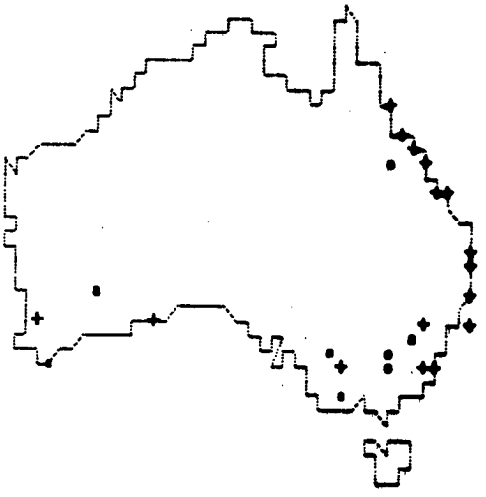

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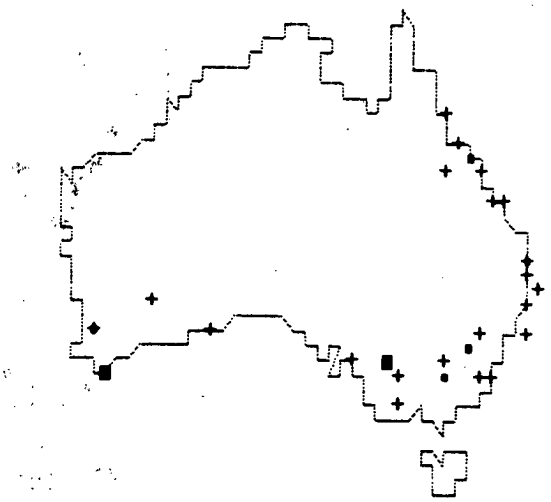

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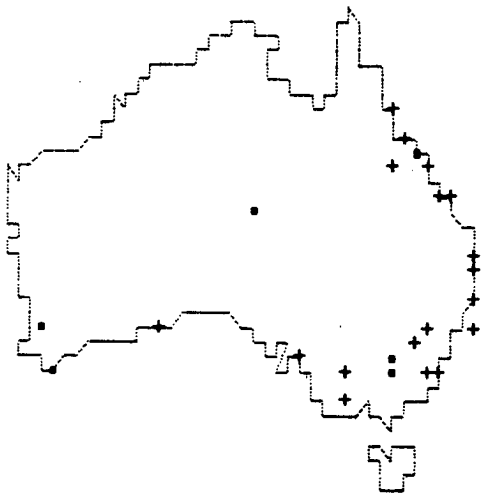

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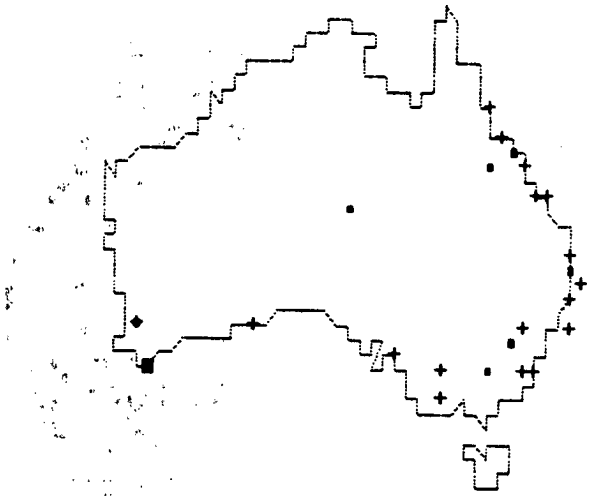

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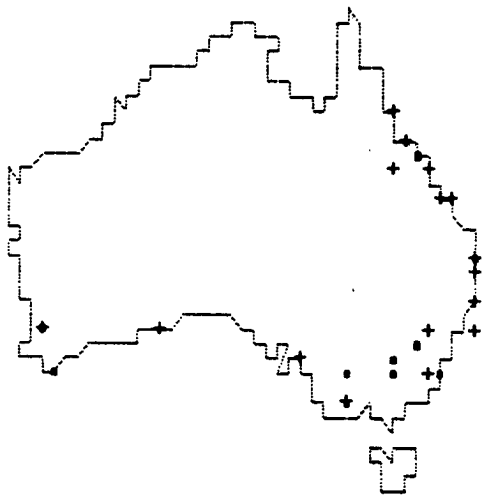

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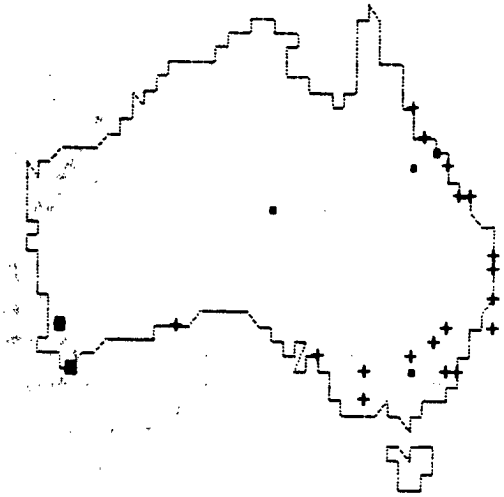

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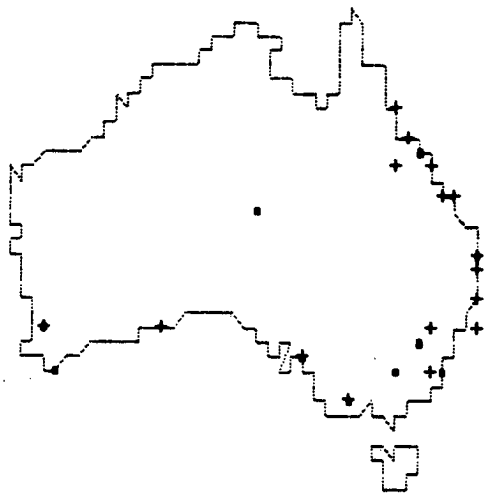

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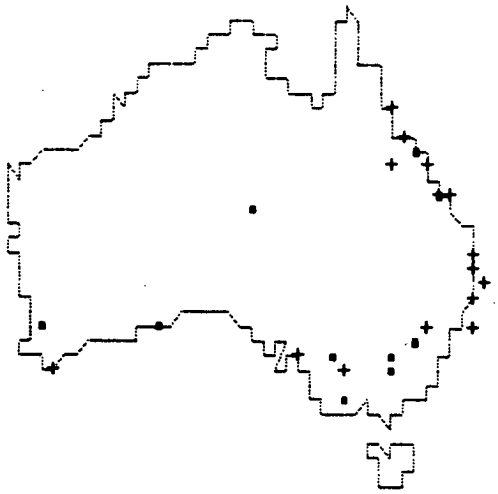

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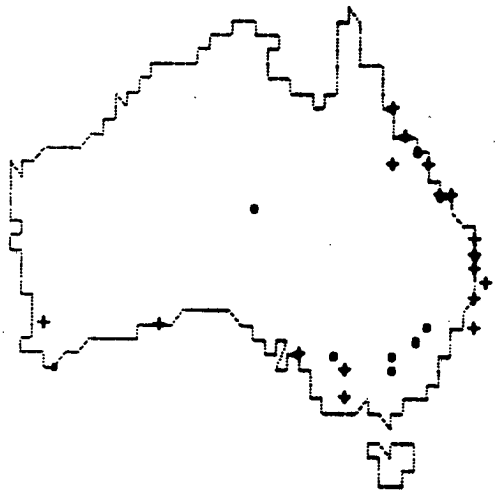

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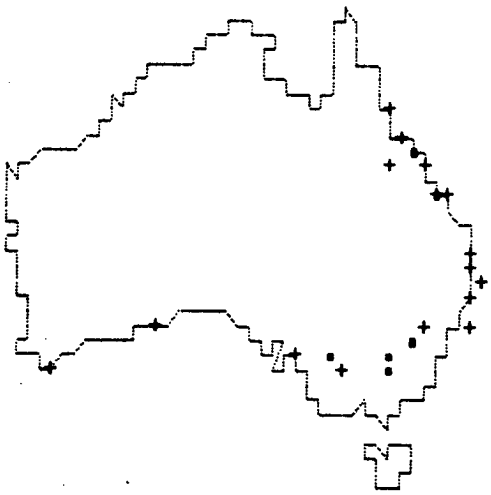

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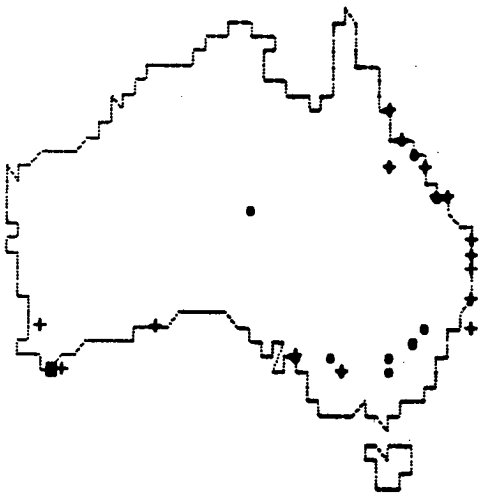

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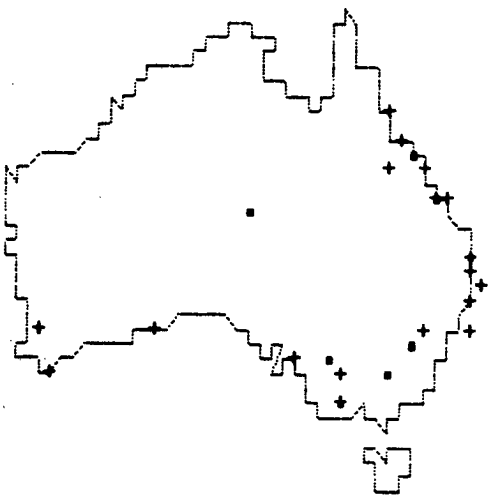

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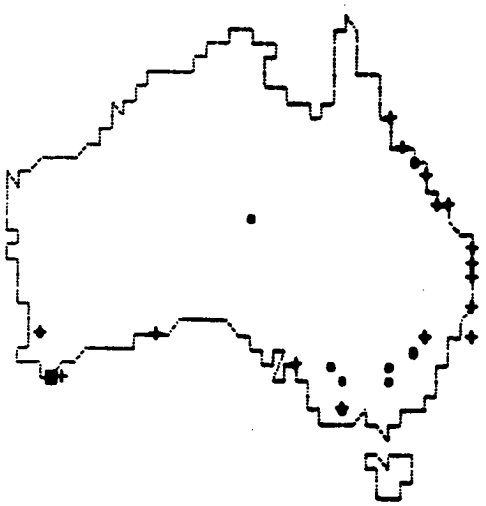
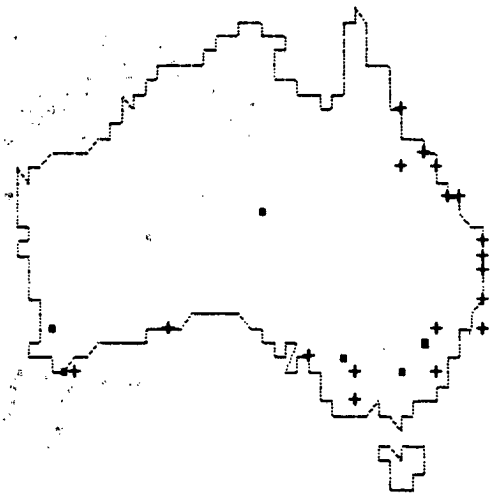


Red-necked Avocet Jan 1988



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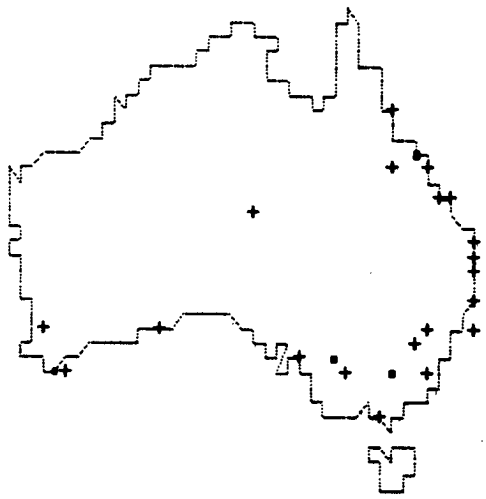

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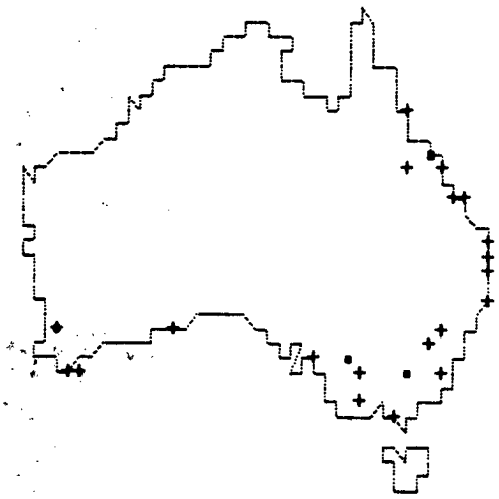

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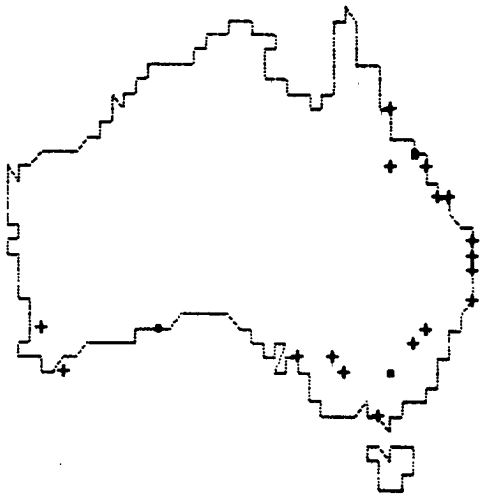

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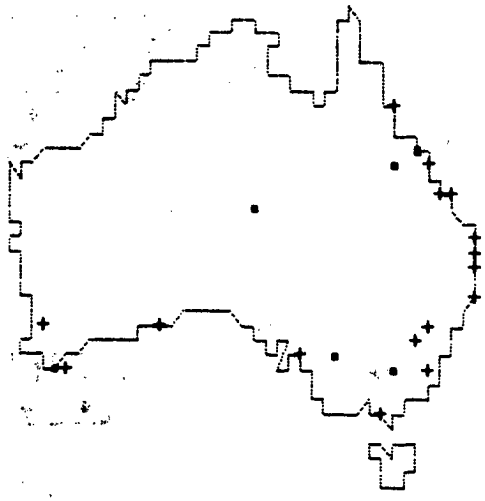

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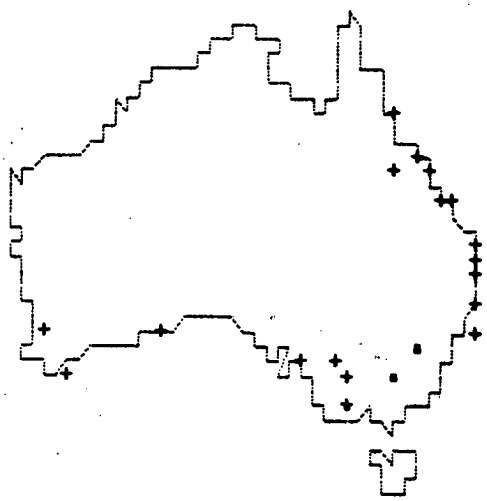

South-eastern inland region

Red-necked Avocet sites from Jan 1986 for 30 months

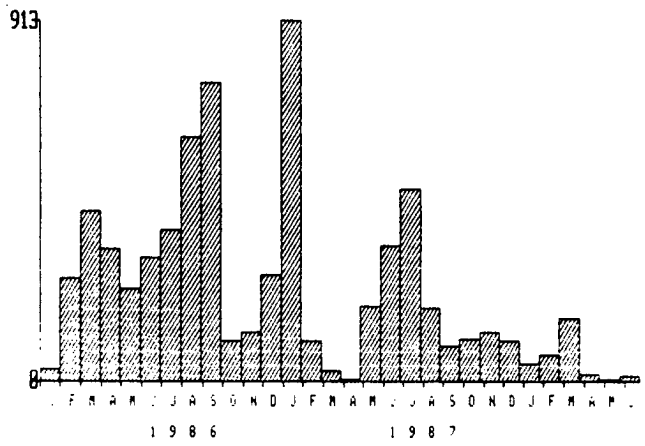

Figure 3a.

Eastern coastal region

Red-necked Avocet sites from Jan 1986 for 30 months

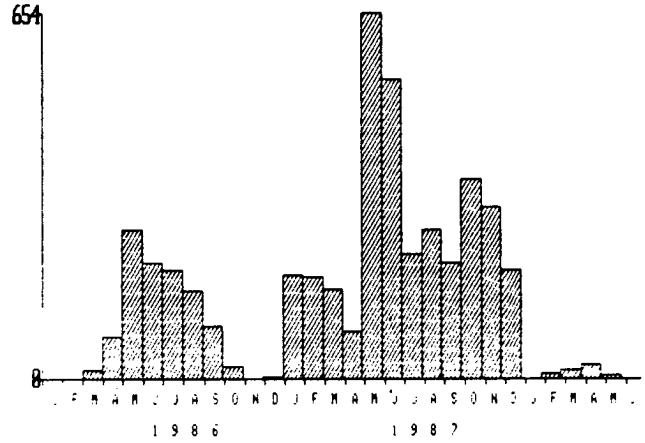

Figure 3b.

South-western coastal region

Red-necked Avocet sites from Jan 1986 for 30 months

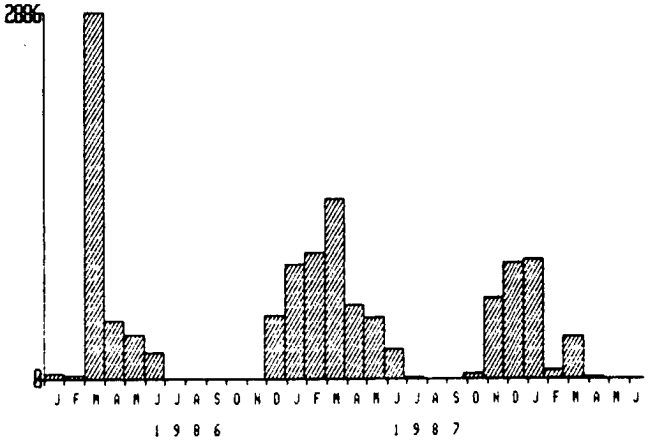

Figure 3c.

Peak Numbers occurred in the summer period - in March 1986, from January to March 1987, and from November 1987 to January 1988. Avocets were absent for part of the winter period - in June 1986 and again in 1987 from August to September.

No correlation groups existed (Table 2).

South-western Inland region.

Avocets were recorded at Roules Lagoon (X21) in the period July 1986 to December 1986, coresponding closely to the period of absence of Avocets from South-western Coastal sites.

ACKNOWLEDGEMENTS

Thanks are due to the many enthusiastic participants in this project.

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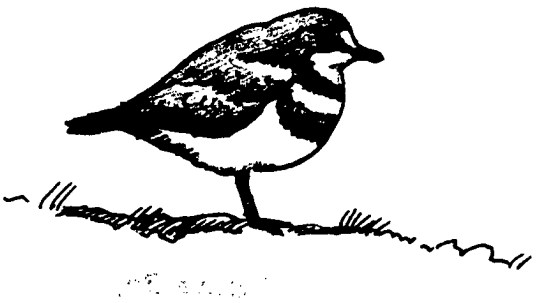

HOODED PLOVER SURVEY - SOUTH AUSTRALIAN/VICTORIAN BORDER TO MURRAY MOUTH

Iain D. Stewart

This survey was prompted by claims that the Hooded Plover numbers on the 390 kilometres of coast line from the Victorian border to the Murray Mouth had declined from approximately 160 in 1982 to 90 in 1987.

Local people, with a knowledge of the coast felt that these claims were unjustified, and decided to survey the coast over one weekend.

The weekend concerned was 5th and 6th November 1988.

Surveyors chosen had a knowledge of the bird, and a knowledge of the local coast.

Survey forms were provided to the surveyors, with the request to record any other relevant information.

SURVEYORS AND THEIR AREAS

1.	Victorian border to Cape Douglas.	Surveyor	R.M. Schleter
2.	Cape Douglas to Carpenter Rocks	Surveyor	G. Hughes
3.	Carpenter Rocks to Southend	Surveyor	A. Gurney
4.	Southend to Robe	Surveyor	I. Stewart
5.	Robe to Kingston	Surveyor	Robert and Patsy Holme
6.	Kingston to 42 Mile	Surveyor	G. Schaeffer
7.	42 Mile to Murray Mouth	Surveyor	P. Nash

Area 1

Schleter surveyed in vehicles and walking where necessary. Distance 34 km Number of birds 8.

Area 2

Hughes surveyed in vehicle and walking where necessary. Distance 22 km Number of birds 11.

Areas 1 and 2 were surveyed on Saturday 5th November. The weather was cold and overcast, with an offshore wind of 20 km /h.

Both surveyors were disappointed with their results, suspecting that birds may have deserted the beach because of the rough, cold weather, to take shelter in the dune system.

Area 3

Gurney Surveyed on motor bike on Sunday 6th November. Weather favourable - calm, sunny day. One area near Carpenter Rocks not surveyed, due to inability to gain access to the beach. In his survey work, Gurney discovered a Hooded Plover nest 600 metres from the coast line, and 2 kilometres from the nearest beach. Nest had 3 eggs, and 2 adult birds sighted at nest site.

It is interesting to note that this nest was scraped out of very hard compacted sand. Photograph of nest taken.

Nest confirmed by National Parks and Wildlife Ranger at South End.

Distance 48 km. Number of birds 21.

Area 4

Stewart surveyed on motor bike and walking where necessary. Survey done on 6th November. Distance 57 km. Number of birds 35 + 3 chicks.

Stewart reported that 60 km is too large for one surveyor, as not sufficient time is devoted to searching for nests and rocky areas are not properly searched.

Area 5

Robert and Patsy Holme surveyed in vehicle and walking where necessary on 6th November. Distance 50 km. Number of Birds 27 + 4 chicks.

Area 6

Schaeffer surveyed in vehicle - 6th November. Distance 70 km. Number of Birds 21.

Area 7

Nash surveyed in vehicle 6th November. Distance 110 km. Number of birds 47.

On the return journey from the Murray Mouth to 42 Mile only 21 birds were sighted. The wind had increased considerably, and the surveyor suggests that many of the birds had moved onto the Coorong Lagoons because of the weather.

General Comments

All the surveyors spoke of the large number of fox tracks on the beach.

Chicks seen on the beach by surveyor Gurney a week earlier could not be sighted during this survey. Fox tracks in the area where the chicks were previously sighted appeared to indicate that the foxes were playing or chasing something.

Similar reports came from other surveyors.

Off Scenic Drive, Beachport, Stewart reported that it appeared a nest was in close proximity, but could not discover it. However, he did notice extensive fox tracks around a rocky outcrop on the beach, where the nest was believed to be.

Since the survey was undertaken, surveyor Gurney has spent considerable time checking on nests on the beach.

One nest was found on a rocky outcrop on the coast, with a nest on the actual rock.

A further nest was found on the Coorong Beach, 2 metres from the base of the dune, but was abandoned after a high tide reached the base of the dune. A further nest was sighted, close to the abandoned nest, which may have been the second nesting attempt by the same birds.

Gurney is of the opinion that high tides are reaching the base of the foredunes, and all nests on the flat beaches of the Coorong would be flooded before hatching.

The confirmed sightings were 170 Hooded Plovers (.43 per kilometre) but it would be certain that some birds were missed. Small areas were not surveyed, and some not thoroughly searched, and weather conditions were not ideal for the Saturday survey.

I am of the opinion that the beach from the Victorian Border to the Murray Mouth would contain 200 birds.

Final figures on sightings for the week-end November 5th and 6th 1988.

170 adult birds and 7 chicks

Since this survey was conducted, a Hooded Plover has been sighted inland in the Canunda National Park, well away from the coast line. The surveyor is of the opinion that the bird is nesting, in a position similar to the birds sighted nesting inland by Gurney.

Further surveys will be undertaken during the Autumn months, but more time will be devoted to inland searching and lake-side searches of the lagoon systems.

HOODED PLOVER AND PIED OYSTERCATCHER SURVEY - VICTORIA 1988

Mick Murlis, 34 Centre Road, Vermont, Victoria, 3133.

The biennial Hooded Plover and Pied Oystercatcher survey was carried out on Victorian beaches during October 1988 when some 114 intrepid counters braved blustery wet weather on both weekends of the survey. Coverage was excellent, better than any count since its inception in 1980 and sincere thanks go to all who were involved.

Almost 800 km of beaches were surveyed which is about 95% of the total possible. The total of 538 Hooded Plovers counted was more than the previous highest (474 in 1980) by 13.5%. After allowing for the sections of the coast not covered in this survey, which were approx. 10km of isolated beaches between Princeton and Capt Otway, approx. 15 km of the 90 Mile Beach from Barton Island to Lakes Entrance, approx. 35 km from Sydenham Inlet to 15km east of Point Hicks, one or two small isolated beaches around Wilsons Promontory, it appears that the total population of Hooded Plovers on Victorian beaches is in the order of 600 birds. From the comparative data given in Table 1, it is reasonable to conclude that the numbers over the 1980 total can possibly be attributed to continuing improvement in the competence/experience of many counters. However, the numbers do appear to have declined slightly in the stretch of coast from San Remo to Wilsons Promontory with a compensating increase in the population between Warnambool and Nelson.

Table 1

Comparative Hooded Plover Survey Results.

Area	1988	1986	1984	1982	1980
Nelson - Warnambool	234	192	183*	208	197
Warnambool - Cape Otway	7*	-	0	-	0
Cape Otway - Queenscliff	26	-	24	9	17
Point Nepean - Point Leo	26	27	15	36	5
Phillip Island	28	8*	20	27	14
San Remo - Darby Beach	66	86	105	105	77
Wilsons Promontory	0*	7*	19	-	18
Snake Island - McLaughlin Beach	35	22	4*	-	14
Ninety Mile Beach - Marlo (including Gippsland Lakes)	43*	6*	0*	5*	33
Marlo - Point Hicks	30*	-	-	-	43
Point Hicks - NSW Border	43*	18*	34	30*	34
	538	351	394	420	474

* incompletely covered
- area not covered

Details of the counts in individual areas are given in Table 3 together with coast description provided by the counters. Calculated densities of birds per kilometre for the individual areas are also given, highlighting the very high densities between Warnambool and Yambuk, as compared to beaches in Eastern Victoria.

Coast descriptions generally agree with the previous information that higher bird densities occur where there are greater seaweed densities on beaches. However, in some areas, e.g. Norman Bay, Squeaky Beach, Point Smythe to Venus Bay and around Flinders greater seaweed densities were not associated with higher Hooded Plover densities. This, and the declining population between San Remo and Wilsons Promontory, could be attributable to increased human activity on the beaches.

Only nine nests were found, possibly due to both good camouflage of the eggs and the difficulty of finding them in such poor weather conditions. One nest, at Port Fairy, was subsequently destroyed by a high tide.

Pied Oystercatcher Results

A comparison of the results of the 1988 and 1986 Pied Oystercatcher counts is given in Table 2 with details of the 1988 count in Table 3.

Table 2

Comparative Pied Oystercatcher Results for 1988 and 1986.

Area	1988		1986
	Pairs	Tot.Birds	Tot. Birds
S.A.Border-Warnambool	41	150	35
Warnambool-Cape Otway	1	2	-
Cape Otway-Queenscliff	7	35	-
Point Nepean-Point Leo	0	6	-
Phillip Island	1	5	1
San Remo-Darby Beach	0	8	4
Wilsons Promontory	2	7	-
Corner Inlet	9	98	)215
Snake Island-McLaughlins Beach	142	468	)
Marlo-Point Hicks	10	37	-
Point Hicks-NSW Border	10	42	12
	223	858	267

The extreme importance of Corner Inlet and the islands immediately east of it, to the Pied Oystercatcher population, is evident. Many breeding pairs and 33 nests were found on Clonmel Island and Box Bank. No nests were reported from Snake Island and Dream Island but, significantly, many fox tracks were seen.

One of the objectives of the Pied Oystercatcher Count was to check the dispersal of birds that had been colour-banded by the Victorian Wader Study Group when the birds were flocking during winter at Queenscliff, Werribee, Stockyard Point (Westernport Bay) and Inverloch. Only ten colour-banded birds (of those colour-banded between February and June 1988) were sighted during the October survey, with the following movements:

1, Queenscliff to Killarney (Light Green Band) - 200 km.
2, Queenscliff to Ocean Grove (Light Green Band) - 10 km.
2, Queenscliff to Point Lonsdale (Light Green Band) - 5 km.
1, Werribee to Port Fairy (Blue Band) - 220 km.
1, Stockyard Point to Killarney (Red Band) - 300 km.
3, Inverloch to Snake Island (Dark Green Band) - 100 km.

The movement distances shown are the approximate coastal distances that the birds would travel.

These data are extremely important as they indicate that;

a) Pied Oystercatchers travel further than was previously know for sure.

b) Movements are both eastward (Inverloch to Snake Island) and westward (Westernport, Queenscliff and Werribee to Western Victoria.)

c) Possibly Cape Patterson acts as a dividing point between birds that move eastwards to breed and those that move westwards to breed after flocking.

It also serves to emphasise the need to preserve habitats which act as flocking points for Pied Oystercatchers, such as Queenscliff.

The survey also reported the sighting of a Sooty Oystercatcher with a yellow band at Cape Patterson, that was originally banded at Snake Island. This is a movement in the opposite direction to that so far shown by Pied Oystercatchers.

Interesting sightings of other wader species were reported during the survey including Sanderlings near Shallow Inlet and at Point Franklin Beach (Cape Otway); Bar-tailed Godwits at many locations in Eastern Victoria and, especially interesting, over 1000 Red-capped Plovers between Seaspray and Reeves Beach on the Ninety Mile Beach.

Table 3. Census data by species and area.

Stretch of Coast	Km	Hooded Plover		Pied Oystercatcher		Coast Description Identifier (See below)
		No. Counted	No. per km	No. of pairs	Total Birds	
NSW Border to Mallacoota	25	31	1.2	7	26	C E G J L
Mallacoota Entrance to Betka River	5	-	-	-	-	D F G J M
Betka River to Mallacoota Aerodrome	3	-	-	-	-	D F K L
Mallacoota Aerodrome to Little Rame Head	9	-	-	-	-	A D F H K L
Little Rame Head to Sandpatch Point	7	2	0.3	-	-	B D F H K L
Sandpatch Point to Wingan Inlet	10	3	0.3	1	2	B D E G K M
Wingan Inlet to Point Hicks	14	7	0.5	2	14	B D E G K M
Point Hicks to Sydenham Inlet		Not Surveyed				
Sydenham to Pearl Point	12	9	0.8	3	9	B C E G K L
Pearl Point to Cape Conran	13	14	1.0	-	3	B C E G K L
Cape Conran to Point Ricardo	11	5	0.5	3	16	C E H K M
Point Ricardo to Snowy River	7	2	0.3	4	9	C E H K M
Snowy River to Lake Tyers	47	10	0.2	5	11	C E G K M
Lake Tyers Beach		2		-	1	C F H K M
Red Bluff to Lake Bunga	2	2	1.0	-	-	B C F H K M
Lake Bunga Beach		1		-	-	C F G K M
Lake Bunga to Eastern Beaches	3	1	0.3	-	-	C E H K M
Eastern Beaches to Footbridge (Lakes Entrance)	3	-	-	2	4	C E G K L
Footbridge to Entrance (Lakes Entrance)	3	4	1.3	2	4	C E G K L
Gippsland Lakes Islands	?	2	?	-	1	C E H K L
Mouth of Tambo River	2	-	-	-	1	C F H K M
Barton Island to Entrance		Not Surveyed				
Barton Island to Golden Beach	42	11	0.3	1	5	C E G K L
Golden Beach to McLaughlins Beach	72	10	0.1	2	4	D E G H K L
Dream Island	7	8	1.1	14	38	C F H K L M
Box Bank	13	11	0.9	52	111	C E F G H K M
Clonmel Island	14	4	0.3	54	235	C F G K M
Snake Island	18	12	0.7	9	53	C F G H K L
Various other islands - Corner Inlet	10	-	-	13	31	-
Corner Inlet	20	-	-	9	98	D F G K M
5 Mile Beach - Wilsons Promontory	8	-	-	-	-	B C F G K M
Oberon Bay to Little Oberon Bay	3	-	-	-	-	
Norman Bay, Wilsons Promontory	2	-	-	2	7	B C F G J M
Squeaky Beach, Wilsons Promontory	1	-	-	-	2	A C E G J M
Picnic Beach, Wilsons Promontory	1	-	-	-	2	A C D G K M
Darby River to Cotters Lake Track	5	6	1.2	-	-	A B D E G J M
Cotters Lake to Shallow Inlet	7	13	1.9	-	1	B C E H J M
Shallow Inlet to Waratah Bay	8	5	0.6	-	-	C F G K M
Cape Liptrap to Venus Bay SLSC	15	7	0.5)			C E G K L
Venus Bay SLSC to Point Smythe	20	14	0.7)	-	7	C E G J L
Inverloch to Cape Patterson		-	-	-	-	C F G K M
Cape Patterson to Harmers Haven	5	2	0.4	-	-	D E H K L
Harmers Haven to Powlett River	12	7	0.6	-	-	D E H K M
Powlett River to San Remo	8	12	1.5	-	-	C E H K L
Forrest Caves to Cape Woolamai (Phillip Is.)	6	11	1.7	-	-	D E G K M
Berry Beach to Summerland (Phillip Is.)	11	12	1.1	1	4	D E G K M
Cowrie Beach to Woolshed Bight (Phillip Is.)	7	3	0.4	-	-	D E H K M
Silverleaves to Observation Point (Phillip Is.)	3	2	0.6	-	1	C F G K L
Point Leo to Shoreham	2	-	-	-	-	D E H K M
Seaholme Beach to Flinders	3	-	-	-	-	A D F J M
Flinders Ocean Beach	1	-	-	-	-	A D F J M
Bushrangers Bay, Cape Schank	2	2	1.0	-	-	A D F J M
Gunamatta Fingal to Cape Schank	7	10	1.4	-	-	D E F G K L
Koonya Beach to No. 16	-	1		-	5	A D E G K L
Rye Ocean Beach to BOAC Rocks	7	12	1.7	-	-	B D G K M
Sorrento Back Beach to Portsea	5	1	0.2	-	1	D E H K M
Sand Island, Queenscliff	3	-	-	4	8	D E H K M
Queenscliff to Point Lonsdale	5	-	-	-	-	B C D E G K M
Lake Victoria	6	-	-	-	-	C F K M
Point Lonsdale to Fellows Road	1	2	2.0	1	2	B D E H K M
Fellows Road to Ocean Grove	5	5	1.0	2	8	B C E H K M
Barwon Heads to Black Rocks	8	3	0.3	1	15	B D F H K L
Black Rocks to Bream Creek	2	8	4.0	-	-	D F H K L
Bream Creek to Torquay	3	-	-	-	-	A D F H J L
Torquay to Point Addis	5	-	-	-	-	B C F K L
Point Addis to Anglesey	7	-	-	-	-	A C F G K N
Fairhaven to Point Roadnight	6	-	-	-	-	D E G K L
Point Roadnight to Urqharts Bluff	4	5	1.2	-	-	D E G K M
Fairhaven to Lorne	5	-	-	-	-	A G K M
Kennet River area	2	-	-	-	-	D F K L
Blanket Bay to Point Franklin	3	-	-	-	-	A D F H K L
Point Franklin Beach	2	3	1.5	1	2	B D E H J M
Cape Otway to Princetown		Not Covered				
Gibsons Steps to Port Campbell	1	-	-	-	-	A F K M
2 Mile Bay	0.4	-	-	-	-	D F H K L
Curdies River to Peterborough	2	3	1.5	-	-	C E G K M
Peterborough to Warnambool	40	4		1	2	A C F H J L
Warnambool to Killarney	12	33	2.7	2	29	-

Killarney to Port Fairy East	6	22	3.7	3	6	D E H J M
Port Fairy Griffith Island	6	6	1.0	2	6	D E G J M
Port Fairy to Cape Reamur	7	35	5.0	4	9	D E G J M
Cape Reamur to Crags	7	9	1.2	1	9	A D E G K L
Crags to Yambuk	5	22	4.4	2	6	A C E H K L
Yambuk to Fitzroy River	19	23	1.2	2	5	B C E H K L
Fitzroy River to Surrey River	13	17	1.2	4	8	B C F H K M
Surrey River to Allestree	3.5	8	2.2	-	-	C F H K N
Bridgewater Bay	16	4	0.25	7	25	B C E G K M
Cape Bridgewater to Swan Lake	18	6	0.3	5	14	C E H K L
Swan Lake to Cape Montesquieu	13	25	2.0	6	22	C E H J M
Cape Montesquieu to White Sands	13	18	1.3	3	8	C E H J M
White Sands to Nelson	7	6	1.1	-	3	C E H J M
	777	538		237	893	

NOTES: 1) The above totals include six juvenile Hooded Plovers found at Surrey River, Port Fairy, Killarney and Phillip Is. (3)

2) Nests were found at: Griffith Is Port Fairy (2 eggs) subsequently destroyed by high tide, 5 Mile Beach, Wilsons Promontory; Point Lonsdale; Box Bank (2 eggs); Rigby Is (Gippsland Lakes); Lake Bunga Beach; Red Bluff to Bunga Beach (3 eggs); Lake Tyers to Snowy River (2 eggs); Pt Ricardo to Cape Conran (2 eggs)

3) The key to the coast description identifier is taken from the sheets filled out by the counters as follows;

COAST DESCRIPTORS:

Mainly Cliffs:
- -with very little beach [A]
  OR
- -with lots of beach [B]

Completely Sandy Beach [C]
OR
Mixed Sand/Rock Reef Beach [D]

Backed by Extensive Dune [E]
OR
Backed by Narrow Dunes or none at all [F]

If there were dunes, was the vegetation on them:
- -thick and scrubby [G]
  OR
- -grassy, with frequent bare areas/blowouts [H]

Was there:
- -lots of sea-weed washed onto the beach (5% of beach covered) [J]
  OR
- -only some or none at all [K]

Was the intertidal area steep and narrow [L]
OR
Flat and broad [M]
OR
Flat and narrow [N]

Hooded Plover Survey - New South Wales

Alan K. Morris, P.O. Box 1392, Gosford South, N.S.W. 2250.

On the weekend 22/23rd October, 1988, the Australian Wader Study Group organised a national wader survey to count the Hooded Plovers in Australia. I organised the N.S.W. section of the survey and 23 amateur bird watchers walked 190 km. of beaches in search of the birds.

Previous counts have estimated the adult breeding population in N.S.W. to be 30-40 birds. This survey (Table 1) showed that the population is abo ut 60 adults, and that the National Parks and Nature Reserves on the N.S.W. South Coast, particularly Cudmirah and Nadgee Nature Reserves, and Murramurrang, Mimosa Rocks, Ben Boyd and Wallaga Lakes National Parks are important locations for the birds. Even on the beaches in the Parks & Reserves, the birds are under threat of too much disturbance.

Table 1 - Hooded Plover Survey N.S.W. 22/23/10/1988.

Beach	Nature Res.	Dist.	Observer	Number
Comerong Beach	Comerong Is. N.R.	3 km	R. Griffin	Nil
Steamers Beach	Jervis Bay N.R.	1 km	P. Davie	Nil
Cave Beach	Jervis Bay N.R.	1 km	P. Davie	Nil
Bherwherre Beach	Jervis Bay N.R.	10 km	P. Davie	Nil
Sussex Inlet Beach	Jervis Bay N.R.	3 km	S.&K.Marden	Nil
Cudmirrah/Berrara	Cudmirrah N.R.	10 km	J. Parker	2A
Berrara/Nth Bendalong		7 km	J. Parker	Nil
Bendalong		6 km	J. Parker	1A
Conjurong		3 km	J. Parker	Nil
Conjola Beach		6 km	P.L. Mallard	Nil
Buckleys Beach	Narrawallee N.R.	1 km	J. Pegler	2A + N 3E
Narrawallee Beach	Narrawallee N.R.	3 km	P.L.Mallard	Nil
Mollymook Beach		4 km	P.L. Mallard	Nil
Wairo Beach		10 km	P.L. Mallard	3A
Burrill Beach		4 km	P.L. Mallard	1A
Racecourse Beach	Burrill	3 km	P.O. Mallard	6A
Tabourie		1 km	J. Brierly	Nil
Willinga		1 km	J. Brierly	Nil
Bawley Point		0.5 km	J. Brierly	Nil
Cormorant		0.5 km	J. Brierly	Nil
Gawney		0.5 km	J. Brierly	Nil
Murramurrang	Murramurrang N.P.	1 km	J. Brierly	Nil
Bull Pup	Murramurrang N.P.	1 km	J. Brierly	Nil
Racecourse	Murramurrang N.P.	1 km	J. Brierly	Nil
Kioloa	Murramurrang N.P.	1 km	J. Brierly	Nil
Merry Beach		0.5 km	J. Brierly	Nil
Durras North	Murramurrang N.P.	7 km	B. Dekker	1A
South Durras		4 km	B. Dekker	Nil
Wasp Head Beaches		4.5 km	B. Dekker	Nil
Durras		2 km	B. Dekker	Nil
Richmond		1.5 km	B. Dekker	Nil
Oaky		3 km	B. Dekker	Nil
North Head		3 km	Not visited	
Chain Beach (Batemans Bay)		2 km	J. Scrivens	2 + Nest
Guerrilla Bay to Broulee		5 km	M. Wulfing	Nil
Broulee to North Head		5 km	J. Whiter	Nil
Moruya S. Head		2 km	S. Dodd	2A
Congo Beach		1 km	S. Dodd	Nil
Congo Pt. to Bingie Bingi Pt.		2.5 km	M. Butterfield	1A
Coila Bar, Bingi Beach		4 km	C. Campion	Nil
South Tuross		4 km	J.J. Lindsey	Nil
Brow Beach		3 km	J. Lindsey	Nil
Brow Lake to Dalmeny		4 km	P. Kingston	Nil
Dalmeny to Narooma		4.5 km	P. Kingston	Nil
Narooma Beach		2 km	M.A. Crowley	2A
Fullers Beach		4 km	S. Marchant	2A
Mystery Bay		2.5 km	S. Marchant	Nil
Mystery Bay top Tilba Trig		4 km	P. Bulger	2A
Tilba Tilba Lake to Wallaga Lake		9 km	M.T. Murn	Nil
Keatings Beach, Bermagui		1.5 km	T. Hoskings	Nil
Haywards Beach, Bermagui		4 km	T. Hoskings	Nil
Baragoot Beach		Not visited		
Cuttagee Beach		1 km	J. Witt	1A
Murrah Beach, Bunga		Not visited		
Bunga Beach, Mimosa Rocks N.P.		Not visited		
Mimosa Beach, Mimosa Rocks N.P.		0.5 km	J. Witt	2A & 2Im
Gilliards Beach Mimosa Rocks N.P.		2 km	J. Witt	2A
Tathra Beach		2 km	J. Witt	2A
Bournda Beach	Bournda S.R.A.	2 km	J. Witt	Nil
Tura Beach		Not visited		
Short Point Beach (Merimbula)		Not visited		
Merimbula Beach		Not visited		
Pambula Beach		Not visited		
Quondolo Beaches	Ben Boyd N.P.	Not visited		
Saltwater Creek	Ben Boyd N.P.	0.5 km	AKM,PR&DS	2A+N3E
North Womboyn	Ben Boyd N.P.	Not visited		
South Womboyn	Nadgee N.R.	5 km	AKM,PR&DS	4A
Lake Spiers Beach	Nadgee N.R.	2.5 km	AKM,PR&DS	4A
Wally Newtons Beach	Nadgee N.R.	2 km	AKM,PR&DS	1A
Little River Beach	Nadgee N.R.	0.5 km	AKM,PR&DS	Nil
Madgee Beach	Nadgee N.R.	1 km	AKM,PR&DS	1A
Saltwater Beach	Nadgee N.R.	1.5 km	AKM,PR&DS	2A
Cape Howe Beach		Not visited		

Total number of Adults	46
Total number of Juveniles/Immatures	2
Number of nests	3
Number of Beach Kilometres Survey	189.5

Approximate Number of Birds in N.S.W.

1. From my experience single birds in October often indicate that another bird is nesting somewhere else on the beach. Even expert observers have difficulty finding the sitting bird. If each single bird represents one pair then another 6 birds can be expected to occur.
   ADD 6

2. Some beaches which were not visited are known to hold birds viz. Cape Howe, North Womboyn and Probably Murray and Bunga Beach and possibly others.
   ADD 10

Total estimated Adult Population in N.S.W. 62

The Hooded Plover Survey was co-ordinated by Mick Murlis.

HOP, SKIP, OR JUMP? CONSTRAINTS ON MIGRATION OF ARCTIC WADERS BY FEEDING, FATTENING, AND FLIGHT SPEED

Theunis Piersma

This article was first published in Dutch as: Piersma,T. 1987. Hink, stap of sprong? Reisbeperkingen van arctische steltlopers door voedselzoeken, vetopbouw en vliegsnelheid. Limosa *60: 185-194. Because of its wide interest, we are reprinting, with permission, the English summary and the figures and tables from the paper. Reprints of the full paper are available from Theunis Piersma at the address given at the end of this article.*

This is a progress report on the research on spring migration strategies of arctic breeding waders wintering along the west coast of Africa. Three alternative travel schemes (Figure 1) provide a framework in which the constraints on migration by feeding, fattening, and flight (ground) speed are discussed.

Using the example of spring migrating Dunlins *Calidris alpina* through a coastal stopover area in Morocco, it is shown that food availability, foraging activity, staging time, and fattening rates are interrelated (Table 1). Fattening is discussed on the basis of data on body weight changes of male Bar-tailed Godwit *Limosa*

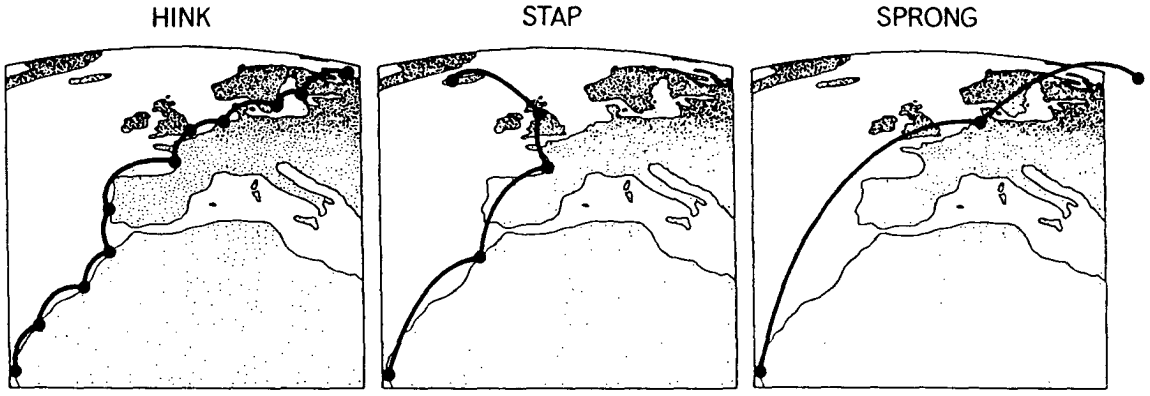

Figure 1. Illustration of three travel schemes for the spring migration of coastal waders from west Africa to the (sub-)arctic breeding grounds: hink (hop: e.g. early migrating Turnstones), stap (skip: Dunlins, Redshanks), or sprong (jump: Knots, Bar-tailed Godwits).

Table 1. Food availability, foraging activity, average staging time, and body weight increase of Dunlins in the Sidi Moussa estuary, Morocco, in March 1981 and April 1982. Food availability is given as biomass (g AFDW/m²) of their most important prey, the ragworm *Nereis diversicolor*. Foraging activity was scored in both years on the same plot during a number of low tide periods (within 3 h from the time of low water), as the percentage of Dunlins present that was foraging. The average staging time was calculated according to a modified capture-recapture method (see Kersten *et al.* 1983). The body weight increase (g/day) was calculated from weighings during the entire migration periods.

	March 1981	April 1982
Food (g/m)	5.4	14.9
Foraging activity (%)	88	80
Average staging time (days)	16	11
Body mass increase (g/day)	1.2	1.6

lapponica during the 1985 spring migration (Figure 2). Fattening is much slower and departure weights are lower on the Banc d'Arguin (Mauritania) than in the Dutch Wadden Sea (Figure 3a), despite the fact that the distance to the goals after departure from the two sites is of comparable magnitude. Lower than average fattening rates at this last spring stopover site lead to a delayed departure to, or a small arrival weight on, the breeding grounds (Figure 3b). It is argued that limited fattening rates which lead to departure delays at the early staging areas, have strong effects on the required fattening efforts at later stopover sites (Figure 3c). This is called the "domino effect".

The possible effects of winds at ground level and at high altitudes during migratory flights are examined by seeing whether 80 gram fat (Figure 3a) is sufficient for male Bar-tailed Godwits to cover the distance between the Banc d'Arguin and the Wadden Sea. It is shown that in the case of the Bar-tailed Godwits leaving the Banc d'Arguin on 25 April 1985, 80 gram would have been sufficient if the godwits managed to fly in the most favourable winds at high (up to 5.5 km) and varying altitudes (Figures 5, 6).

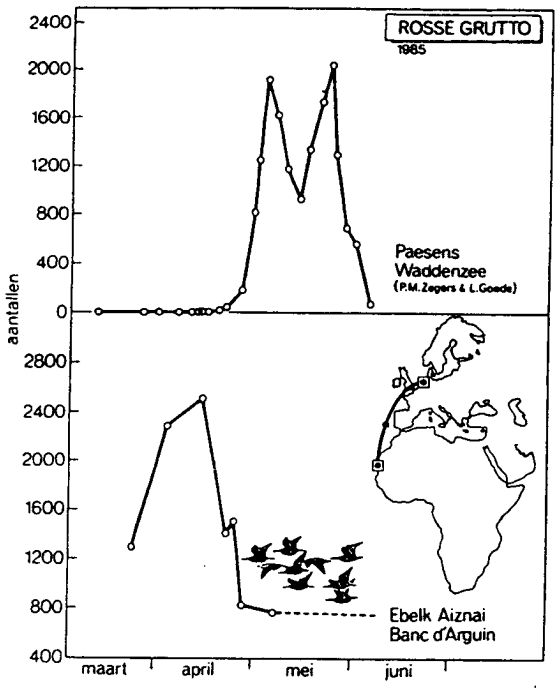

Figure 2. Changes in the numbers of Bar-tailed Godwits on a roost in the wintering area (Ebelk Aiznai, Banc d'Arguin) and in a staging area (Paesenserpolder, Dutch Wadden Sea) in spring 1985. The map shows the location of the two sites. The arrow indicates that two Bar-tailed Godwits, which were colour-marked on the Banc d'Arguin in 1985, were relocated near Paesens one month afterwards.

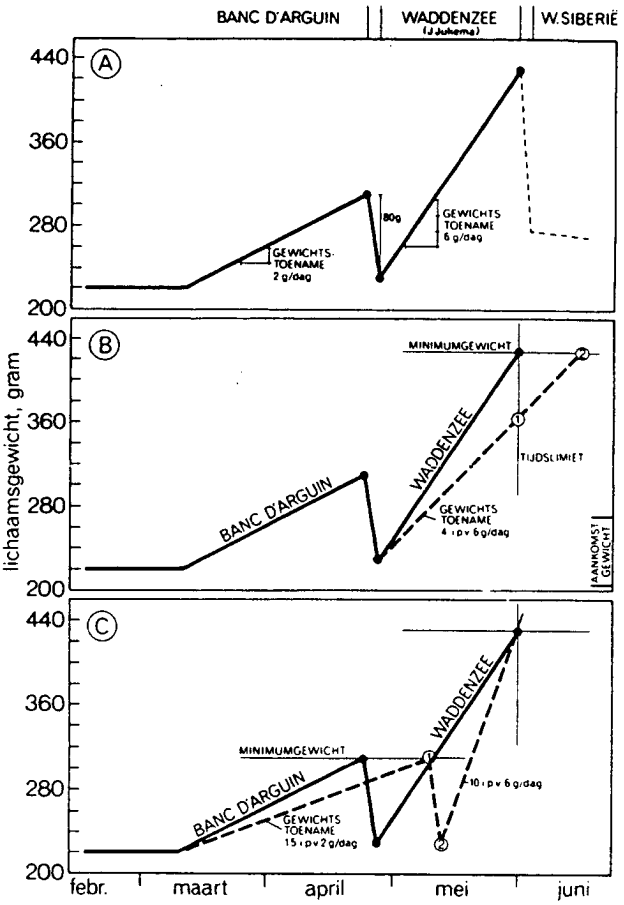

Figure 3. Average weight changes of male Bar-tailed Godwits during the spring migration of 1985. Thick lines indicate measured weight changes, striped lines estimated (A) and hypothetical (B,C) weight changes, respectively.

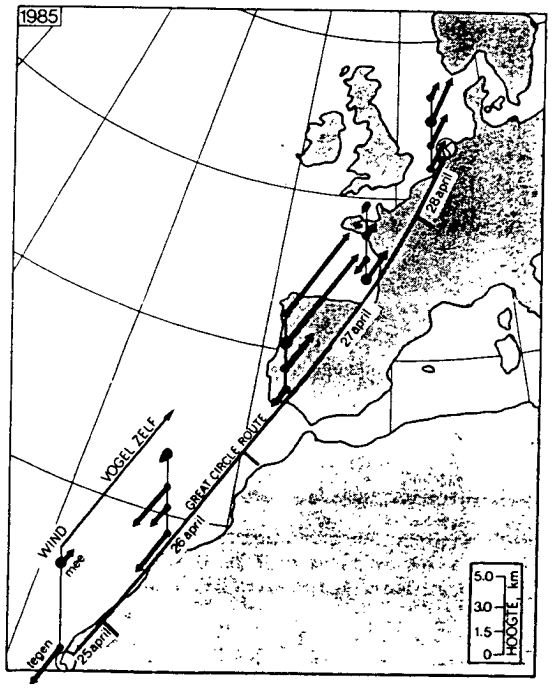

Figure 5. Calculated strengths of opposing *(tegen)* or following *(mee)* wind-vectors at different heights relative to the birds' own flight speed (56 km/hr), and direction. The picture applies to the migration of the Bar-tailed Godwits that left the Banc d'Arguin on 25 April 1985 (see Ens 1985). The thick dots indicate the best flight heights at each site.

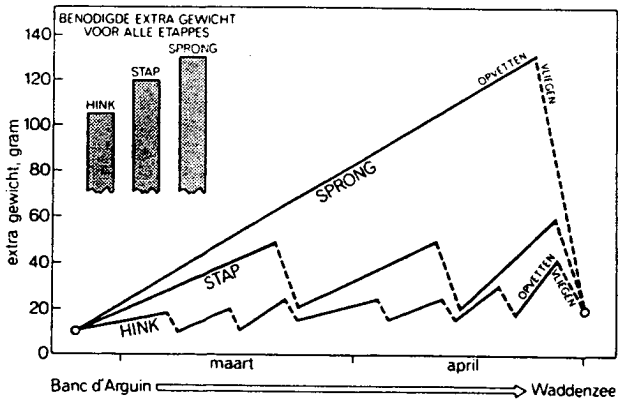

Figure 4. Scheme of the weight changes (g extra weight) during spring migration of a wader species from West Africa to the Wadden Sea according to three different travel schemes: *hink* (hop), *stap* (skip), or *sprong* (jump, see Figure 1). Hatched, incomplete bars (based on the x-axies) indicate the total extra (fat) mass required to cover the entire distance under the three flight regimes.

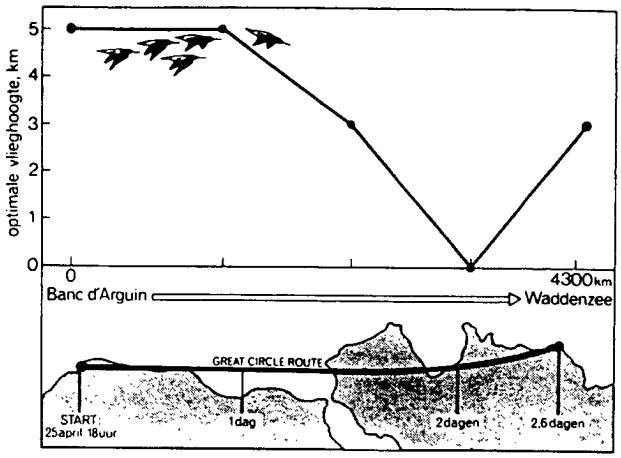

Figure 6. Hypothetical track of optimal flight heights of Bar-tailed Godwits which left the Banc d'Arguin on 25 April 1985 for a direct flight to the Dutch Wadden Sea (based on Figure 5).

Figure 4 shows that making a series of short flights is always energetically cheaper than covering the same distance in one long flight, due to the costs of transporting the extra fuel (fat). "Hopping" also entails smaller risks of fattening and timing delays. The reason that many waders nevertheless make very long flights, is thought to be due to a limited availability of high quality feeding (stopover) habitats along the flyways. In addition to the (species-specific) availability of good habitats, seasonal (high altitude) wind patterns may have a modifying influence on the timing and patterning of wader migration.

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THE IMPORTANCE OF SOUTH-EAST SUMATRA AS A SUMMERING AREA FOR NON-BREEDING WADERS, ESPECIALLY THE BAR-TAILED GODWIT *LIMOSA LAPPONICA*

Finn Danielsen & Henrik Skov

INTRODUCTION

Before 1983 almost nothing was known about the avifauna of the coastal wetlands of eastern Sumatra. Since then three surveys of waterbirds have been carried out; in October-November 1984, in July-August 1985 and in March-April 1986 (Silvius *et al.* 1986, Danielsen & Skov 1986, Silvius 1986).

These surveys have found that eastern Sumatra is a vital link in the East Asia/Australasia flyway for waders. This flyway population is considered to be the smallest and most threatened in the world with a total population of 4-6 million birds of over 70 species (Parish 1987). The three surveys demonstrated that several coastal wetlands in eastern Sumatra are of international importance for waterbirds according to the criteria of the Ramsar Convention.

This paper presents the results of the survey in 1985, when wader counts were carried out in the provinces of Jambi and Sumatra Selatan during the northern summer (for other details see Danielsen & Skov 1986). The aims of this survey were to find out the number and species of summering waders and the key sites of waders and their status.

STUDY AREA AND METHODS

The coastline of the provinces of Jambi and Sumatra Selatan in south-east Sumatra (103°5'E, 1°N - 2°5'S) consists mainly of accreting shores with 50-1000 m wide mudflats bordered by mangrove forest (Figure 1).

Fieldwork was conducted in late July in the province of Jambi and in early August in the province of Sumatra Selatan. In Jambi, a total of approximately 150 km of the coastline were

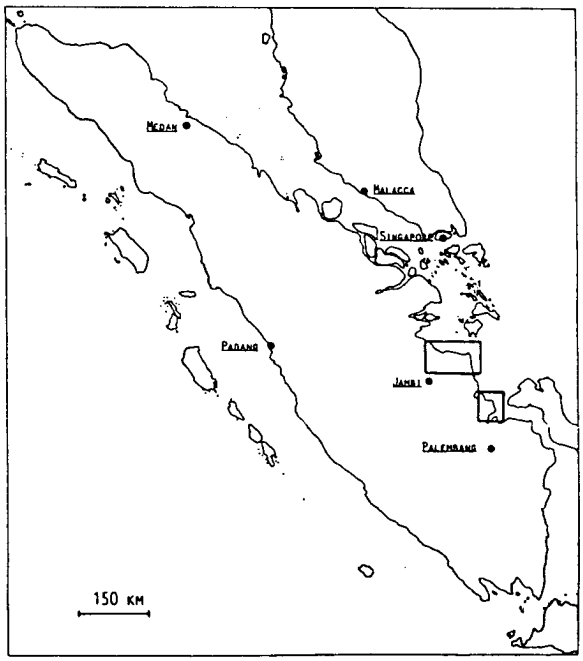


Figure 1. Map of South East Sumatra, showing the study areas at Jambi and Sumatra Selatan.

surveyed between Kuala Tungkal and Tanjung Djabung. In Sumatra Selatan, about 80 km along the peninsula between Sungai Sembilang and Banuyasin II estuary were surveyed.

We travelled eastwards and northwards along the coastline in patrol boats, together with guides from PPA (Directorat General for Forest Protection and Nature Conservation in Indonesia) to observe shorebirds migrating

Table 1. Counts of waders in Jambi and Sumatra Selatan in July and August 1985.

		Jambi	S Selatan	Total
Grey Plover	*Pluvialis squatarola*	0	2	2
Mongolian Plover	*Charadrius mongolus*	10	0	10
Greater Sand Plover	*Charadrius leschenaultii*	7	0	7
Mongolian/ Greater Sand Plover		294	*200	494
Eurasian Curlew	*Numenius arquata*	2 253	800	3 053
Whimbrel	*Numenius phaeopus*	366	700	1 066
Eastern Curlew	*Numenius madagascariensis*	0	2	2
Black-tailed Godwit	*Limosa limosa*	12 800	30 000	42 800
Bar-tailed Godwit	*Limosa lapponica*	20	2 000	2 020
Redshank	*Tringa totanus*	1 024	*1 000	2 024
Marsh Sandpiper	*Tringa stagnatilis*	80	*100	180
Greenshank	*Tringa nebularia*	1	8	9
Terek Sandpiper	*Xenus cinereus*	783	*500	1 283
Common Sandpiper	*Actitis hypoleucos*	3	21	24
Turnstone	*Arenaria interpres*	1	0	1
Asian Dowitcher	*Limnodromus semipalmatus*	16	0	16
Great Knot	*Calidris tenuirostris*	2	1	3
Red-necked Stint	*Calidris ruficollis*	0	*100	100
Curlew Sandpiper	*Calidris ferruginea*	144	*100	244
Eastern Collared Pratincole	*Glareola maldivarum*	25	0	25
Total		17 828	35 534	53 363

* These figures are minimum numbers estimated from identification of approximately 20% of the total waders seen.

along their flyway during their early autumn migration. Starting points were the small fishing settlement Nipah Panjang at the mouth of the river Batang Hari and Palembang.

The coast was observed from short distances of 50-800 m. During the fieldwork period, high tides were mostly during the afternoon, so counts of birds at high tide roosting sites could easily be made whilst skirting the coast.

Counts were generally made with 10x50 binoculars. However if large numbers of waders were seen, a 25x60 telescope was used. In some places shortage of time or large waves made use of telescope impossible. On such occasions an estimate of total numbers was made, and sometimes (e.g. Telok Galas) only a small percentage (20%) of waders could be identified. The time spent on census of birds varies from site to site, and ranged from several hours to several days.

A few wader species roosted at high tide on the branches of mangrove trees along the shoreline (and sometimes on scattered trees further inland and out of immediate sight), so it was sometimes necessary to flush these waders by shouting.

RESULTS

The results of the wader counts are presented in Table 1. A total of 55 000 summering and migrating waders was found. Most abundant were Black-tailed Godwits, numbering 43 000 birds. The majority of the Black-tailed Godwits gathered at three high-tide roosting sites: Sungai Simbur Naik, 6 000 birds (24 July), Tanjung Jabung, 4 500 birds (27 July) and Telok Galas 30 000 birds (4 August).

We found it difficult to determine the age of the Black-tailed Godwits. A few birds were identified as adults in worn breeding plumage or in full non-breeding plumage. The majority of birds identified were considered immatures or post-juveniles, from the combination of the presence of a pectoral band and lack of barring of underparts. Adults in transitional plumage are almost impossible to separate from immatures/post-juveniles, but it is very unlikely that the majority of adults present at the beginning of August would have already moulted into full winter plumage.

A total of 3 000 Eurasian Curlews *Numenius arquata* was observed, with approximately 800 at Tanjung Jabung and at Telok Galas. About 2 000 Bar-tailed Godwits *Limosa lapponica* were found, nearly all in the vicinity of Telok Galas. All birds observed were in full non-breeding plumage. In addition, a total of 2 000 Redshanks *Tringa totanus* were found, with a maximum of 500 at the mouth of Sungai Simbur Naik and at Telok Galas. Small numbers of Asian Dowitchers *Limnodromus semipalmatus* were recorded at the mouth of Sungai Simbur Naik (9 birds) and at the mouth of Kuala Sado-Luar (6 birds).

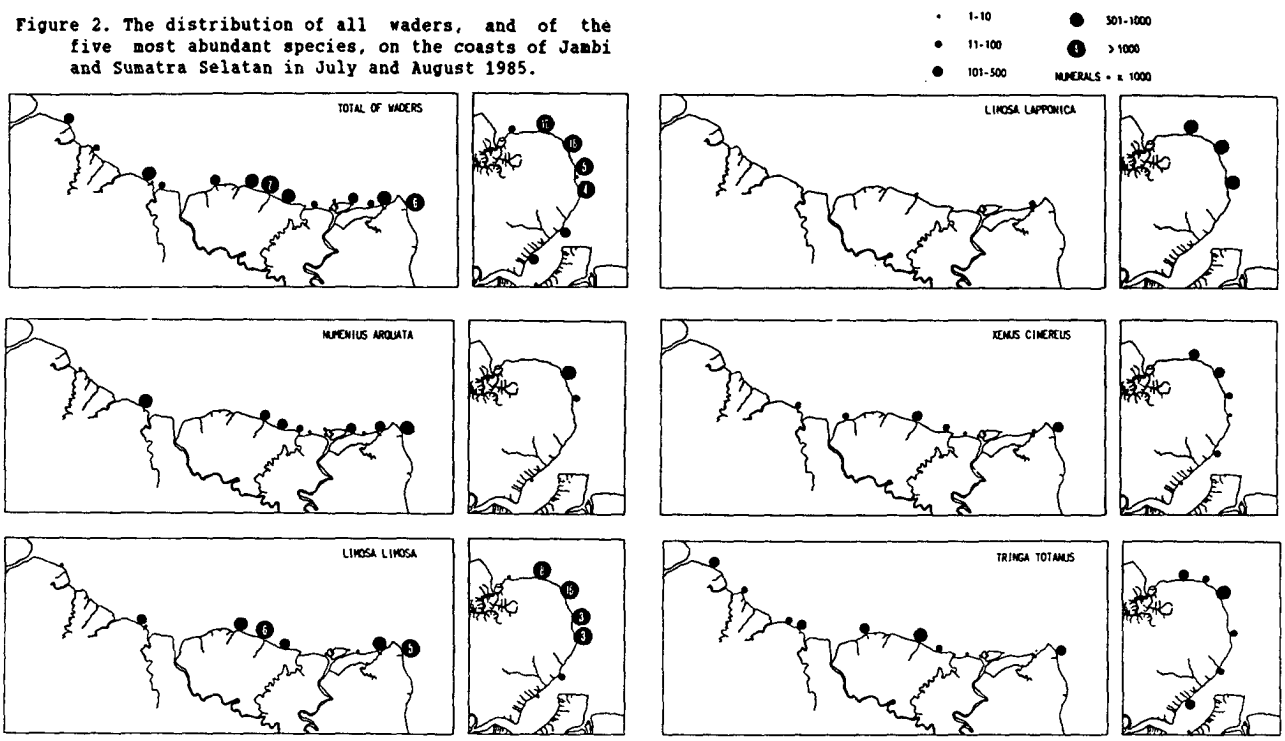
DISCUSSION

Such large numbers of migratory waders as we recorded are unprecedented at this time of the year in any area in South East Asia. ComparableBlack-tailed Godwits have previously been recorded only on the River Niger in Africa and the Gulf of Carpentaria in northern Australia (Morel & Roux 1973, D. Parish in litt.).

Our observations indicate that south-east Sumatra most likely to be used as a summering area for non-breeding Black-tailed Godwits. The first arrivals of juveniles in Africa occur in the middle of August (Morel & Roux 1971). In October-November 1986 a total of 16 000 Black-tailed Godwits were seen in eastern Sumatra, indicating that the majority of the birds do not stay in the area but migrate further south. Lane (1984) recorded a total of 56 500 wintering in Australia.

From Museum collections in the Netherlands, Silvius *et al.* (1985) found evidence that the Asian Dowitcher was summering in Sumatra in small numbers in the 1930s. During the present

Figure 2. The distribution of all waders, and of the five most abundant species, on the coasts of Jambi and Sumatra Selatan in July and August 1985.



study some Asian Dowitchers might have been overlooked and mistaken as Bar-tailed Godwits, and it is very likely that more Asian Dowitchers actually were present.

During the survey in the same area in October-November 1984, the most abundant species was also the Black-tailed Godwit, followed in abundance by the Mongolian Plover and the Redshank. However, the dominating species during the survey in March-April 1986 were the Redshank, followed by the Asian Dowitcher and the Mongolian Plover. For a detailed comparison of these three surveys see Silvius (1988).

Our survey indicates that Sumatra is an important summering area during the northern breeding season for several species of waders, particularly Eurasian Curlew, Black-tailed Godwit, Bar-tailed Godwit and Redshank. If the numbers of Black-tailed Godwit that we observed occur in this area each year, then South-east Sumatra should be regarded as the most important summering area in the world for non-breeding birds of this species.

The shoreline of south-east Sumatra is under severe threat from agricultural exploitation and logging operations of the mangrove forest, and from rapid land-claim. More basic information is needed on the location of key sites for waterbirds, since the conservation of these birds and their habitats is of great urgency. Most of the coastal wetlands in Indonesia have so far received little or no ornithological attention.

ACKNOWLEDGEMENTS

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BAR-TAILED GODWIT *LIMOSA LAPPONICA* IN AUSTRALIA PART 1: RACES, BREEDING AREAS AND MIGRATION ROUTES

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1. SUMMARY

Bill and wing length data obtained from more than 2100 Bar-tailed Godwits caught in Australia show that birds from north-western Australia have significantly longer bills (2 to 4mm, on average, for adult females and males, respectively) and shorter wings (5mm) than those from the south-east. Neither group of birds match well the published biometric data for *baueri*, the race which is claimed to spend the non-breeding season in Australia. Sexing criteria based on bill length have been established for both adult and juvenile Godwits in the two regions and allow approximately 90% of birds to be sexed at the 95% confidence level. The adult sex ratio is unity in south-east Australia, whilst in the north-west males form about 70% of the population. Band returns show that Godwits from Western Australia migrate northwards via the Chinese coast to breeding grounds in central north Siberia. South-eastern Godwits appear to have a different migration route and possibly breed in Alaska. The size and sex ratio differences, together with probable differences in migration routes and breeding grounds, indicate that there may be two races present in Australia, neither of which seem to be *baueri*. Biometric data and breeding site location support the view that Godwits from north-western Australia are of the, as yet, unaccepted *menzbieri* sub-species described by Portenko.

2. INTRODUCTION

Two sub-species of Bar-tailed Godwit are recognised: the nominate *lapponica*, breeding from the Taimyr Peninsular west to northern Europe and spending the non-breeding season on the coasts of Europe and west Africa, and *baueri*, which breeds in Siberia, east from the Taimyr peninsular, and in Alaska, and migrates to south-east Asia and Australasia during the northern winter (Cramp and Simmons 1983).

The two races can be separated on the basis of size, with *baueri* being the larger (see Tables 1 and 2), and on plumage (see for example Hayman et al. 1986, Prater et al. 1977, Nieboer et al. 1985). The females of both races are larger than the males.

It has been suggested by Portenko (1936) that an intermediate race, *menzbieri*, different in both size and plumage to the other two, occurs in central north Siberia, but Vaurie (1965) includes these birds within *baueri*. Portenko's measurements for *menzbieri*, as well as those for *baueri* and *lapponica*, are included in Tables 1 and 2. His bill and wing length values for the latter two sub-species are noticeably shorter than those of Prater et al, being c.3mm less for *baueri* and 2mm less for *lapponica*.

Rogers (1984) has analysed bill and wing length measurements, and moult and weight data, obtained from the early catches of Bar-tailed Godwits in south-eastern Australia. His bill and wing length results are also given in Tables 1 and 2.

Lane (1987) estimates that the Bar-tailed Godwit population in Australasia totals more than 200,000 birds, with at least 100,000 occurring in north-western Australia, 34,000 in the south-east and 70,000 in New Zealand, where it is the most common wader. The *lapponica* population is estimated to be about 650,000 (Cramp and Simmons 1983). Lane also records that Godwits are common on southward migration in Japan, Korea and The Philippines, but are scarce at that time on the south-east Asian coastline. He suggests that the regular occurrence of Godwits on migration in the Pacific and the relative scarcity in far eastern Asia on northward migration, compared to southward, indicates that birds take a more direct route back to the breeding grounds. He also comments that few Godwits appear to move between the north-west and south-east coasts of Australia during either migration.

This paper records average bill and wing length data obtained from most of the 2141 Godwits which have been caught in Australia between 1979 and 1988. Totals of 853 have been caught in south-eastern Australia and 1288 in the north-west. A more detailed analysis of biometric and moult data and population structure is included in Part 2 of this paper. Information is also given on band recoveries and comment is made on races occurring in Australia.

3. METHODS

The great majority of birds were caught with cannon nets. Reasonable samples were obtained in south-eastern Australia (SEA) for all months in the non-breeding season (September to March), except February, and for June (non-breeding first-year birds). Data from north-western Australia (NWA) have been obtained during five expeditions covering the August/September (arrival), October/November and March/April (departure) periods.

Biometric data were obtained using standard methods and birds were aged by primary feather wear and plumage pattern. The ageing convention used is that of the Australian Bird and Bat Banding Schemes:

3+ - in third year or older
2+ - in second year or older
2 - in second year
1 - in first year.

It is generally possible to separate 3+ and second year birds during the October to December period. However, this cannot be done following moult of the tenth primary in either age group and both are then aged as 2+. Three+ and 2+ birds are often referred to as adults and first years as juveniles.

4. RESULTS AND DISCUSSION

Bill Length

Bill lengths were taken to the nearest whole mm. Frequency histograms of bill length for adult and first year Godwits in NWA and SEA are shown in Fig. 1. It is evident that NWA males of both age groups (i.e. the birds with shorter bills) have longer bills than SEA males, with this tendency being less so for females. Inspection of the histograms also indicates that bill length variability is greater in females than males, and that there are more males than females in NWA.

Use of a computerised method (Rogers, in press) to determine male and female bill lengths for the two age groups in each region (based on the Griffith (1968) percentage cumulative frequency technique (PCF) and assuming coefficients of variation to be equal) gave the results listed in Table 3, and these confirm the visual interpretation of the histograms. Application of the chi-squared test confirms that in all four cases the estimated bill size distribution is consistent with the observed distribution. The agreement of SEA bill length data with that obtained previously by Rogers (1984) is excellent.

Average NWA male bills are 4.1 to 6.0mm longer than those of SEA males depending on age (adults 86.1 vs. 82.0mm; juveniles 87.5 vs. 81.5mm), whilst the differences in females are 1.8 to 2.5mm (adults

Table 1. Published data for bill lengths (mm).

		MALE				FEMALE				
Sub-species	Age	n	$\bar{x}$	sd	Range	n	$\bar{x}$	sd	Range	Source
baueri	A	26	83.6	-	75/94	15	110.5	-	102/119	(1)
"	U	428	82.0	4.84	-	-	106.5	6.39	-	(2) *
"	U	16	80.7	-	70/89	17	107.0	-	88/119	(3)
lapponica	A	62	78.5	-	69/87	30	99.2	-	86/108	(1)
"	U	34	80.4	3.30	72/86	22	97.7	5.43	86/107	(4)
"	U	29	76.7	-	68/84	33	97.2	-	89/110	(3)
menzbieri	U	8	83.7	-	80/86	9	105.8	-	95/110	(3)
baueri	J	17	79.4	-	72/88	14	100.9	-	96/116	(1)
lapponica	J	54	75.0	-	61/83	37	90.0	-	75/103	(1)

KEY: A,3+ or 2+ = adult, J or 1 = juvenile, U = unaged.
n=sample size, $\bar{x}$ = mean, sd = standard deviation.
(1)=Prater *et al.* (1977).
(2)=Rogers (1984).
(3)=Portenko (1936).
(4)=Cramp and Simmons (1983).
*=data obtained from live birds using percentage cumulative frequency method.

Table 2. Published data for wing lengths (mm).

		MALE				FEMALE				
Sub-species	Age	n	$\bar{x}$	sd	Range	n	$\bar{x}$	sd	Range	Source
baueri	A	26	224.4	-	210/242	17	238.9	-	227/256	(1)
"	U	281	225.1	6.3	-	-	239.0	5.9	-	(2) *
"	U	16	215.8	-	206/230	17	233.2	-	224/249	(3)
lapponica	A	64	211.3		200/221	31	223.3	-	214/231	(1)
"	U	36	210	5.0	203/224	25	223	5.6	204/230	(4)
"	U	31	205.8	-	197/218	34	216.5	-	209/232	(3)
menzbieri	U	8	213.9	-	209/223	11	225.4	-	218/239	(3)
baueri	J	17	211.9	-	199/228	14	227.1	-	216/240	(1)
lapponica	J	57	204.7	-	190/219	31	216.9	-	209/224	(1)

Table 3. Bill length data (mm) for adult (3+/2+) and first year (1) Bar-tailed Godwits as determined by the PCF technique.

			MALE		FEMALE		
Age	Region	Sample Size	$\bar{x}$	sd	$\bar{x}$	sd	Estimated % male
3+/2+	NWA	450	86.1	4.9	108.2	5.6	68
"	SEA	667	82.0	5.2	106.4	6.7	51
1	NWA	683	87.5	4.1	109.3	5.2	68
"	SEA	129	81.5	5.6	106.8	7.3	60

Table 4. Sexing criteria for adult (3+/2+) and first year (1) Bar-tailed Godwits at the 95% confidence level, based on bill length (mm).

Region	Age	Male	Female	% sexed correctly	% sexed wrongly
NWA	3+/2+	≤92	≥100	91.7	0.2
"	1	≤94	≥101	94.4	0.1
SEA	3+/2+	≤88	≥97	89.9	0.2
"	1	≤87	≥98	86.3	0.2

Table 5. Wing length data (mm) for adult (2+) and first year (1) Bar-tailed Godwits calculated from birds sexed on bill length by the PCF method.

			MALE		FEMALE	
Age	Region	Sample size	$\bar{x}$	sd	$\bar{x}$	sd
2+	NWA	128	219.2	5.9	233.2	6.8
"	SEA	355	224.6	6.6	238.7	6.8
1	NWA	213	208.0	6.6	217.6	6.2
"	SEA	106	217.5	6.7	232.9	6.9

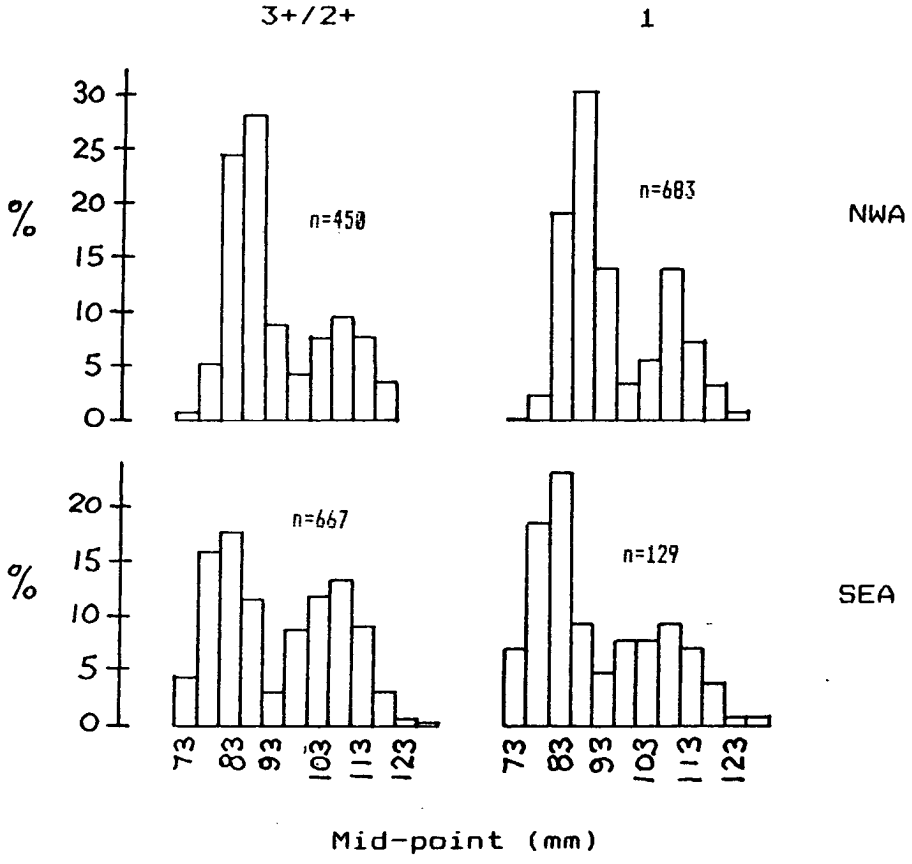

Fig 1. Percentage frequency histograms of bill-lengths for adult (3+/2+) and juvenile (1) Bar-tailed Godwit in north-western (NWA) and south-eastern (SEA) Australia.

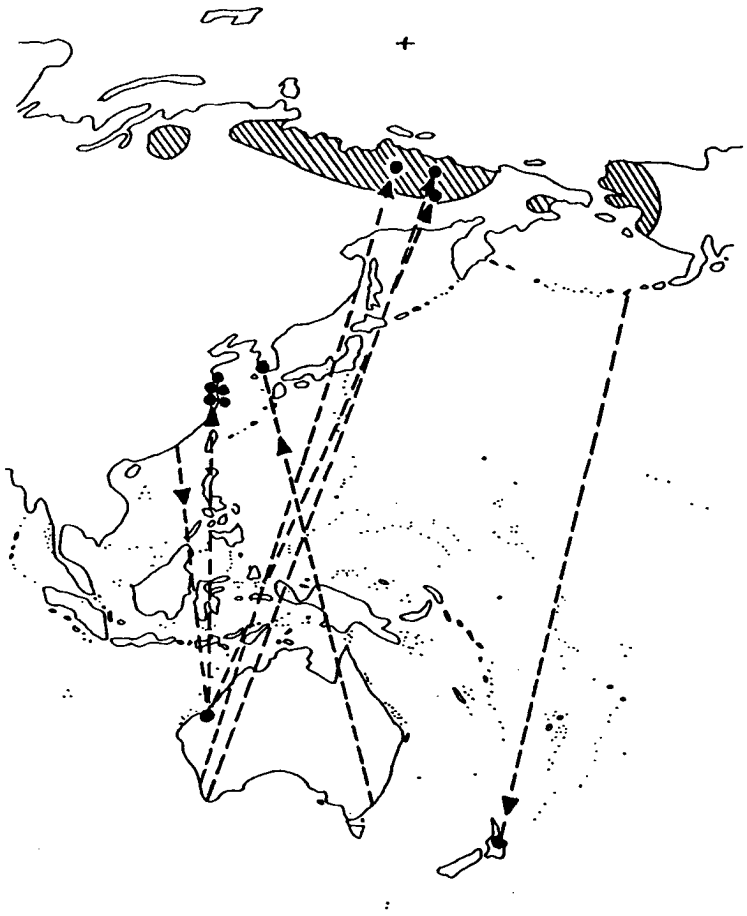

Fig. 2. Long distance movement of Bar-tailed Godwit banded in Australia (9), Hong Kong (1) and Alaska (1).

KEY: ● = recovery sites

— — ▶ — = line joining banding and recovery site

= breeding sites.

108.2 vs. 106.4mm; juveniles 109.3 vs. 106.8mm). All differences between regions for each age group are significant ($p<0.005$). First year bill lengths differ more from those of adults in NWA (c.1.3mm) than is the case in SEA (c.0.5mm). This could be due to increased feather wear in the high-UV climate in NWA causing bills to appear longer. This effect may be accentuated by the fact that almost all juveniles (99%) were caught late in the season, i.e. March/April.

The general similarity of the bill lengths of adult and first year birds for each region differs from that given for museum specimens in Table 1, where average first year bill lengths were 4 to 10mm shorter than those of adults, depending on sex. Presumably, the bills of Australian juveniles were fully grown when first years were caught, i.e. November onwards in SEA and, prdominantly, March/April in NWA. Dick (1976) suggests that even in October and November juvenile *lapponica* in Mauritania have bills which are shorter than those of adults.

Neither sets of adult bill lengths agree particularly well with published data for *baueri* (see Table 1). Bills of both sexes in SEA are shorter, on average, than those given by Prater et al for specimens (males 1.6mm, females 4.1mm), whereas shrinkage should, if anything, lead to specimen bills being shorter than those of live birds. NWA male bills average longer (+2.5mm) and female bills shorter (-2.3mm) than Prater et al *baueri* measurements. This result compares interestingly with Portenko's bill length data for *menzbieri* and *baueri* which have a similar inverted relationship. Average NWA bill lengths are consistent with those of *menzbieri* when allowance is made for specimen shrinkage.

Bill length data derived from the PCF technique can be used to calculate sexing criteria (Rogers 1976) and the results are listed in Table 4. The criteria for both age groups are similar to each other on a regional basis and, in SEA, agree well with those obtained by Rogers (1984). Excellent agreement was obtained when the SEA criteria were tested against 182 birds sexed on breeding plumage, with only two birds being sexed differently.

Calculation of bill lengths for the different age groups in the two regions, using birds sexed by the criteria in Table 4, gave very good agreement with the values obtained directly from the PCF technique, even though 8 to 13% of birds in the overlap range could not be sexed at the 95% confidence level. The largest difference in the means was 1.2%, with the remainder being less than 1%.

The imputed sex proportions from the PCF analysis indicate that adult males (68%) predominate in NWA, whilst the sex ratio in SEA approximates to unity. First year males also predominate in NWA (68%) and there are more juvenile males (60%) in SEA than females.

Wing Length

Wing lengths were measured to the nearest whole mm. Data obtained directly from sexed birds (PCF criteria) are given in Table 5 and are similar to those in Rogers (1984). Justification for the use of direct calculation is based on the good result obtained in the case of bill lengths and confirmatory evidence from a PCF analysis of wing lengths which gave results within 1% of those calculated directly. Adult wing length data are for 2+ Godwits with new tenth primaries in order to eliminate interpretation problems caused by feather wear.

NWA adults have wings which are about 5.5mm shorter, on average, than those of SEA birds of the same age (male: NWA 219.2mm, SEA 224.6mm; female: NWA 233.2mm, SEA 238.7mm). Differences for first year birds in NWA and SEA are more variable, being 9.5mm shorter in NWA than SEA for males and 15.3mm shorter for females. These larger differences are probably due to the greater wear of juvenile primaries caused by higher UV degradation in NWA compared to SEA. Wing length differences between regions for each age group are significant ($p<0.005$).

Comparison with museum data (see Table 2) shows SEA Godwit to have a very similar average wing length to that of *baueri*, although wing shrinkage in specimens should cause these to be shorter. Average NWA Godwit wing lengths lie between those of *baueri* and *lapponica*, and are consistent with those of *menzbieri*, especially if allowance is made for specimen shrinkage.

Band Recoveries

There have been 11 overseas movements of banded Bar-tailed Godwits between Asia/Alaska and Australasia and these are summarised in Fig. 2.

Most of the movements have been between Western Australia and the Chinese coastline (six, including Hong Kong) and the central north Siberian breeding grounds (three). Interestingly, the breeding grounds of Western Australian Godwits lie in the region identified by Portenko for the proposed *menzbieri* sub-species. There has only been one movement of a south-eastern Australian Godwit to Asia, which was a bird controlled in South Korea. The connection with Alaska was established by the movement of a bird banded in the Pribilof Islands to New Zealand.

All Australian recoveries in Asia were either in April/May (i.e. during northward migration) or in late May/early June on the breeding grounds, with the sole exception of the control in NWA of a first year bird banded in Hong Kong in September.

The recovery information seems to indicate that Western Australian birds breed in north central Siberia, whilst New Zealand birds and, perhaps, those from south-eastern Australia breed in Alaska. All Godwits from Australasia may migrate northwards via the Asian coastline in order to have a fall-back position if inhospitable weather occurs on the breeding grounds. This interpretation differs from that of Lane (1987) who suggested that Godwits migrate over the Pacific Ocean when returning to the breeding grounds.

On southward migration climatic problems do not arise and Alaskan (and perhaps Siberian) Godwits may make long trans-Pacific flights. The lack of recoveries on southward migration (except for the Hong Kong juvenile) and observations concerning large numbers on southward migration in Japan and Korea (in Lane 1987) would appear to support this view.

It is interesting to note that although more than 2100 Godwits have been banded in NWA and SEA, there have been no recorded movements between the two sites. Also, although 40% of the total have been banded in SEA, only one (out of an Australian total of nine) has been recovered in Asia.

Band recovery evidence indicates that SEA birds do not migrate through NWA (in either direction) and that they follow a different migration route and have different breeding grounds to NWA birds.

5. CONCLUSIONS

Bar-tailed Godwits in north-western Australia have longer bills and shorter wings, on average, than those occurring in South-eastern Australia. Recovery data show that Godwits from Western

Australia migrate northwards along the Chinese coast and breed in north central Siberia. South-eastern Australian Godwits probably use a different migration route and may breed in Alaska.

The fact that Godwits from the two regions have significantly different bill and wing lengths, neither sets of which agree well with the published data for *baueri*, and that the non-breeding and breeding areas and migration routes appear to be different for the two groups, suggests that they may be of separate races, neither of which is *baueri*. The bill length relationship of NWA Godwit with *baueri*, i.e. male bills longer, females shorter, indicates that they are Portenko's *menzbieri*. The breeding location supports this conclusion.

It would be useful to obtain plumage descriptions of Godwits from the two regions in Australia in order to determine if differences occur in this respect also.

Also supportive of the separate race hypothesis is the distinct difference in sex ratios between NWA and SEA. If the Godwits are of the same race, it is difficult to explain the different sex ratios in the two regions as competition from the larger females should cause the male percentage in the population to rise as the distance from the breeding grounds increases. In fact, the reverse is the case when NWA is compared to SEA. However, if SEA (and New Zealand) Godwits migrate from Alaska across the Pacific, it would be reasonable to suggest that the sex ratio should be about unity as the available habitat to enable separation of the sexes to occur is limited. This habitat restriction is not a problem for NWA birds and it is possible that inter-sexual competition has forced males to move further south in the non-breeding range, that is to NWA. Females should predominate to the north in south-east Asia.

6. ACKNOWLEDGEMENTS

My grateful thanks are due to the AWSG and VWSG cannon-netting teams, ably led by Clive Minton, for allowing me to analyse their hard-won data and to the Australian Bird and Bat Banding Schemes for permission to use the band recovery information.

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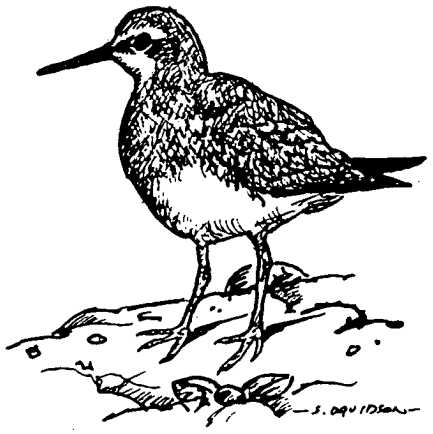

BAR-TAILED GODWIT *Limosa lapponica* IN AUSTRALIA PART 2: WEIGHT, MOULT AND BREEDING SUCCESS

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1. SUMMARY

Bar-tailed Godwits are heavier in south-eastern Australia (SEA) than in north-western Australia (NWA) and females are heavier than males in both regions. On average, adult females and males weigh, respectively, 345 and 287g in SEA and 292 and 264g in NWA. The weights of first year birds follow a similar pattern. Whilst latitudinal weight differences have been observed in other wader species in Australia, it is suggested that in this case the cause is more likely to be the smaller size of Godwits in NWA compared to SEA. Pre-departure weights of SEA birds are heavier than those from NWA and calculated flight ranges of Godwits from both regions show that the heavier birds are capable of flying non-stop to the Asian mainland. Average duration of adult primary feather moult in SEA is around four months, with moult commencing in late September, after arrival, and completing in late January/early February. In NWA, moult commences in late August/early September, also following arrival; completion data are not available for NWA. The duration and timing of moult in SEA is similar to that of other long distance migrants to Australia e.g. Curlew Sandpiper, Red-necked Stint and Red Knot. The primary moult score of second year Godwits is well ahead of that of adults in both regions. Approximately 75% of first year Godwits in SEA undergo some degree of primary moult, with more females (60%+) having a complete moult than males (35%+). In SEA, the average number of first year birds caught in the November/February period was 7.5% with an annual maximum of 27% in 1984/5. NWA data were inadequate for determination of age structure and breeding success. Catches made in NWA during March/April 1988 indicate that most adults have left by late March. Bar-tailed Godwits are very faithful to non-breeding site with no movements being recorded in either NWA or SEA. Adult male Godwits in both SEA and NWA are well into breeding plumage having similar levels in both regions by late March; females are far more advanced at the same time in NWA than in SEA. Few juveniles gain any semblance of breeding plumage. The oldest bird recaptured to date is an adult female of more than 6 years in SEA. Comparison of bill and wing lengths of retraps shows the measurements to vary by about 1%, on average.

2. INTRODUCTION AND METHODS

Part 1 of this paper (Barter 1989a) dealt with the racial composition of Bar-tailed Godwits in Australia, their breeding areas and migration routes. Godwits from north-western Australia were found to have significantly longer bills and shorter wings than those from the south-east. The bills and wings of neither population fit well the available data for the *baueri* sub-species. Godwits from the north-west best match the measurements of the as yet unaccepted sub-species, *menzbieri*, which breeds in central north Siberia. Band returns of north-western Australian Godwits from the *menzbieri* breeding grounds support this conclusion. Godwits from the two regions appear to have different migration routes and do not intermix in Australia. Sexing criteria were developed for adult and juvenile Godwits from both areas.

Methods are as described in Part 1. The ageing convention is:

3+ - in third year or older
2+ - in second year or older
2 - in second year
1 - in first year.

Three+ and 2+ birds are often referred to as adults and first years as juveniles.

3. RESULTS AND DISCUSSION

Weight

The average weight data by region, age group and month are given in Tables 1 and 2. Data from south-eastern Australian (SEA) adults retrapped in different years are graphed in Fig. 1.

SEA adult male Godwits average 287g during the non-migratory period, i.e. December/January, whilst females are almost 60g heavier at 345g. Birds are lighter in north-western Australia (NWA) with adult males being, on average, 264g and females 292g in October/November. It is usual for waders of the same species to be lighter in NWA than SEA (Barter 1987, Barter et al 1988). However, in this case it appears that the explanation may be that the Godwit sub-species present in NWA is smaller than that in SEA (based on wing lengths - see Part 1.)

Retrap data indicate that there is a high degree of weight variability from year to year (see Fig.1) with, perhaps, a tendency for birds to lose weight in the early part of the non-breeding season. The reason for the variability is not obvious but is unlikely to be due to changes in food supply from year to year. More likely possibilities are variations in annual arrival time or, as with Red Knots, preparation for onward passage to New Zealand (Barter et al 1988).

On average, male first year birds in SEA weigh around 300g and females 350g, whilst in NWA males weigh about 240g and females 290g. Females in both regions have similar weights to those of adults, whilst SEA first year males are heavier and NWA first years lighter than the comparable adult males.

Application of the Summers and Waltner (1979) flight distance equation, using weights obtained just before departure, i.e. second half March in SEA and late March/early April in NWA, gives calculated flight ranges of 7300km (average) and 8100km (heaviest bird) for adult SEA males and 7100km and 10,100km, respectively, for adult females. The assumptions used are that the lean weight is 93% of the December/January average and that the average flight speed is 75 km/h. The heaviest SEA male weighed 475g and female 630g. In NWA, the estimated flight ranges are 5000 km (average) and 6800 km (heaviest bird) for adult males and 5300km and 8800km, respectively, for females, with the heaviest male being 405g and female 505g.

It is interesting to note that in all cases the flight range of SEA adults exceeds that of NWA birds and this difference, together with the potential flight range itself, indicates that Godwits from the two regions probably follow separate migration routes to the Asian mainland.

The heaviest birds of each sex from both regions are comfortably capable of flying non-stop to the Chinese coastline (7500km from SEA, 5000km from NWA). The heaviest SEA females could, in fact, fly directly to South Korea (9200 km), where a SEA-banded bird has been recovered on northward migration (ABBBS 1987). However, it seems more likely that such birds would stage somewhere en route, e.g. the Philippines.

Analysis of the weights of birds banded and recaptured in NWA during the March/April 1988 period shows that many had lost weight during the intervening period. For example, in a group of 34 juvenile Godwits recaptured after a period of 11 to 13 days, 20 had decreased in weight by an average

Table 1. SEA weight data by age and month (g).

Age	Month	MALE n	MALE mean	MALE sd	FEMALE n	FEMALE mean	FEMALE sd
3+/2+	Sept	9	304.4	45.6	17	362.8	24.9
	Oct	7	266.9	16.5	14	332.8	31.5
	Nov	40	276.3	24.6	28	327.0	38.2
	Dec	114	288.2	21.4	110	344.7	29.2
	Jan	40	284.1	24.3	23	348.9	19.8
	Mar 2nd half	85	406.6	63.3	99	503.8	60.7
1	Nov	12	333.3	19.2	6	421.7	52.6
	Dec	9	295.5	42.7	6	341.9	48.9
	Mar 2nd half	16	298.8	51.4	12	352.7	17.4

Table 2. NWA weight data by age and month (g).

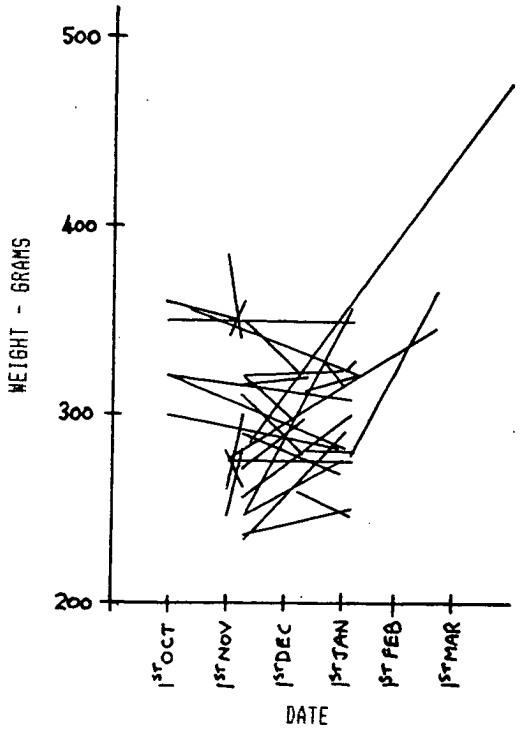
Age	Month	MALE n	MALE mean	MALE sd	FEMALE n	FEMALE mean	FEMALE sd
3+/2+	Sept	29	246.8	18.7	11	299.5	23.2
	Oct/Nov	119	263.9	22.7	53	292.4	17.6
	Mar 3rd week	6	350.9	24.8	7	413.6	44.1
	Mar 4th week	14	358.5	24.0	2	400.0	77.8
	Apr 1st week	84	348.8	31.4	39	421.4	47.1
2	Sept	40	249.0	22.3	15	308.8	23.2
	Oct/Nov	15	247.1	25.6	7	282.1	22.0
1	Oct/Nov	4	208.0	30.6	1	260.0	-
	Mar 3rd week	96	237.0	20.9	52	284.6	30.2
	Mar 4th week	98	240.9	21.3	32	283.1	28.6
	Apr 1st week	189	240.5	17.4	102	292.8	27.4

Table 3. Breeding plumage fraction* of adult Godwit.

Period	Region	Sex	n	mean
Mar 3rd week	SEA	M	81	0.51
		F	82	0.02
Mar 4th week/ Apr 1st week	NWA	M	125	0.66
		F	45	0.33

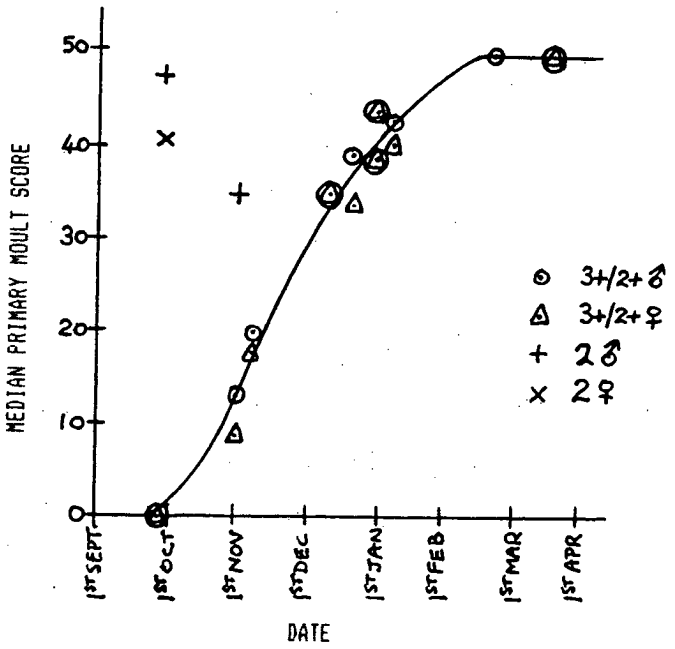
* Scored subjectively for individual birds on the basis that 0% = 0.0 and 100% = 1.0. Results are weighted averages for a number of catches in each region, n = sample size.

n = sample size, sd = standard deviation.



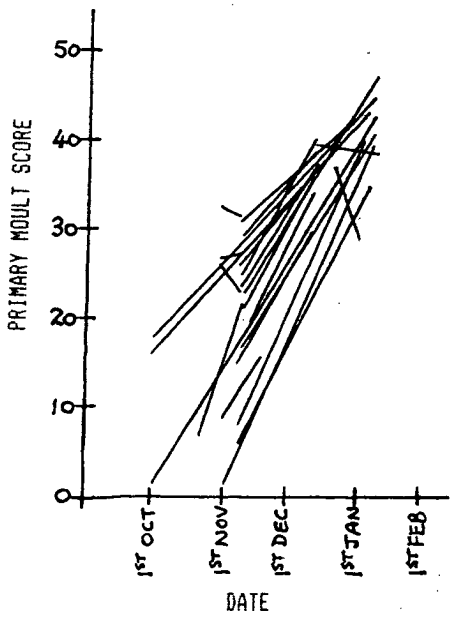
Weights of individual SEA adult (3+ and 2+) Bar-tailed Godwit retrapped in different years.

FIG 1



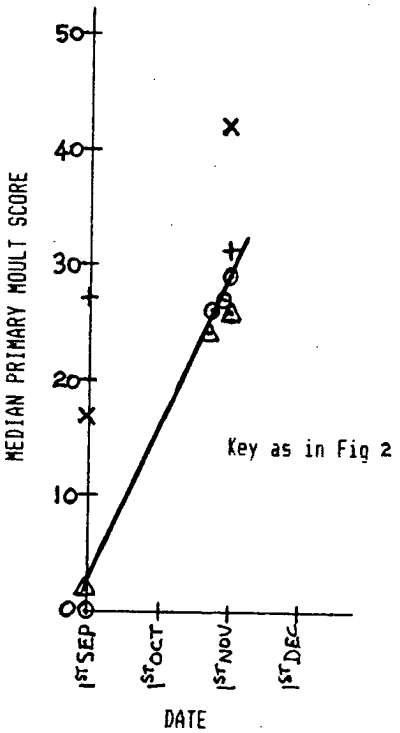
SEA adult (3+ and 2+) and second (2) year Bar-tailed Godwit primary moult data.

FIG 2



Moult scores of individual SEA adult (3+ and 2+) Bar-tailed Godwit retrapped in different years.

FIG 3



NWA adult (3+ and 2+) and second (2) year Bar-tailed Godwit primary moult data.

FIG 4

of 19g, whilst 10 had increased by 12g and four remained identical in weight. One juvenile recaptured twice was 7g lighter when caught 13 days later and an additional 15g less when caught again the next day. Insufficient data are available for 2+ birds in order to allow any conclusions to be drawn for this age group.

Weight losses have also occurred in recaptured Godwits in SEA (Purchase and Minton 1982) and these were attributed to weight, age and sex differences (e.g. fat adult females are more susceptible to weight loss), large catch size and high ambient temperatures. All these conditions occur in NWA at some time during the March/April period.

Primary Feather Moult

Primary feather moult data are shown graphically in Figs. 2 to 4.

On average, SEA adults appear to commence moulting in late September (e.g. 45% moulting on September 28th), following arrival, and finish in late January/early February (Fig.2). No difference was found between the sexes. The moult duration of approximately four months is similar to that recorded for Curlew Sandpipers *Calidris ferruginea* in Tasmania (Barter 1986), and Red-necked Stints *C. ruficollis* (Paton and Wykes 1978) and Red Knots *C. canutus rogersi* (Barter et al, 1988) in Victoria. Information obtained from retrapped adults (see Fig.3) confirms the moult duration of around 120 days for individual birds, although it is noticeable that those Godwits which commence moulting earlier undergo a more leisurely moult than late starters.

In NWA, adults commence moulting in late August/early September (Fig.4), shortly after arrival, and are still approximately one month ahead of SEA adults in mid-moult (i.e. early November vs. early December). Again there appears to be no difference between the sexes.

Second-year Godwits in both regions start moulting before adults, with NWA second years being in mid-moult as adults arrive and SEA second years having nearly completed primary moult by the time adults reach SEA (Figs. 2 and 4).

The different starting times of primary moult in the two regions, and between the age groups, is consistent with earlier arrival of adults in NWA compared to SEA and the freedom of second years to commence moult earlier than adults because they remain on the non-breeding grounds during the nesting season.

In NWA, approximately 25% of first year birds were undergoing primary moult in late March/early April and about 10% had completed moult at that time. Sample sizes were much smaller in SEA but indicated that a similar percentage of first years to NWA was in moult in late March with only a few having completed moult. In mid-June, 63% of SEA first year female Godwits (n=19) had undergone a complete primary moult, whilst only 36% of males (n=28) had done so. A further 11% of females and 21% of males had completed a partial moult. In both sexes 25% had not moulted at all. It seems that in SEA more juvenile females undergo a complete wing moult than males, but that, in total, about the same percentage of both sexes undergo some degree of primary moult.

Total Head length

Few birds were measured for total head length (46 in SEA and 10 in NWA). Percentage cumulative frequency analysis (PCF) of the SEA sample gave means and standard deviations of 117.9 and 5.7mm for adult males, respectively, and 143.5 and 6.9mm for adult females. The sexing criteria are ≥125mm for adult males and ≥ 135mm for adult females, with 89% of adults capable of being sexed correctly at the 95% confidence level. The correlation between birds sexed by either total head or bill length is 100%. There is good agreement between the means and standard deviations obtained from the PCF analysis and directly from birds sexed using the total head length criteria.

Population age structure and breeding success

In SEA, juveniles start to arrive in October. The average percentage of juveniles caught in the November/January period from 1979 to 1986 was 7.5%, with the highest levels being 21% in 1981/2 (n=19) and 27% in 1984/5 (n=45). Interestingly, the 1985/6 season which was a poor year for Godwits (3% juveniles; n=76) was good for Red Knots (32% juveniles; n=74). The difference could be explained by weather or predator-related factors associated with different breeding grounds, as the Red Knot sub-species visiting Australia breeds on the Chukotski Peninsular in far eastern Siberia (Barter 1989b) whilst the SEA Bar-tailed Godwit population probably breeds in Alaska (see Part 1).

In NWA, no juveniles were caught in August/September (n=93), whilst they represented 3% of birds captured in October/November. In the late March/early April 1988 period there were 74% (n=846) juveniles present in catches indicating that the majority of adults had already left for the breeding grounds. Broome (NWA) was found to have 79% juveniles (n=254; 4 catches) in late March, increasing to 88% in early April, whilst Anna Plains had a greater percentage of adults (57%; n=206; 4 catches). It is not known whether these differences are due to the differing site preferences of the two age groups or to the earlier departure of adults from Broome.

Site Fidelity

Bar-tailed Godwits were found to be very faithful to their non-breeding sites with all retraps occurring close to the original banding position (SEA:n=52; NWA:n=62). As mentioned in Part 1, there have been no recorded movements between NWA and SEA.

Breeding Plumage

Breeding plumage details for adult Godwits from the two regions are given in Table 3.

It can be seen that adult males have more breeding plumage than females in both regions. There is little difference between males in NWA (0.66) and SEA (0.51) just before departure, especially when allowance is made for the later catching period in NWA. However, NWA adult females (0.35) are well in advance of those in SEA (0.02), where only four birds out of 82 had put on any breeding plumage.

No SEA juveniles were recorded as having any breeding plumage in March, whereas four males out of 28 and one female out of 19 showed traces (0.1) in mid-June. In NWA, ony 2% of juveniles had any breeding plumage in late March/early April and all were males, with the most for any bird being 0.25.

Little data are available on possible retention of breeding plumage by Godwits arriving in Australia, although traces were found in adult males, and none in females, in SEA in early November.

Longevity

The oldest Godwits caught to date are from SEA where an adult female was caught 6 years and 1 month after banding, and two adult males 5 years 3 months later. Undoubtedly, older birds will be caught as the period increases during which catching has occurred.

Reproducibility of measurements

Comparison of bill lengths obtained from retrapped birds (n=87) showed them to differ by about one mm, on average, between measurements. This represents a variation of about 1% of the bill length and is considered to be acceptable.

Wing length comparisons showed the average variation to be about 2.4mm (n=27). This difference represents a variation of slightly more than 1% of wing length and, if allowance is made for wear, seems to be very satisfactory.

4. ACKNOWLEDGEMENTS

My grateful thanks are due to the AWSG and VWSG cannon-netting teams, ably led by Clive Minton, for allowing me to analyse their hard-won data and to the Australian Bird and Bat Banding Schemes for permission to use the band recovery information.

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FEEDING NOTES ON THE TEREK SANDPIPER *Tringa terek*

Martin Schulz, 167 South Beach Road, Bittern, Vic. 3918.

INTRODUCTION

The Terek Sandpiper *Tringa terek* is a migratory wader species arriving in Australia in late August and early September. It occurs commonly along the northern Australian coastline from Shark Bay in Western Australia around to Botany Bay in New South Wales; elsewhere it is uncommon and localized in distribution (Blakers et al. 1984, Lane and Davies 1986). In Victoria Emison et al. (1987) regarded it as a scarce summer migrant with sightings concentrated in the Port Phillip Bay, Westernport Bay and Corner Inlet areas.

In Australia, the Terek Sandpiper occurs mainly in coastal localities and favours mudflats adjacent to mangroves (McKean 1976, Blakers et al. 1984, Lane and Davies 1986). The bird also occurs on rock and coral reefs, sand beaches and occasionally around brackish coastal swamps and lagoons, saltpans and sewage lagoons (McKean 1976, Emison et al 1987).

On 25 October 1987 I observed two birds on an ocean beach approx. 2 km west of Cape Howe in far east Gippsland. The site consisted of a wide sandy beach with an extensive reef system exposed at low tide. The Terek Sandpipers were feeding in and around a mixed group of waders, comprising Hooded Plovers *Charadrius rubricollis*, Red-capped Plovers *C. ruficapillus*, Ruddy Turnstones *Arenaria interpres*, Grey-tailed Tatlers *Tringa brevipes*, Bar-tailed Godwits *Limosa lapponica* and Red-necked Stints *Calidris ruficollis*.

There is little information available on the feeding behaviour and diet of the Terek Sandpiper in Australia (Lane and Davies 1986). Consequently I was interested to find out what these birds were feeding on and how they went about catching their prey.

METHODS

The Terek Sandpipers were observed at both high and low tides with 8 x 40 Pentax binoculars. Direct dietary observations were difficult because the prey items taken were small. Instead, information on diet was gained by collecting and analysing faeces. Because other waders were present, the only sure way of collecting known Terek Sandpiper faeces was to observe the birds defaecating and then immediately to go to the spot and collect the faeces. This disrupted the feeding movements of the birds and limited the number of faeces collected. Faeces collected were wrapped in paper towelling and then dried in direct sunlight for nine hours. Each of the dried faeces was crumbled with forceps into a petri dish and examined under a dissecting microscope (magnification 50 X). Unfortunately no reference collection was available and so prey remains could only be identified to order level.

A quantitative analysis of prey consumption was not possible because the prey remains were fragmented. Instead, the presence of each prey type in an individual faecal sample was divided into:

a. <5% of the total amount in the sample,
b. 5-75% of the total amount in the sample,
c. >75% of the total amount in the sample.

RESULTS AND DISCUSSION

Feeding Behaviour

At both high and low tides the two Terek Sandpipers spent the majority of the observation periods actively foraging. At high tide the birds spent

the entire period (60 minutes of observation) high up on the beach where foraging occurred predominantly around embedded seaweed. In contrast, at low tide the birds spent the entire period (90 minutes of observation) either on:

i. the water's edge where a thin film of water covered the sand with occasional pools and channels up to 3cm deep and

ii. the lower littoral zone on bare rock, in areas of dense cunjevoi *Pyura* spp. concentrations and in shallow pools (up to 2cm deep). No foraging was observed on the reef platform in the supralittoral or upper littoral zones.

The Terek Sandpiper has a distinctive feeding pattern: the birds were highly mobile when foraging, constantly moving forwards then sharply changing direction or executing sharp turnabouts. Five types of feeding manoeuvres were identified:

1. Pecking at the sand surface in front of to the side of the moving bird.

2. Pecking at the surface of shallow pools in the lower littoral zone of both the reef and beach areas while the bird was moving or stationary.

3. Pecking at prey below the surface (at a maximum depth of 2cm) or on the floor of shallow pools in the lower littoral zone of both the reef and beach areas while the bird was moving or stationary.

4. Chasing prey - either along the sand or water surface. This consisted of a short dash followed by a forward lunge at the substrate surface with the head held low and bill near horizontal.

5. On several occasions an individual was seen snatching at insects that had taken flight.

There appeared to be no difference in the foraging manoeuvres or patterns utilized on the rock substrate of the reef from those used on the sand substrate of the beach.

No attempts at probing into the sand substrate of the beach were observed. This method of feeding has been widely reported (e.g. Burton 1974, McKean 1976, Johnsgard 1981, Hayman et al. 1986) and may be better suited to a muddy shore environment where the substrate is more pliable.

The Terek Sandpipers fed in and on the edge of loose groups of waders as well as, on occasions, more than 50m from the nearest wader. When feeding amongst other waders the Terek Sandpipers actively ran in and around the other birds frequently pecking at prey items within centimetres of foraging plovers and stints. However, no agressive interactions were observed when the birds were feeding this close.

The two foraging birds never occurred closer than approx. 1 m from the other individual, although they always moved in the same general direction. When alarmed (e.g. when I moved too close or a White-bellied Sea-Eagle *Haliaeetus leucogaster* or Brown Falcon *Falco berigora* flew overhead) they stopped feeding, and quickly joined company with each other and often with other waders and took flight in close concert.

DIET

Waders are generally opportunists, feeding on whatever foods are available (Recher 1966). However, with the distinctive recurvature of the bill it has been suggested that the Terek Sandpiper is more specialised in its foraging (Voous 1960).

Direct feeding observations were difficult, although small dipterans and sandhoppers (*Amphipoda*) were chased or snatched at on a number of occasions. In the shallow pools in the lower littoral zone amphipods were common and these were a likely prey target. No observations were made on the birds taking small molluscs i.e. the birds were not seen to peck a number of times at any one spot in quick succession. The Hooded Plover uses this method when feeding on small molluscs (Schulz 1986).

The dominant prey items identified in the faeces were amphipods and dipterans (Table 1). The only other prey identified was a small number of beetles.

The faeces were collected at low tide but it is difficult to ascertain whether the prey remains originated from birds feeding high up on the beach during high tide or along the water's edge at low tide.

Faecal analysis suffers from the disadvantage that some items such as worms, insect larvae and other soft-bodied prey are almost entirely digested and difficult to detect using this method. However, Feare (1966) found in a dietary study of the Purple Sandpiper *Calidris maritima* that faecal samples appeared to be representative of what was actually consumed. Goss-Custard (1973) suggested that in dietary studies one should describe as much of the diet as possible by observation and fill any gaps by examining faeces. For the purposes of the study the faecal analysis based on a limited sample must be viewed with come caution.

The predominance of dipterans and amphipods in the faeces is similar for Terek Sandpipers on non-breeding grounds overseas. For example, Johnsgard (1981) observed that in wintering areas the species preys on a variety of insects (such as beetles and dipterans), crustaceans, and small gastropods.

Crabs form an important part of the diet of Terek Sandpipers in the Nakdong Estuary, South Korea (Piersma 1986).

The distinctive bill shape is typical of species which frequently pursue active prey in shallow water. The recurvature of the bill allows the bill to be held and brought to bear in a horizontal position which facilitates the caputre of active prey whose escape path is horizontal (Burton 1974). For example, amphipods in the very shallow pools in the lower littoral zone take evasive action from would-be predators by either actively swimming away from the source of danger on the surface of the pool or shallowly covering themselves with sand. The Terek Sandpiper's bill structure and feeding behaviour is well suited to capturing such prey.

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TABLE 1.

Prey items (identified to order level) recorded in faeces of the Terek Sandpiper (*Tringa terek*), west of Cape Howe, Victoria.

Note: Presence of prey in each faecal sample was divided into: a. <5%, b. 5-75%, and c.>75% of the total.

	FAECES (N = 10)									
PREY	1	2	3	4	5	6	7	8	9	10
Class Insecta										
Order Diptera	c	b	a	-	c	b	b	b	b	-
Order Coleoptera	a	-	-	-	-	-	b	-	-	-
Class Crustacea										
Order Amphipoda	b	c	c	c	b	c	b	c	c	c

This section gives details of wader and wetland work being carried out in Asia by the Asian Wetland Bureau (AWB). The Bureau's activities cover many aspects of wetland research, management and conservation, including water and shorebird studies, which are being continued within AWB as the Interwader Programme. Most of the following items have been extracted from the current issue of Asian Wetland Newsletter.

WETLAND RECLAMATION AND CONSERVATION: THE KOREAN DILEMMA

South Korea is one of East Asia's smallest and most densely populated countries, yet has one of the fastest growing economies in the region. It is a mountainous country with 80% of the land over 100m, but the western and southern slopes of the peninsula are gentle, with broad coastal plains and well developed river systems terminating in the extensive intertidal mudflat areas of the Yellow Sea.

As the population continues to grow, the pressures upon these intertidal areas are increasing for conversion to industrial or agricultural land. The Government sees reclamation as the answer to the country's problems. By the year 2001 the South Korean Government plans to reclaim 66.5% of the coastal wetlands along the south and west coasts. This would involve 155 estuaries and bays, and a total area of 420,000 ha of intertidal wetland would be lost.

Much of this reclamation has already begun; the sad demise of the Nakdong Delta being a particularly tragic blow. In view of this, in Spring 1988 a team of three graduate students from the University of East Anglia, Norwich, UK, in conjunction with Dr. Won Pyong-Oh and students from the Institute of Ornithology, Kyung Hee University, Seoul, Korea and with the support of the Asian Wetland Bureau, set out to attempt to evaluate the importance of these wetlands to conservation and the extent of the reclamation threat.

The results of the survey were startling, and identified the coastal wetlands of western South Korea as being the most important area yet known in East Asia for migratory shorebirds. 150,000 shorebirds of thirty species were counted, 80% of which were at four locations in the northern provinces of Kyonggi-do and Ch'ung Ch'ongnam-do. These four sites; South Kanghwa Island, South Yong Song Island, Namyang Bay and Asan Bay are earmarked for further reclamation and development.

Much of Asan Bay has already been reclaimed, yet is still one of South Korea's major sites for migratory shorebirds. In Spring 1988, the survey showed the area to be used by 40,000 shorebirds, predominantly Great Knot *Calidris tenuirostris*, Dunlin *C. alpina* and Bar-tailed *Limosa lapponica* and Black-tailed Godwit *L. limosa*, which all roost in the inner bay at high tide. Asan was formed by the damming of two river estuaries and the bay is now embanked on all sides. Development is still continuing with a large part of the southern shore of the outer bay undergoing reclamation that will destroy the feeding area for 5000 shorebirds. Further plans for Asan include other reclamation projects and the development of an industrial port. Clearly this would be disastrous for populations of migratory birds, and if conservation is to advance in South Korea it is at sites such as Asan that a compromise must be reached. Asan is already very popular with tourists from Seoul and would be suitable for development as an environmental showpiece and education centre, displaying how development and conservation can advance hand in hand.

In addition to the importance of these areas to large numbers of birds, they were also found to

hold significant populations of several rare or endangered species. A major discovery was large numbers of the rare Nordmann's Greenshank *Tringa guttifer*, listed in the ICBP Red Data Book. A minimum of 98 birds was counted, which represents one of the largest counts of this species in the world. The birds recorded in Korea were on passage north to Sakhalin Island, USSR, where the whole world population, estimated at less than 1000 birds, is thought to breed.

The Great Knot is a species that winders almost exclusively in North Australia and breeds in North East Siberia. A minimum of 30,000 Great Knots was counted in Korea, representing the largest number ever recorded in Asia and approximately 10% of the known world population.

Ringing and weight data from Australia, and the lack of large numbers elsewhere in Asia, suggests that this species flies direct from North West Australia to the Yellow Sea coasts of Korea and China, a distance of over 5000 km. A minimum total of 1300 Eastern Curlews *Numenius madagascariensis* represents over 10% of the world population.

Protection of wetlands is also vital to Korea's coastal fishery industry. Its annual yield for 1987 was 2,000,000 metric tons, representing a value of US$1,260,000,000. Yet annual catches are decreasing, hit by increasing urban and industrial pollution combined with loss of fish breeding and feeding areas. With over 500,000 people dependent upon this industry, the socio-economic threats from reclamation and pollution are very serious. Studies have shown organic pollution in 38% of watersheds to be over an acceptable level. Levels of heavy metals in some coastal birds analysed have been found high enough to cause kidney lesions, and the effects of recent increases in pesticide use are not yet known. Clearly the introduction and enforcement of some form of effective pollution control legislation is urgently needed in South Korea.

The only wetland area in South Korea of importance to waterbirds with any existing or pending protection status is the Nakdong Delta. As part of a loan from the World Bank for the construction of the Nakdong Barrage, it was agreed that due to its ecological importance, part of the estuary should be designated a National Environmental Preservation Area. (NEPA)

Following the exciting results from the Spring 1988 survey project in South Korea much needs to be done. It is most strongly recommended that the South Korean Government reviews its proposed plans for reclamation in certain areas, and grants protection status to the four key coastal wetland sites of international importance. It is also important that full environmental impact assessments are carried out prior to any future large scale reclamation projects.

Meanwhile Dr. Won and students from Kyung Hee University, with the backing of the Asian Wetland Bureau will continue surveying coastal wetlands to gather much needed baseline ecological information. In autumn 1988, whilst the attention of the world was focussed on South Korea and the Olympic Games, Dr. Won and his students were at work elsewhere, revisiting sites to monitor southward migration.

A 200 page report entitled an 'A survey of Coastal Wetlands and Shorebirds in South Korea, Spring 1988' is now available from AWB.

Colin Poole.

NAKDONG NEPA UPDATE

Long delays over the establishment of a National Environmental Preservation Area (NEPA) as part of the Nakdong Barrage and Reclamation Project, Pusan, South Korea at last seem to be at an end.

As early as 1985, the World Bank stipulated that the establishment of the NEPA was a condition of their funding of the project, but by October 1988, with 99% of this funding disbursed and the barrage completed, this requirement had still not been met. Repeated changes in the proposed area of both the reclamation and the NEPA, as well as intransigence on the part of the local government, which is not party to the Bank's loan agreement, have caused concern for the future protection of the estuary. Nevertheless, the Korean government has remained committed to minimising impact on the estuary and in February 1988 after discussions with the World Bank, agreed to reduce the planned reclamation area from 20 to 11.7 sq.km.

On October 8, 1988, the Minister of Construction (MOC) submitted a final draft proposal for the NEPA to be approved by other concerned ministries. An Environmental Impact Assessment approved by the Office of the Environment has led to regulations which forbid the establishment of industries likely to cause pollution; the use of coal for heating; and stipulate secondary sewage treatment, on reclaimed areas close to the NEPA. A revised proposal by the MOC gives December 31st 1988 as the deadline for establishing the NEPA. Pusan city's plans for development of the area within the NEPA have now been cancelled, and the Vice President of World Bank's Asia Region, Mr. Attila Karaosmanoglu, has given further assurance that "no development will take place in the proposed NEPA area".

UNPRECEDENTED NUMBERS OF ENDANGERED WATERBIRDS DISCOVERED IN SOUTH SUMATRA

A survey of coastal wetlands in South Sumatra carried out as part of a long-term project, 'Integrating Wetland Conservation with Land-use Planning in East Sumatra' has discovered huge concentrations of resident and migratory waterbirds, including unprecedented numbers of several endangered species.

The project started in September 1988, and is jointly organised by Asian Wetland Bureau (AWB) /Interwader and PHPA (the Directorate General of Forest Protection and Nature Conservation, Indonesia). Fieldwork has been conducted by staff of AWB, and PHPA, The Environmental Studies Centre of the Sriwijaya University and the Danish Ornithological Society. The surveys were primarily funded by WWF and the Danish Government.

Their discoveries, concentrated on the Banyuasin Peninsula (an area previously proposed as a nature reserve by AWB/INTERWADER and the International Council for Bird Preservation (ICBP), included 13,000 Asian Dowitchers *Limnodromus semipalmatus* (ICBP Red Data Book species; previous estimated world population 8,000), 2,600 Eastern Curlews *Numenius madagascariensis* (estimated world population 12,000), 21 Nordmann's Greenshanks *Tringa guttifer* (ICBP Red Data Book Species; estimated world population 1,000) and 7 Chinese Egrets *Egretta eulophotes* (ICBP Red Data book species, estimated world population 1-2,000). Other notable counts of shorebirds included 5,700 Terek Sandpipers *Xenus cinereus* 25,000 Black-tailed Godwits *Limosa limosa* and 7,000 Eurasian Curlews *Numenius arquata*.

Equally significant was the location of three colonies of Milky Storks *Mycteria cinerea* totalling 1,000 nests. A previous survey in 1984 had discovered 3,000 Milky Storks in the area, but the

whereabouts of breeding colonies had hitherto been unknown. The discovery is a vital step towards the conservation of a species whose total world population is estimated at only 6,000 individuals. 600 Black-headed Ibis *Threskiornis melanocephalus* and 176 Lesser Adjutant Storks *Leptopilos javanicus* were notable counts of other threatened species.

The Sumatra project is one of several being undertaken by AWB/INTERWADER and PHPA as part of a three-year programme directed at the conservation and sustainable utilization of Indonesian wetlands, some of the most extensive in Asia.

RECLAMATION THREATENS CHINA'S WETLANDS

More than 6,600,000 ha of wetlands and coastal lands in The People's Republic of China have been targeted for reclamation before the year 2000. The country's National Committee on Agricultural Zone Planning released a report in March 1988 giving details. The report indicated that up to 10 million hectares of coastal areas can be converted to farmland. Reclamation will be initiated in 14 coastal provinces and municipalities in 1988. One major reclamation project will focus on the Sanjiang Plains in Heilongjiang Province. Reclamation will affect 660,000 hectares of wetlands - more than 30% of this wetland of international importance, as listed in the Directory of Asian Wetlands. The Sanjiang plains are extremely important for fisheries, sustainable harvesting of seeds and peat and for breeding and migratory waterbirds. The plains are a breeding ground for the endangered Oriental Stork *Ciconia boyciana* and Red-crowned Crane *Grus japonensis*. Reclamation and intensification of agriculture has been recommended for the Huanghuaihai Plains in the lower reaches of the Yellow River including 600,000 ha in the delta. The Yellow River delta is one of China's largest estuarine systems with 150,000 ha of mud and sandflats. The delta is extremely important for commercial fishery with over 56 species of fish being present. It is also of great importance for migratory and wintering waterfowl.

DIRECTORY OF ASIAN WETLANDS DUE FOR PUBLICATION

After a concerted 3 year effort involving hundreds of people, the joint WWF/IUCN/IWRB/ICBP Asian Wetland Inventory project is drawing to a close. The principal output, the 1700 page Directory of Asian Wetlands is now in its final form and will be published by IUCN in 1989. Limited runs of separate national sections of the regional directory are also being printed where needed, while complete national inventories are being published for a number of countries. The Indonesian Wetland Inventory was published by PHPA and AWB-Indonesia in December 1987 and the Directory of Malaysian Wetlands was published by the Department of Wildlife & National Parks, Peninsular Malaysia in December 1988. In Thailand, the Philippines, Sri Lanka and Vietnam, directories are under preparation, and Japan and Pakistan are in the process of publishing theirs.

While the project is now over, its completion represents the basis for renewed wetland conservation efforts in the region. Some progress has already been made - Nepal, and Vietnam have recently joined the Ramsar Convention and Philippines and Indonesia are giving serious consideration. Conservation action is underway at key sites in Malaysia, Indonesia and the Philippines through AWB programmes, and follow-up documentation of sites is being carried out. AWB is also initiating work on the identification of wetland conservation priorities for the region, in the light of the Directory of Asian Wetlands.

NORDMANN'S GREENSHANKS

AWB will shortly be preparing a full status report on Nordmann's Greenshank *Tringa guttifer* for publication in 1989. Details of all non-published records, and all records since 1980 are sought, both of field observations and specimens. Photographs of the species in all plumages are also needed. Please send to: John Howes, at AWB-HQ.

WORKSHOPS ON SHOREBIRD BANDING

AWB continued its training activities for shorebird banders during 1988 with funding from the Australia National Parks and Wildlife Service (ANPWS). The program was divided into two phases; one with three Asian biologists participating in work in Australia in March and April, and the second with an experienced Australian bander, Doug Watkins, visiting banding groups in Asia (Taiwan, China, Thailand, Indonesia, The Philippines, and Malaysia) in April-June and August-October.

RAMSAR NEWS

Vietnam Becomes Fiftieth Member. Vietnam has become the fiftieth country to join the RAMSAR Convention, and, more significantly, the first in South-east Asia. Vietnam is the ony RAMSAR contracting party in a triangle running from India to Japan to Australia. This represents an important step forward for wetland conservation in Asia.

The Red River Delta, designated by Vietnam for inclusion in the Convention's List of Wetlands of International Importance, is the most important area for wintering wildfowl in Northern Vietnam, holding more than 100,000 birds between October and March. These include numbers of endangered species such as Chinese Egret *Egretta eulophotes*, Asian Dowitcher *Limnodromus semipalmatus*, Black-faced Spoonbill *Platalea minor* and Saunder's Gull *Larus saundersii*. AWB has been invited to conduct a training course there in March 1989 by the Wetland and Waterbird Working Group of Vietnam.

SOME OBSERVATIONS ON THE SHOREBIRDS OF SOME ISLANDS IN THE LOWER GANGETIC DELTA, GREATER NOAKHALI DISTRICT, BANGLADESH

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INTRODUCTION

Bangladesh - the largest delta in the world - has been formed by the alluvial deposits of the Ganges, Brahmaputra and Meghna rivers and their tributaries. Greater Noakhali District (GND) lies in the South of Bangladesh, i.e. the Lower Gangetic Delta (LGD), bordering the eastern part of the mighty river mouths and the delta. It also includes the islands of Hatya, Nijhum Dweep, Moulovir char, Ghashir char, Shehebenir char and many others in the Bay of Bengal. Some of the extensive mudflats of Noakhali mainland like Char Bhata and those of the islands mentioned above act as an important staging area for shorebirds during southward migration.

During the Asian Mid-winter Waterfowl Count, 1988, all the areas mentioned above (composing the eastern part of the LGD) were visited from January 16 to 19, 1988. A total of 32 hours was spent making the observations of the shorebirds.

A pair of 8 x 40 binoculars was used and observations were made from an average distance of 150 meters. Hayman et al (1986) was mainly used to visit the islands, occasionally rowing it as near

Table 1. Species and number recorded at each site.

SPECIES	SC	MA	ND	GC	MC	CB	TOTAL
Pied Avocet *Recurvirostra avosetta*	-	-	8	-	-	50	58
Crab Plover *Dromas ardeola*	-	-	6	-	-	-	6
Oriental Pratincole *Glareola maldivarum*	-	-	2	-	-	-	2
*Little Pratincole *G. lactea*	-	-	-	-	-	-	-
Red-wattled Lapwing *Vanellus indicus*	4	-	2	-	-	10	16
*Spur-winged Plover *V. spinosus*	-	-	-	-	-	-	-
Grey Plover *Pluvialis squatorola*	-	-	90	-	-	-	90
Pacific Golden Plover *P. fulva*	60	100	50	-	300	200	710
Greater Sandplover *Charadrius leschenaulti*	-	20	-	-	-	-	20
*Little Ringed Plover *C. dubius*	-	-	-	-	-	-	-
Kentish Plover *C. alexandrinus*	20	2000	700	-	-	12	2732
Lesser Sandplover *C. mongolus*	300	14000	1540	3000	500	30	19370
Whimbrel *Numenius phaeopus*	-	-	20	-	-	-	20
Eurasian Curlew *N. arquata*	69	236	20	1000	-	25	1350
Black-tailed Godwit *Limosa limosa*	6	-	30	60	-	-	96
Redshank *Tringa totanus*	60	250	340	200	500	50	1400
Greenshank *T. nebularia*	45	30	480	200	1000	30	1785
Spotted Greenshank *T. guttifer*	-	-	200	-	100	-	300
Terek Sandpiper *Xenus cinereus*	-	-	120	-	300	10	430
Common Sandpiper *Actitis hypoleucos*	-	100	500	300	100	35	1035
Ruddy Turnstone *Arenaris interpres*	34	-	-	-	-	30	64
Curlew Sandpiper *Calidris ferruginea*	35	17	-	-	200	10	262
Stint sp. *Calidris sp.*	20	-	-	-	-	-	20
Spoon-billed Sandpiper *Eurynorhynchus pygmaeus*	-	3	-	-	-	-	3
Unident. wader spp.	2085	1020	6550	31050	15150	2528	58383
TOTAL	2738	17776	10658	35800	18150	3020	88152

* = Species with no figures were sighted on the nearby mainland.

KEY TO ABREVIATIONS

SC	:	SHEHEBENIR CHAR	GC	:	GHASHIRE CHAR
MA	:	MACHARA (HATYA ISLAND)	MC	:	MOULOVIR CHAR
ND	:	NIJHUM DWEEP	CB	:	CHAR BATA

as possible to the roosting/feeding areas. Sometimes the birds were approached on foot too.

RESULTS

Among the several species of waterfowl observed during this period a total of twenty four (24) shorebird species was recorded. More than 60% of the species were observed at the northern mudflats of Nijhum Dweep and on the sandbars of the channel between Hatiya Island and Nijhum Dweep. This area lies downstream of the proposed Sandwip Cross-Dam but is within the project area. The species and the number of the individuals recorded in various areas of the eastern parts of the LGD are given in Table 1. Nomenclature follows Hayman et al (1986).

DISCUSSION

Bangladesh appears to be a 'white-patch' in terms of wader study. Some work on the birds in general has been done by Rashid (1987) and Khan (1982) and particularly on waterfowl/waders by Khan (1986), Khan & Rahman (1982), Rashid & Khan (1987), Rashid & Scott (1988) and Sarker & Sarker (1986).

It can be seen from the table that huge flocks of shorebirds were using the survey area during the observation period. Many of them could not be identified and the numbers of birds were as far as possible estimated.

Significant records which make this an important area for conservation include the following:-

Nordmann's Greenshank - unfortunately an accurate count of this highly endangered species was not made. However the estimate of 300 birds is the largest number seen anywhere in the world, possibly accounting for ca 30% of the estimated world population according to Howes and Lambert (1987). This indicates that the LGD may be the main wintering ground for this species.

Crab Plover - the 6 birds observed were the first recorded in Bangladesh. Sarker and Sarker (1988) are uncertain of its presence.

Spoon-billed Sandpiper - 3 birds were observed. This is significant due to the lack of records of this species during the wintering period throughout its range.

Among the other important waterfowl recorded were Bar-headed Goose *Anser indicus*, Purple Heron *Ardea purpurea*, Eurasian Spoonbill *Platalea leucorodia*, White Stork *Ciconia ciconia* and Great Black-headed Gull *Larus ichthyaetus*. Khan & Rahman (1982) worked between October 31 and November 8, 1981 in the area adjacent to the present study area, viz. Char Rahman and Sonadia Island and reported the occurrence of Open-billed Stork *Anastomus oscitans*, Black-necked Stork *Xenorhynchus asiaticus*, Lesser Adjutant Stork *Leptoptilos javanicus*, White Ibis *Threskiornis aethiopica* and Greylag Goose *Anser anser* as well as waders. Among the waders not mentioned in Table 1 but reported by Khan & Rahman (1982) are Sanderling *Calidris alba*, Dunlin *Calidris alpina* and Ruff *Philomachus pugnax*.

By virtue of its geographical location, Bangladesh holds an important strategic position for migratory birds and particularly shorebirds. Moreover, with the Himalayas in the north acting as a barrier it also plays the role of a winter staging area for several far eastern breeders like Nordmann's Greenshank and Spoon-billed Sandpiper, in addition to those widespread Palearctic breeding species like Lesser Sandplover, Grey Plover, Curlew Sandpiper, Ruff, Common Redshank, Eurasian Curlew, Pied Avocet, Kentish Plover, Common Sandpiper and Ruddy Turnstone. Some observations were also made from April 24 to 26, 1988, in the same area, when a comparatively small number of waders (3,000) belonging to 16 species was sighted (Paul Thompson, Flood Hazard Research Centre, U.K., (pers. comm.), suggesting that most of the waders had left for their northward migration journey to China and Siberia.

The proposed Sandwip Cross-Dam, under the Land Reclamation Project of the Bangladesh Water Development Board with the technical co-operation of the Kingdom of Netherlands, has some sound socio-economic objectives but the environmental impact of the cross-dam, including the expected morphological effects have yet to be studied. There is no doubt that the alteration of the water flow and change in the physical land shape will have an effect on the value of the area for migratory waders. A detailed study of the environmental impacts of this project is neded before the project is allowed to go ahead.

ACKNOWLEDGEMENTS

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FURTHER OBSERVATIONS ON THE SHOREBIRDS IN THE LOWER GANGETIC DELTA, BANGLADESH

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A follow-up survey to that conducted by S.M.A. Rashid in 1988 of Hatya and surrounding islands in the Lower Gangetic Delta, Greater Noakhali District, Bangladesh, took place between January 27th and February 3rd, 1989. The survey involved staff of the Asian Wetland Bureau, the Bangladesh Forest Department and the Nature Conservation Movement of Bangladesh (NACOM). Its aims were to identify and count waterbirds in the area, to collect preliminary data on wetland uses and threats there, and to make recommendations, based on the results, for further study of wetlands in Bangladesh.

The team visited all sites covered by Rashid, as well as some additional islands north-west and north-east of Hatya. Over 53,000 shorebirds of 35 species were recorded, as well as 12,000 other waterbirds (chiefly gulls and terns, ducks and geese, and herons and egrets).

The most significant discovery of the survey was of 257 Spoon-billed Sandpipers *Eurynorhynchus pygmaeus*, the largest concentration of this species ever recorded away from the breeding grounds. Furthermore, two birds carried coloured leg flags. It is likely that these birds were marked as part of a study of Spoon-billed Sandpipers on the Northern Chukotski Peninsula, U.S.S.R., initiated in 1986, by Dr. Pavel Tomkovitch. Dr. Tomkovitch has been informed and news is awaited.

Other notable records were 3 Nordmann's Greenshanks *Tringa guttifer*, 9 Asian Dowitchers *Limnodromus semipalmatus*, 2,300 Broad-billed Sandpipers *Limicola falcinellus*, 19 Bar-tailed Godwits *Limosa lapponica* and 77 Red Knots *Calidris canutus*. The last two species are apparently new records for Bangladesh. Large numbers of several locally rare waterbird species were observed; the most noteworthy being 3,200 Indian Skimmers *Rynchops albicollis*.

All the islands are prone to erosion from the strong currents which formed them. In a bid to stabilise newly formed islands, afforestation plantations of mangrove trees *Avicennia officinalis*, *Sonneratia apetala* and *Bruguiera rhizophora* have been initiated by the Forest Department. Other dominant land-uses noted were fisheries and agriculture - chiefly rice cultivation. Very few threats to waterbirds or the habitat were observed though small-scale hunting may take place. The greatest threat to the area may be the development of large scale construction projects such as the proposed Sandwip-Cross Dam.

A full coastal survey of Bangladesh, concentrating on wildlife and coastal resources, was among the recommendations put forward at the end of the survey. Discussions with the Forest Department and NACOM have been encouraging, and AWB is currently searching for funding for the 12 month coastal survey.

A full report on the January/February 1989 survey is in preparation, and the results will be summarised later in "*The Stilt*".

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AN INTRODUCTION TO THE NEW ZEALAND DOTTEREL

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The aim of this article is to introduce a wider audience to a wader that is endemic to New Zealand and about which relatively little is known, either in New Zealand or abroad. I will start by outlining briefly the history of discovery and study of the species, then review what we know and what we do not know about various aspects of its biology and ecology. Work we are currently undertaking is aimed at filling some of the gaps in this knowledge. Finally, I will describe some of the problems that the species has faced (and faces now), then suggest what the future may hold. Areas and localities mentioned in the text are shown in Figure 1.

DISCOVERY AND CLASSIFICATION

The NZ Dotterel was discovered by European man in 1773 when specimens were collected by the Forsters in Dusky Sound, Fiordland, during Cook's second voyage. The name 'Dusky Plover' was conferred by Latham and subsequently translated by Gmelin to produce *Charadrius obscurus*. It has long been suspected that the species is not 'mainstream' *Charadrius* however, and at least five genera have since been suggested (or erected) to house it, namely *Pluviorhynchus, Haematopus, Hyetoceryx, Ochthodromus* and, most recently, *Pluvialis* (Oliver 1955). Current opinion, based on comparisons of skeletal structure (Strauch 1978), breeding behaviour (Phillips 1980), clutch size and plumage, suggests that *obscurus* is not as closely related to *Pluvialis* (or to *Haematopus*) as it is to some members of *Charadrius*. Modern biochemical techniques have not (as far as I am aware) yet been used to address the question; until such studies are carried out, the species should probably remain in *Charadrius*.

Physical descriptions of the bird can be found in Falla et al (1979) and Hayman et al (1986). It is the largest member of the genus, with adults typically weighing 135-150g. Overall, the NZ Dotterel probably resembles the Greater Sand Plover *C. leschenaultii* most closely but appears more heavily-built.

The first organised study of the species was begun in December 1950 when H.R. McKenzie initiated a colour-banding programme. Between 1950 and 1977, 66 chicks and 20 adults were banded, although the value of much of this early work was negated by the fact that the colour bands used deteriorated rapidly and most were lost within one-two years of banding (McKenzie 1978). More recently, the study was co-ordinated by Sylvia Reed. At the time of her death in 1981, approximately 170 birds had been banded in total. When I first became actively interested in the species in 1986, field surveys and an analysis of recent sightings suggested that about 50 birds still retained all or some of their colour bands. As these birds were widely scattered (and many could not be unequivocally identified), I decided to concentrate banding on a relatively small number of birds in a defined area. Over the past two years, this study has revealed many details of birds' movements between flocking and nesting area (Dowding, in preparation), as well as providing additional information on breeding, morphometics, primary moult, diet and some aspects of behaviour.

DISTRIBUTION, POPULATION AND STATUS

A little over 100 years ago, Buller (1882) was able to write of the New Zealand Dotterel: "This fine species, although nowhere very plentiful, is dispersed along the whole of our shores, frequenting the ocean-beaches and the sand flats at the mouths of all our tidal rivers". Since Buller's time, the range of the species has contracted dramatically. At present, it is largely absent from the southern half of the North Island and from most of the South Island. There are thus two apparently isolated breeding populations (see Figure 1) separated by about 1000km; one is found along the coastline of the northern part of the North Island (roughly north of 38°S) and the other on Stewart Island, at about 47°S. Birds of the northern population are found on few offshore islands, probably because most of these provide little suitable habitat; one exception is Great Barrier Island, which supports a group of about 50 birds on the sandy beaches of its east coast. There are occasional sightings of birds on Farewell Spit and on the Westland coast, suggesting that a few pairs may survive and attempt to breed in various parts of the South Island. These are unlikely, however, to be self-sustaining populations. A search of the available literature suggests that the species has never been recorded on any of New Zealand's outlying islands (Dowding, unpublished).

The first attempt at a complete census of the species was made by Edgar (1969) who arrived at totals of about 1100 for the northern population and 200 for the southern. For the past 20 years, numbers have probably remained roughly static - counts collected by Reed (1981) and my own observations suggest that the total population is currently about 1400 birds. There is, however, no recent information on the size of the Stewart Island population and we are assuming that it has not changed significantly. The slight increase over Edgar's estimate is almost certainly due to better survey coverage in northern areas than to any real increase in the number of birds.

There is an obvious difference in the breeding habitats of the northern and southern birds which has often prompted the question of whether the two groups are distinct, possibly sub-species. It is usually assumed that the present populations are only recently separated (e.g. Hayman et al. 1986) and thus unlikely to have diverged to any extent. The few available 19th century records from the southern North Island suggest that these birds were high-altitude breeders like the South Island population; it is thus possible that the mountain-breeding birds of both islands may have been reproductively isolated from the northern birds (which appear to breed exclusively on the coast) for some time. There is, at present, no evidence either way but we have recently begun a study of the Stewart Island population which may provide some information on this subject.

The status of the NZ Dotterel is debated; Sibson (1967) and Edgar (1969) both described it as rare and Reed (1981) declared that "a species with a total population of fewer than 1400 is surely entitled to be classed as endangered". Hayman et al (1986) also classified it as endangered but Bell (1986) listed it as "threatened" (=vulnerable). The fact that numbers are relatively stable and that the population is fairly well spread suggests that the species may not be immediately endangered; it is clearly vulnerable, however, and numbers should be monitored regularly to detect any changes in the current position.

MOVEMENT

One well-known characteristic of the NZ Dotterel is the annual movement from nesting territory to flock site and back. In the past, the mountain-breeding birds of the South Island were recorded descending (mostly to the east coast) to flock in late summer and returning to the high country to breed in early spring (e.g. Potts 1872). This pattern is still seen on Stewart Island, with some birds thought to cross Foveaux Strait (a distance of 35-40km) to

form the winter flock seen each year at the southern tip of the South Island. In the northern population, many (but not all) adult birds move from their breeding beaches along the coast to a flock site, typically on an exposed sandspit at the mouth of a river or the entrance to a harbour. Why some birds remain on their breeding grounds throughout the year is not known. Our studies at Omaha in Northland have shown that adult birds are sedentary in the sense that there is little (if any) movement in or out of a defined area; there is, however, considerable local movement within it. Apart from annual movements to and from breeding areas, it is clear that some adult birds occasionally (regularly?) move short distances (e.g. 3-10km) from one estuary or stream mouth to another, apparently to feed, and return in the same day. This behaviour has been observed at different times of the year, but we do not yet know if it is more common at some times than at others.

A recent analysis of sightings from the 1970s and early 1980s (G. Peterson, pers.comm.) also shows that once adult birds are established in an area, they tend to remain in it for many years. There are cases on record of birds moving from one area to breed in another (and remaining there) but they are uncommon. It is not known what may trigger such a move but one obvious possibility is the loss of a mate. Juveniles of the northern population are known to wander widely (McKenzie 1978), probably for up to two years, before they begin breeding. Presumably this wandering increases gene flow in a species in which most of the adult birds appear to be sedentary. Nothing is yet known about movement of juveniles in the Stewart Island population.

BREEDING BIOLOGY

It is sometimes assumed that NZ Dotterels may be sexed (at least in the breeding season) by the depth and extent of colour on the underparts, males being generally darker than females. While this is often the case, it is certainly not reliable enough to be of much practical use. First, many observations show that in some pairs both birds achieve the same degree of colour; second, most birds in the northern population show maximum colour in May-July. By the time breeding actually begins in September, birds have very often become much paler and any sex difference is likely to be even less marked. Analysis of the morphometric data collected so far has detected no useful differences; although males may average slightly larger than females, there is considerable overlap (Dowding, unpublished).

Members of the sub-order *Charadrii* are known to have a wide range of mating systems (Oring 1982) but as yet there is no evidence for any system other than monogamy in the case of *C. obscurus*. Until recently, very few pairs have been banded. McKenzie (1978) believed that individuals wandered so much that they were likely to change mates regularly but Reed (1981) concluded that birds "probably pair for life". One pair resident just north of the Omaha study area has been recorded paired for at least 8 of the past 12 seasons, a finding that supports the latter view. More information is clearly required and we are looking at duration of pair bonds as part of our study. The results so far indicate that most birds retain mates from one season to the next (Dowding, unpublished).

In the northern population, most nests are to be found on open beaches (particularly at estuaries and stream mouths) and among dunes behind beaches. Johnsgard's (1981) statement that "these birds invariably nest in sandy situations" is not entirely accurate however; nesting is also quite commonly on shell-banks where these occur. The normal clutch is 3 eggs, although 2 is not uncommon and there are occasional records of larger clutches (e.g. McKenzie 1967). Incubation has not yet been studied in any detail but is known to last 28-30 days (McKenzie 1952). There appears to be much variability in both the degree to which incubation is shared and the length of incubation stints; this is another area where further work is required. The fledging period is also reported to be highly variable at 28 to 52 days (McKenzie et al. 1977). My own observations suggest that it is usually nearer the latter; part (but surely not all) the variation may be explained by the fact that fledging is gradual, probably over a period of 7-10 days, during which the chick can fly but appears reluctant to do so.

LONGEVITY

There is one outstanding report, often quoted in the literature, that deserves some comment. In 1976, a bird bearing a very worn metal band was captured near Auckland and re-banded. Part of the number on the old band was apparently legible and it was deduced that the bird was one banded as a chick in 1950. There must now be considerable doubt as to the validity of this deduction however, as the bird is still being seen, at an apparent age of more than 38 years. While this seems highly improbable, we do know that the birds are relatively long-lived; there are a number of well-documented cases of individuals 12-16 years old. The main problem in age determination of the species is, without doubt, that most birds survive longer than their colour bands.

FOOD

A wide variety of food items has been recorded for the northern population of the New Zealand Dotterel and many of the observations were recently summarised by Latham (1987). It appears that the birds will take almost any suitably-sized animals, alive or recently-dead; small fish are known to be eaten but the bulk of the diet consists of invertebrates. The commonest food item taken on northern beaches is probably the land sandhopper *Talorchestia quoyana*. There is little information available on the diet of Stewart Island birds.

PROBLEMS PAST AND PRESENT

The New Zealand Dotterel probably first came under serious pressure with the arrival of European man. On the east coast of the South Island (possibly the stronghold of the species at the time), it was often shot for food; descriptions such as "This excellent gamebird" (Potts 1885) and "They... are very fat at that time, and of exquisite flavour..." (Earl, quoted in Gray 1845) are to be found in the early literature. It seems obvious that introduced predators, such as European rats, cats, mustelids and hedgehogs, must also be partly responsible for the decline of the species. In the present northern population there is egg loss on a large scale and breeding success is very low; there is, however, very little evidence available on the relative impacts of introduced predators and 'natural' ones, such as gulls; this is yet another area where study is needed. What seems likely is that continued coastal development and increasing recreational use of beaches by humans (with their vehicles and dogs) is having an effect. Increased disturbance during the breeding season may be tipping a delicate balance by allowing predators greater access to undefended nests. A warden system, keeping humans and dogs out of a nesting area over the summer, has recently been in operation at Wharekawa, on the Coromandel peninsula; results are very encouraging and considerable numbers of chicks are fledging from the area. (P. Thomson, pers. comm.).

On the positive side, we know that the New Zealand Dotterel is a long-lived bird; indeed, this may be

the chief reason why it is still extant. It is also persistent in its breeding habits, with females laying two or even three replacement clutches per season. Numbers appear to be stable and we are now aware of some of the problems facing the species; however, there is little room for complacency when the total population is less than 1500 and funding for conservation, management and education is practically non-existent. The New Zealand Dotterel was described by Hutton and Drummond (1923) as "another bird that has had to beat a retreat before civilisation". I hope that retreat has run its course and can now be gradually reversed.

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WADERS WHICH ARE RARE IN NEW ZEALAND, AND THE INCIDENCE OF RARE MIGRANT WADERS IN THE PAST FOUR YEARS

INTRODUCTION

A high percentage of the wader species recorded in New Zealand could be classed as vagrants. There are some 60 species of wader on the New Zealand list and, of these, 48 can be classed as very rare, with less than fifteen records. Rarities are most often recorded from the main wader sites near Auckland-Manukau Harbour, Kaipara Harbour and the Firth of Thames and from Lake Ellesmere near Christchurch in the South Island. This reflects not only the high numbers of birds at these sites, but also the proximity of many bird watchers. Two sites which are hardly ever watched have produced a number of records of rare waders - Parengarenga Harbour in the far north and Farewell Spit (to which access is restricted) on the north-western tip of the South Island. It is a shame that Farewell Spit is not a permanently staffed bird observatory.

Any piece on rare waders in New Zealand ought not to forget the six species of endemics which have very small populations - Shore Plover (120), Chatham Island Snipe (50), Auckland Island Snipe (??), Chatham Island Oystercatcher (50), New Zealand Dotterel (up to 1500), and Black Stilt (50). The first four of these species are confined to off-shore islands; the latter two are much affected by predation and disturbance at their breeding sites. Two other species of endemic wader, Wrybill (up to 5,000) and Variable Oystercatcher (max. 1500), seem not to be threatened. The South Island Pied Oystercatcher (80,000), a distinct subspecies of the species found also in Australia, is steadily increasing its numbers. One species of wader breeding in New Zealand migrates to Australia - the Double-banded Plover (10,000+).

AUSTRALIAN WADERS IN NEW ZEALAND

No species of wader breeding in Australia migrates on an annual basis to New Zealand. Red-capped

Plovers have been recorded regularly and have bred once. Both the Red-necked Avocet and Red-kneed Dotterel have been recorded as vagrants. In only comparatively recent times two species of Australian origin have established themselves in New Zealand - Spur-Winged Plover (??) and Black-fronted Dotterel (260+). The former arrived in 1932 and is now found throughout the country; the latter was first noted in 1950 and now is well-established in several locations in both the North and South Islands.

WADERS COMMON IN SOUTH-EASTERN AUSTRALIA AND UNCOMON IN NEW ZEALAND

Many species which occur in high numbers in south-eastern Australia are regular visitors in only small numbers to New Zealand. More than twenty Curlew Sandpipers, Red-necked Stints or Sharp-tailed Sandpipers at any single site would be noteworthy in the New Zealand context.

A number of wader species in this category merit classification as rarities. Between July 1984 and June 1988 records were as follows (Numbers refer as closely as can be estimated, to the total of individuals recorded in the four year period from July 1984 to June 1988):

Far-eastern Curlew	155
Large Sand Plover	8
Mongolian Plover	4
Japanese Snipe	1
Grey-tailed Tatler	26
Common Sandpiper	2
Greenshank	12 - one of which has been in residence for ten years and another for nine
Marsh Sandpiper	6
Terek Sandpiper	26
Great Knot	1
Asiatic Black-tailed Godwit	28
Sanderling	11

For many years the most likely bird to be added to the New Zealand wader list has surely been the Wood Sandpiper, and still it has not been recorded here.

WADERS RARE IN BOTH SOUTH-EASTERN AUSTRALIA AND NEW ZEALAND

In the period from July 1984-June 1988 Asiatic Dowitcher, (2 records) and Wilson's Phalarope were added to the New Zealand list. Other records in the same period included:

Little Curlew	4
Oriental Pratincole	1
Grey Plover	4
Ruff/Reeve	1
Ringed Plover	1
(New Zealand's second; staying for two years)	
Wandering Tatler	4
Red-necked Phalarope	1
Pectoral Sandpiper	39
Lesser Yellowlegs	3
Hudsonian Godwit	8
Whimbrel	11
(American subspecies)	

Of these rarer species, only the Oriental Plover was not recorded in the five-year period. The status of the American Golden Plover in New Zealand is unknown, but there have been suggestive sightings recently, as in the past - the species may be a regular visitor in small numbers. The pattern of records over many years suggests that some American species occur more frequently in New Zealand than in Australia; for example, Hudsonian Godwits and Lesser Yellowlegs are often noted, if not annually.

Species in this category on the New Zealand list but not recorded in the period include: Bristle-thighed Curlew (previously three records from the Kermadecs), Painted Snipe, Western Sandpiper, Least Sandpiper, Baird's Sandpiper, White-rumped Sandpiper, Buff-breasted Sandpiper, Bartram's Sandpiper, Dunlin (previous records have involved birds in breeding plumage), and Grey Phalarope.

It is idle to speculate about which as yet unrecorded rarities might be added to the New Zealand list in the future, but a few remarks are worth making. Despite some sightings of unusual stints within the period, no stint species has been added to the list, so Little Stint, Long-toed Stint and the less likely Semipalmated Sandpiper are yet to be recorded. But perhaps it should be noted that Hayman et al seem to believe that the birds formerly accepted in New Zealand as Least Stint were Long-toed Stint. Note also that Little Ringed Plover has yet to be recorded in New Zealand.

SOURCES OF INFORMATION

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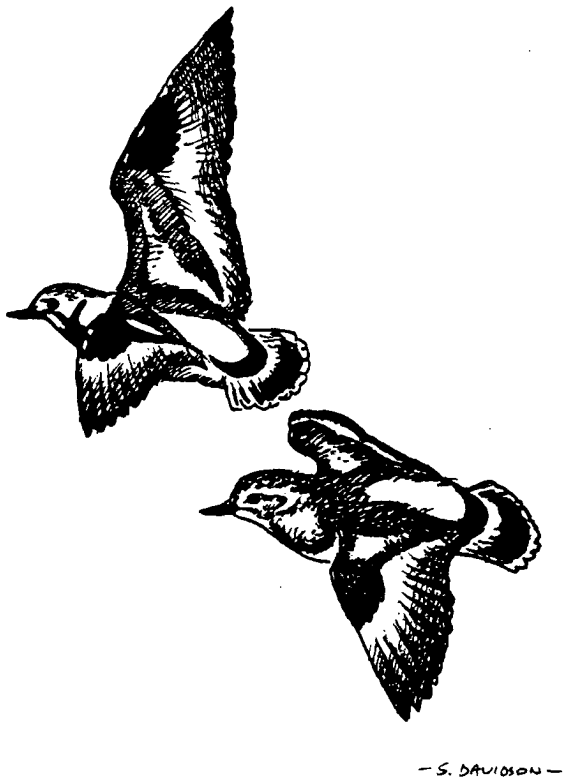
Stephen Davies & Adrian Riegen, Department of Philosophy, Private Bag, Auckland, New Zealand.



ADDENDUM TO "BIOMETRICS AND MOULT OF LESSER GOLDEN PLOVERS *Pluvialis dominica fulva* IN VICTORIA" - *STILT* 13:15-19.

1. INTRODUCTION

In the original paper it was claimed:

(a) that Victorian Lesser Golden Plovers appear to come from Alaska, and

(b) that the intermediate wing lengths of Victorian birds cast doubt on the claimed ability to separate *dominica* and *fulva* on the basis of discriminant function analysis based mainly on wing length, as proposed by Connors (1983).

Connors used the discriminant function to separate specimens from north-west Alaska as *fulva* and *dominica* and demonstrated that there is no evidence of inter-breeding between the forms in sympatric areas, as the occurrence of phenotypically intermediate birds in such areas is no higher than in allopatric regions. This evidence has, in large part, led to the two races being given full species status.

However, probably plovers of intermediate wing length were not included in Connors' analysis and these birds may be hybrids of the two forms.

2. NEW INFORMATION

I have recently been reminded (D.G. Thomas, pers.comm.) of the recovery of a Lesser Golden Plover in New South Wales which had been banded in the Prifilof Island, Alaska, during southward migration (24/8/66). This movement provides additional support for the claim that Lesser Golden Plovers in south-eastern Australia breed in Alaska.

During recent years I have seen a number of distinctly grey-brown plovers in Victoria and in the current season (1988/89) three have been observed within a flock of about 50 birds at Werribee Sewerage Farm, Victoria (R.J. Swindley, M.J. Carter, pers. comm.). *Dominica* are noted as being grey-brown compared with the yellow-buff of *fulva* (Hayman et al 1986), and there has been some speculation that at least one of the latter birds could be a bird of the American race. However, a possibility that also needs to be considered is that these grey birds could be hybrids from inter-breeding of the *fulva* and *dominica* forms in the sympatric zone in Alaska.

3. REFERENCES

Connors, P.G. 1983. Taxonomy, distribution and evolution of Golden Plovers (*Pluvialis dominica* and *Pluvialis fulva*) Auk 100:607-620.

Hayman, P., Marchant, J. and Prater, T. 1986. Shorebirds. Croom Helm. London.

M.A. Barter, 21 Chivalry Avenue, Glen Waverley, Vic. 3150.

FURTHER INFORMATION CONCERNING THE BREEDING GROUNDS OF RED KNOT *Calidris canutus rogersi*

1. INTRODUCTION

North-eastern Siberia, Alaska and, particularly, Wrangel Island have been suggested as *rogersi* breeding areas (Portenko 1972, Flint 1972, Cramp and Simmons 1983). Roselaar (1983) disputes the claim that *rogersi* breeds on Wrangel Island and suggests that birds from this island and from Alsaka form a fifth race that migrates along the Pacific Coast of North America to unknown non-breeding sites.

Results of analyses of bill and wing lengths of Red Knots caught in Australia (Barter et al 1988) confirm that the sub-species occurring in Australia is *rogersi*.

2. NEW INFORMATION

Tomkovich (1988) has recently published morphological data, obtained from Russian museum specimens, which show that there are four Siberian breeding populations (see Fig. 1). He concludes that the description of *rogersi* in breeding plumage corresponds to that of birds from the Chukotski Peninsular in far eastern Siberia.

I have used Tomkovich's bill and wing length measurements for the four breeding populations to give population averages on the basis of there being equal numbers of each sex. This allows ready comparison of his measurements with those obtained from live unsexed Australian *rogersi*, if the assumption is made that the sex ratio in Australia is also unity. The results are listed in Tables 1 and 2, together with the Australian data from Barter et al 1988.

Table 1. Bill length data for Siberian-breeding Red Knots (adapted from Tomkovich 1988) in mm. (M = male, F = female).

Population	Sample Size	Mean	Range
Taimyr Peninsula	15M 7F	33.7	29.0-37.3
Novosibirski Pen.	7M,6F	31.7	29.0-34.4
Chukotski Pen.	5M,8F	32.4	28.9-34.2
Wrangel Island	18M,11F	36.4	33.3-38.3
Australia	683	32.9	28.5-38.8

Table 2. Wing length data for Siberian-breeding Red Knots (adapted from Tomkovich 1988) in mm. (M = male, F = female)

Population	Sample Size	Mean	Range
Taimyr Peninsular	18M,6F	165.5	158.5-173.0
Novosibirski Pen.	5M,4F	157.6	150.0-164.0
Chukotski Pen.	5M,8F	163.0	150.5-170.5
Wrangel Island	17M,12F	168.6	159.5-175.5
Australia	717	165.3	148-177

The measurements of Australian knots agree well with Tomkovich's data for the Chukotski Peninsular, especially when allowance is made for specimen shrinkage. The only other breeding population that could possibly match that of *rogersi* is the one from the Taimyr Peninsular. However, these latter birds, when in breeding plumage, have rufous vents and under-tail coverts, unlike *rogersi*. Their bills are also longer. It can also be seen that Wrangel Island Knots have considerably longer bills and wings than those of Australian birds.

Recently, the Australian Bird Banding Scheme has received advice of the late July recovery (28/7/82) of an Australian-banded Red Knot near Magadan on the southern coast of Eastern Siberia, to the west of the Kamchatka Peninsular (see Fig. 1 for location). It is reasonable to assume that this bird was returning from breeding-grounds further to the east and the recovery provides additional support for the suggestion that *rogersi* breeds on the Chukotski Peninsular.

3. CONCLUSION

Additional information on the morphometrics of Siberian Red Knot breeding populations, in conjunction with the recovery of an Australian-banded knot in late July in eastern Siberia, provides convincing support for Tomkovich's suggestion that rogersi breeds on the Chukotski Peninsular.

4. REFERENCES

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Roselaar, C.S. 1983. Subspecies recognition in the Knot *Calidris canutus* and occurrence of races in Western Europe. Beaufortia 33(7):97-109.

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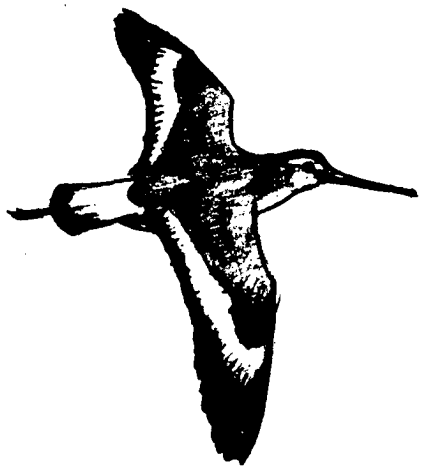
M.A. Barter, 21 Chivalry Avenue, Glen Waverley, Vic. 3150.



THE LITTLE CURLEW *Numenius minutus* IN AUSTRALIA: WHAT HAPPENS IN THE WET SEASON?

Since mid-1987 the RAOU, funded by ANPWS, has been conducting a study of waders in Kakadu National Park. Initial surveys found that while the number of species present is high, the number of individuals of most of those species was not. Some of the species are rare by Australian standards, including Little Ringed Plover and Redshank, but the species for which Kakadu is of the greatest significance is the Little Curlew. In the late dry season (October/November) Little Curlews number in the tens of thousands on the dry floodplains, and their daily movement patterns have been documented. They forage in the relative cool of the early morning and late afternoon, usually taking seeds and insects from amongst short, dense grass, and they gather in enormous flocks around freshwater pools in the heat of the day. They do feed on the grasslands around these pools during the day, but frequently retreat to the water, presumably to cool-off. The birds appear not to feed at night. The only birds found at night were roosting on a recently-burnt grassland.

The Little Curlew is common on dry grasslands across much of northern Australia at the end of the dry season, but Kakadu is significant because it contains a large area of suitable habitat which is protected from pastoralism and feral buffaloes. With the arrival of the wet season in Kakadu and elsewhere in northern Australia however, the Little Curlews disappear. There are very few records for Little Curlews during the wet season (December - March), but those records that do exist suggest that the birds move inland ahead of the rains. The most promising record is of thousands in the Richmond district of Queensland in February 1903 (Berney 1904).

The Kakadu study is progressing to banding and colour-banding in an attempt to trace the movements of Little Curlews, but we don't even know where they are for much of their time in Australia! Because of the Richmond record, south-western Queensland may be the bottomless pit into which the Little Curlews disappear. To piece together the movement patterns of Little Curlews in Australia, I am trying to gather as many records as possible, especially for the period December to March.

If you have any records or suggestions, please contact me:

Michael Bamford,
P.O. Box 224,
Capel, WA, 6271.
097 272 675

REFERENCE

Berney, F.L. (1904) North Queensland notes on some migratory birds. Emu 4: 43-47.

Michael Bamford, P.O. Box 224, Capel, W.A. 6271.

SOOTY OYSTERCATCHER FEEDING ON A WASHED UP CUNJEVOI

On sandy ocean beaches in eastern Victoria the Sooty Oystercatcher *Haemotopus fuliginosus* can usually be observed foraging on the tideline on bivalve molluscs such as the Pipi *Plebidonax deltoides* and, occasionally, polychaete worms and in the upper sections of the beach (especially around decaying seaweed clumps) on sandhoppers (Amphipoda).

It was with surprise that whilst walking along a beach east of Clinton Rocks in east Gippsland, Victoria on 22 September 1988 that I observed a Sooty Oystercatcher feeding on a freshly washed-up cunjevoi (Sea Squirt) *Pyura* spp. The cunjevoi had

been first discovered by several Australian Ravens *Corvus coronoides* judging by the distinctive tracks and bits of cunjevoi innards strewn about on the adjacent sand. They had made two roughly rectangular incisions into the tough outer skin or tunis (measuring 4.5 x 2.5cm and 3.0 x 1.5cm respectively) revealing the soft red meaty innards.

The Sooty Oystercatcher was standing next to the cunjevoi and constantly pecking at the innards through the two incisions made by the ravens. Occasionally some innards would stick to the oystercatcher's bill and the bird would wipe the bill on adjacent damp sand.

The oystercatcher obviously had a liking for this meal as after I had investigated what the bird was eating and moved off down the beach it went back to the cunjevoi and resumed feeding.

This observation demonstrates that the Sooty Oystercatcher like many other wader species is an opportunistic feeder.

Martin Schulz, 167 South Beach Road, Bittern, Vic. 3918.

RECENT INTERESTING WADER RECORDS IN WESTERN AUSTRALIA

Hooded Plover:

The Esperance region still turns up impressive flocks of this species.

13.03.88 Total of 350 on Kubitch and Gore Lakes, near Esperance (R. Jaensch, R. Vervest).

09.04.88 Flock of 539 on Lake Warden, near Esperance (G. McDonald).

01.10.88 Flock of 260 on Lake Karbul, near Esperance (R. Jaensch).

Banded Stilt:

Breeding!!!

Sept.88 ca. 3,000 on a small lake near Nambling (31 15'S, 117 00'E) (C. & W. Napier).

04.08.88 Adults and chicks on Lake King (33 05'S, 119 32'E). Aerial survey yielded counts of 4,000 adults and 7,000 chicks, but ground surveys suggested 3-4 times these numbers. Precise location of nesting site not found. (A. Bougher).

Masked Lapwing:

May be common everywhere else in Australia, but very rare in the south-west of W.A.

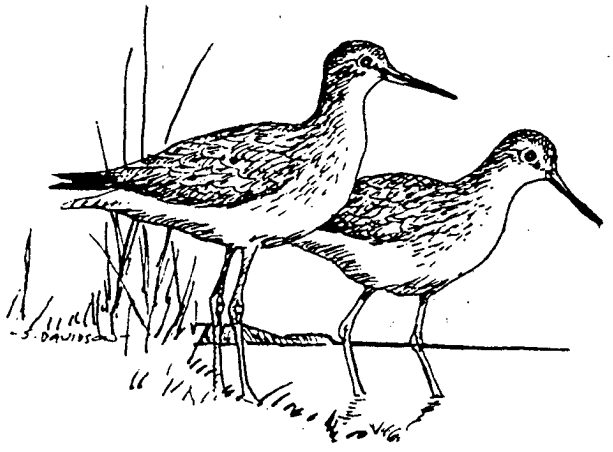
09.05.88 Single bird at Lake Yangebup, in Perth (D. James).

Redshank:

20.04.88, 20.06.88, 18.07.88. A single bird seen on each occasion at Roebuck Bay, Broome (B. Wells & G. Hooper - Broome Bird Observatory).

Asian Dowitcher:

June/July 1988. One seen (several times?) at Roebuck Bay, Broome (B. Wells & G. Hooper - Broome Bird Observatory).



BANDING ROUND-UP

Compiled by Kim Lowe, Australian Bird & Bat Banding Schemes, Australian National Parks & Wildlife Service, GPO Box 8, Canberra ACT 2601.

The following lists are from data supplied to the Australian Bird and Bat Banding Schemes between August 1988 and February 1989. Permission must be sought from the banders and clearance given by ABBBS before using these data in publications.

Layout of data:
Line 1 - band number; banding place; co-ordinates; date of banding; age; sex; bander.
Line 2 - recovery method; recovery status; recovery place; co-ordinates; recovery date; age; sex; finder.
Line 3 - distance and direction between banding and recovery places; time elapsed between banding and recovery.

Symbols used:

Age code:
U = unknown;
P = nestling;
J = juvenile;
1 = within the first year of life;
+1 = within the first year or older;
2 = within the second year;
+2 = within the second year or older; etc.

Sex:
U = unknown;
M = male;
F = female.

Method of encounter:
01 = probably trapped;
02 = trapped but device is unknown to the banding office;
03 = trapped in a mist net;
04 = trapped with a cage trap;
05 = trapped with a cannon net;
40 = band found on a bird, no further data on how encountered;
41 = band returned, not reported if on a bird;
46 = colour marking sighted in field bird one of a cohort marked in this manner;
48 = colour marking sighted in field;
54 = beachwashed;
61 = shot - reason unknown;
63 = taken for scientific study;
67 = taken for food or feathers;
99 = found dead, cause unknown.

Status after encounter:
00 = status of bird and band is unknown;
01 = status of bird unknown,band left on bird;
02 = status of bird is unknown and the band was left on the bird;
03 = bird is dead, status of band is unknown;
04 = bird is dead, band left on bird;
05 = bird is dead, band removed from bird;
13 = bird released alive with band;
14 = bird released alive, band removed;
26 = bird was alive in the wild with the band;
29 = bird partially decomposed, band removed.

Note: band numbers beginning with letters are from foreign banding schemes. The band numbers beginning with 'UNK' are coded numbers for sightings of colour marked birds for which the real band number is unknown.

129 RUDDY TURNSTONE ARENARIA INTERPRES

051-26822 BEACHES CRAB CK RD ROEBUCK BAY BROOME WA 18d 0mS 122d22mE 25/03/85 +2 U AUSTRALASIAN WADER STUDY GROUP
99 05 ULAKHAN-KYUYOL VERKHOYANSKY YAKUT USSR 68d33mN 136d32mE 07/06/86 U U SOVIET BANDING SCHEME
Distance: 9666 km Direction: 5 degs. Time elapsed: 1 yrs 2 mths 13 days

The second international control, the other was further south in the USSR.

140 DOUBLE-BANDED PLOVER CHARADRIUS BICINCTUS

041-18268 POINT COOK, ALTONA VIC 37d55mS 144d46mE 03/08/86 +2 M VICTORIAN WADER STUDY GROUP
54 04 TIHAKA BCH COLAC BAY STHLAND NEW ZEALAND 46d23mS 167d54mE 14/11/88 U U WOODHAMS
Distance: 2120 km Direction: 123 degs. Time elapsed: 2 yrs 3 mths 11 days

041-18276 INVERLOCH (ANDERSONS INLET & PT. SMYTHE) VIC 38d37mS 145d45mE 09/06/86 1 M VICTORIAN WADER STUDY GROUP
99 05 LOWER OHAU RIVER NEAR TWIZEL NEW ZEALAND 44d 0mS 170d11mE 09/09/88 U U MURRAY
Distance: 2123 km Direction: 114 degs. Time elapsed: 2 yrs 3 mths 0 days

NB54759 LAKE WAINONO NEW ZEALAND 44d42mS 171d 9mE 29/09/85 +1 F NEW ZEALAND BANDING SCHEME
05 13 INVERLOCH (ANDERSONS INLET & PT. SMYTHE) VIC 38d37mS 145d45mE 14/05/88 +2 M VICTORIAN WADER STUDY GROUP
Distance: 2210 km Direction: 278 degs. Time elapsed: 2 yrs 7 mths 15 days

More trans-Tasman controls from this interesting project.

153 BAR-TAILED GODWIT LIMOSA LAPPONICA

071-53004 MOUTH OF THE PRESTON RIVER WA 33d19mS 115d40mE 31/10/81 U U WA WADER STUDY GROUP
61 05 ARGAKHTAH SREDNEKOLYMSK YAKUT ASSR USSR 68d23mN 153d14mE 05/06/85 U U SOVIET BANDING SCHEME
Distance: 11698 km Direction: 13 degs. Time elapsed: 3 yrs 7 mths 5 days

071-53007 BASIN BAY GARDEN ISLAND WA 32d14mS 115d41mE 13/12/81 U U WA WADER STUDY GROUP
61 05 ABIY LAKE ABIYSKY REGION YAKUT ASSR USSR 68d23mN 145d 3mE 03/06/85 U U SOVIET BANDING SCHEME
Distance: 11419 km Direction: 10 degs. Time elapsed: 3 yrs 5 mths 21 days

071-53051 SALTWORKS, PORT HEDLAND WA 20d11mS 118d54mE 18/11/82 +2 F WA WADER STUDY GROUP
61 05 VERHNEKOLYMSK REGION YAKUT ASSR USSR 65d46mN 150d56mE 24/05/84 U U SOVIET BANDING SCHEME
Distance: 9906 km Direction: 12 degs. Time elapsed: 1 yrs 6 mths 6 days

The first three controls to the USSR, 071-53004 is the longest movement. Previous controls were to Korea and China.

160 TEREK SANDPIPER TRINGA TEREK

J5018682 SONEZAKI-SHINDEN KITAKYUSHU-SHI JAPAN 33d49mN 130d58mE 18/05/83 +2 U YAMASHINA INST FOR ORNITHOLOGY
05 13 BEACHES CRAB CK RD ROEBUCK BAY BROOME WA 18d 0mS 122d22mE 24/03/88 +2 U AUSTRALASIAN WADER STUDY GROUP
Distance: 5807 km Direction: 190 degs. Time elapsed: 4 yrs 10 mths 6 days

The third Japanese control to Australia, joining the one Australian control to Japan.

161 CURLEW SANDPIPER CALIDRIS FERRUGINEA

041-05283 WERRIBEE SEWERAGE FARM (SPIT, PT WILSON) VIC 38d 3mS 144d32mE 18/02/84 +2 U VICTORIAN WADER STUDY GROUP
40 02 SREDNEKOLYMSKIY REGION YAKUT ASSR USSR 67d 9mN 153d36mE 03/06/84 U U SOVIET BANDING SCHEME
Distance: 11690 km Direction: 3 degs. Time elapsed: 0 yrs 3 mths 14 days

041-14089 SALTWORKS, PORT HEDLAND WA 20d11mS 118d54mE 08/11/83 +2 U WA WADER STUDY GROUP
03 13 BELE LAKE SHIRINSKY KHAKASSKY USSR 54d43mN 90d 4mE 18/08/85 U U SOVIET BANDING SCHEME
Distance: 8741 km Direction: 343 degs. Time elapsed: 1 yrs 9 mths 10 days

The second and third controls to the USSR, 041-05283 is the longest movement.

162 RED-NECKED STINT CALIDRIS RUFICOLLIS

032-22668 SOUTH END OF PIPECLAY LAGOON TAS 42d59mS 147d31mE 22/11/79 +2 U SHOREBIRD STUDY GROUP (BOAT)
61 05 CHITA O KALARSKIY REGION USSR 56d34mN 115d51mE 00/07/83 U U SOVIET BANDING SCHEME
Distance: 11425 km Direction: 342 degs. Time elapsed: 0 yrs 0 mths 0 days

032-33596 WERRIBEE SEWERAGE FARM (SPIT, PT WILSON) VIC 38d 3mS 144d32mE 25/11/81 +2 U VICTORIAN WADER STUDY GROUP
61 05 KHASAN DISTRICT PRIMORYE REGION USSR 42d51mN 131d21mE 00/10/82 U U TATARINOV
Distance: 9058 km Direction: 350 degs. Time elapsed: 0 yrs 0 mths 0 days

032-34683 WERRIBEE SEWERAGE FARM (SPIT, PT WILSON) VIC 38d 3mS 144d32mE 21/02/82 1 U VICTORIAN WADER STUDY GROUP
41 02 SASKYLAK ANABARSKIY YAKUT ASSR USSR 71d59mN 114d 0mE 01/06/84 U U SOVIET BANDING SCHEME
Distance: 12435 km Direction: 350 degs. Time elapsed: 2 yrs 3 mths 8 days

032-44968 RALPHS BAY (WEST) TAS 43d 2mS 147d26mE 06/12/86 1 U SHOREBIRD STUDY GROUP (BOAT)
03 13 DA TU TADU RIVER TAICHUNG TAIWAN 24d15mN 120d30mE 13/08/88 U U TURMAN LAI
Distance: 7945 km Direction: 334 degs. Time elapsed: 1 yrs 8 mths 7 days

The third, fourth and fifth controls to the USSR and the first to Taiwan. 032-34683 is the longest movement.

163 SHARP-TAILED SANDPIPER CALIDRIS ACUMINATA

051-08339 WERRIBEE SEWERAGE FARM (SPIT, PT WILSON) VIC 38d 3mS 144d32mE 26/01/80 +2 U VICTORIAN WADER STUDY GROUP
99 05 ABIYSKIY REGION YAKUT ASSR USSR 68d20mN 144d33mE 28/05/84 U U SOVIET BANDING SCHEME
Distance: 11796 km Direction: 0 degs. Time elapsed: 4 yrs 4 mths 2 days

The second control from the USSR and the longest movement.

164 RED KNOT CALIDRIS CANUTUS

051-08441 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 22/03/80 1 U VICTORIAN WADER STUDY GROUP
99 05 MAGADAN O OLYSKIY REGION USSR 59d35mN 151d15mE 28/07/82 U U SOVIET BANDING SCHEME
Distance: 10860 km Direction: 3 degs. Time elapsed: 2 yrs 4 mths 6 days

The first control from the USSR and the longest movement.

165 GREAT KNOT CALIDRIS TENUIROSTRIS

061-38139	10 KM SOUTH OF ANNA PLAINS WA	19d15mS	121d20mE	24/08/82	+2	U	WA WADER STUDY GROUP
05 13	KHABAROVSK K SCHASTYA BAY CHKALOV I USSR	53d25mN	141d12mE	00/07/85	U	U	SOVIET BANDING SCHEME
Distance:	8274 km Direction: 12 degs.	Time elapsed: 0 yrs 0 mths 0 days					
061-38266	80 MILE BEACH 7 KM SOUTH ANNA PLAINS WA	19d15mS	121d25mE	08/09/82	+2	U	WA WADER STUDY GROUP
61 05	KAMCHATKA O UST-KHAYRYUZOVO USSR	57d 7mN	156d45mE	29/08/83	U	U	SOVIET BANDING SCHEME
Distance:	9079 km Direction: 18 degs.	Time elapsed: 0 yrs 11 mths 21 days					
061-38342	10 KM SOUTH OF ANNA PLAINS WA	19d15mS	121d20mE	24/08/82	2	U	WA WADER STUDY GROUP
67 05	HANGZHOU BAY SHANGHAI CHINA	30d47mN	121d35mE	08/04/87	U	U	LU
Distance:	5536 km Direction: 0 degs.	Time elapsed: 4 yrs 7 mths 15 days					
061-38504	10 KM SOUTH OF ANNA PLAINS WA	19d15mS	121d20mE	24/08/82	1	U	WA WADER STUDY GROUP
01 00	LUHUA VILLAGE FUJIAN PROVINCE CHINA	25d44mN	119d22mE	26/03/86	U	U	RENGUAN
Distance:	4981 km Direction: 357 degs.	Time elapsed: 3 yrs 7 mths 2 days					
061-44751	BEACHES CRAB CK RD ROEBUCK BAY BROOME WA	18d 0mS	122d22mE	18/04/85	+2	U	AUSTRALASIAN WADER STUDY GROUP
67 05	MOUTH OF YANTZE RIVER SHANGHAI CHINA	31d 5mN	121d50mE	11/04/87	U	U	LU
Distance:	5432 km Direction: 359 degs.	Time elapsed: 1 yrs 11 mths 23 days					
061-70158	SHORES OF THE 80 MILE BEACH WA	19d15mS	121d20mE	31/03/88	+2	U	AUSTRALASIAN WADER STUDY GROUP
01 00	CHONGMING DAO SHANGHAI CHINA	31d36mN	121d30mE	25/04/88	U	U	NATIONAL BIRD BANDING CENTER
Distance:	5627 km Direction: 0 degs.	Time elapsed: 0 yrs 0 mths 25 days					

The first and second controls to the USSR, all others were to China. 061-38266 is the longest movement. Note that 061-70158 covered the distance in 25 days supporting the theory of direct flights between Australia and China by this species.

THE STILT

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A.W.S.G. ITEMS

Editorial. 1
Errata. 1
Chairman's Report for 1987 - Mark Barter. 1
Appointment of Membership and Liaison Officer - Mark Barter. 2
Cox's Sandpiper Identification - Mark Barter. 2
Northward Migration Project - Mark Barter. 2
1988 R.A.O.U. Congress - Mark Barter. 2
Three R.A.O.U. Reports of Interest to A.W.S.G. Members. 2
Conservation Officer's Report for 1987 - Jeff Campbell. 2
Recent Literature. 2
Report from Membership and Liaison Officer - Peter Haward. 3
Treasurer's Report for 1987 - David Henderson. 3
A Report on A.W.S.G. Research Activities. 4
1988 NW Australia Wader Expedition (19 March-10 April) - Clive Minton. 5
Double-banded Plovers - A Further Plea - Clive Minton. 5
A New Project for the A.W.S.G. - Brett Lane. 6
A.W.S.G. to Run 1989 Scientific Day - Brenda Murlis. 6
A.W.S.G. Committee for 1988-1990 - Brenda Murlis. 6
Wandering Waders: August 1987 to January 1988. 6

A.W.S.G. Regular Wader Counts Project. Interim Report to June 1987: Migratory Waders - Richard Alcorn. 7
Wader Frequencies Counts at Peel Inlet, Western Australia, Between 1983 and 1985 - Gordon Baker. 23
Red Knot (Calidris canutus rogersi) In Australia. Part 1: Sub-species Confirmation, Distribution and Migration - Mark Barter, Angela Jessop and Clive Minton. 29
Biometrics, Moult and Migration of Large Sand Plover (Charadrius leschenaultii) Spending the Non-Breeding Season in North-Western Australia - Lisa Barter and Mark Barter. 33
The Winter 1987 Population Monitoring Count: Lesser Golden Plovers Over-wintering in Australia - Marilyn Hewish. 41

INTERWADER

Migration Monitoring 1987. 47
News from the Region. 47
A.W.B. Activities. 47
Asian Wetland Bureau - Phillipines. 49
Asian Wetland Bureau Publication List. 50
Some Waders of the Sunderbans Mangrove Forest, Bangladesh. 51

NEW ZEALAND

Preliminary Report on the 1987 New Zealand Winter Wader Count - Paul Sagar. 52

OPEN NOTEBOOK

Possible Unusual Movement of Red-necked Avocets into Northern Australia - Gordon Claridge and Richard Johnson. 53
An Undescribed Gulf Plains Wetland in Queensland - Gordon Claridge, Richard Johnson and Christine Dalliston. 53
Waders in the Far Northern Great Barrier Reef - John Cornelius. 54
Pectoral Sandpipers and Long-toed Stilts in South-Western Australia: Notes on Abundance and Distribution - Roger Jaensch. 54
Lake Macleod: Newly-Discovered Wetland of International Importance for Waders - Roger Jaensch. 57
Waders at Wattle Creek - Israelite Bay, Western Australia - Brenda Newbey. 58

The Breeding of Pied Oystercatchers and Hooded Plover on Wide Ocean Beaches - A Nesting Association? - Martin Schultz. 58
An Oriental Pratincole in Tasmanian - John Waugh. 58
Unusual Behaviour of Four Sharp-tailed Sandpipers Calidris acuminata - Jon Wren. 60

BANDING ROUND-UP

Banding round-up - Kim Lowe, ABBBS. 61
Banding totals for January to June 1987. 64

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