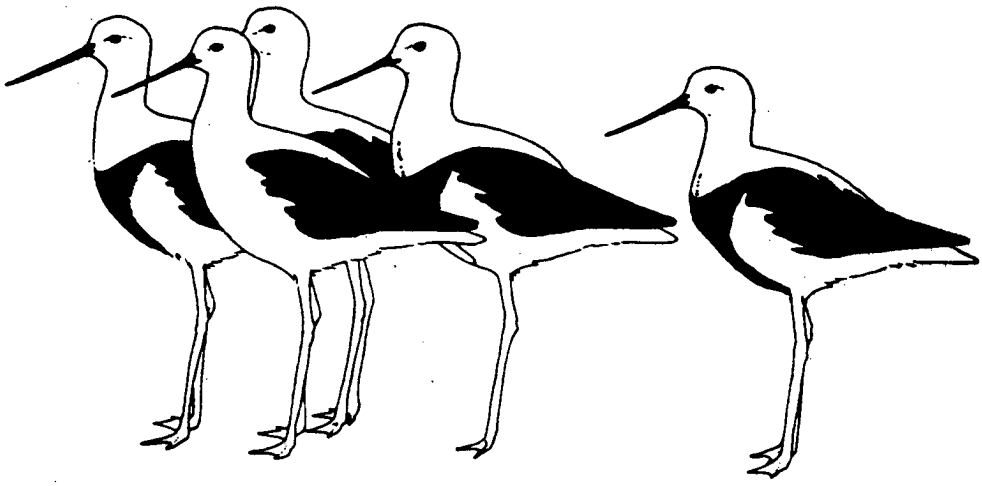
The Stilt



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

Number 12

April 1988

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 1988:

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

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

EDITORIAL

This editorial must begin with an apology to all those contributors who submitted material for this edition of *The Stilt* but heard nothing from me. Mark Barter has been collating material and David Thomas began the editing job in my absence. My sincere thanks to them both and apologies to all contributors for the lack of correspondence and feedback from me.

Three errors crept into *The Stilt* 11. These are detailed later, but my apologies to the contributors whose articles contained the errors.

It is surprising to me that only two "Wandering Waders" were reported for the previous 6 months. I find it difficult to believe no other unusual sightings of waders etc. were made by anyone anywhere! Please send in any sightings of interest to me or your Regional Representative to pass onto me for the next *The Stilt*.

Readers will delight in the artwork of Stephen Davidson whose drawings can be found in these and future pages of *The Stilt*. Stephen has kindly provided these drawings and I am sure readers will agree that *The Stilt* is better for them.

Would contributors please note the format of articles when preparing contributions. It seems every contributor has a different style of referencing and formatting. Please look before you write!

Eric Woehler.

"ERRATA"

Three errors appeared in *Stilt 11*, two in John Hobb's note on Black-fronted Plovers (page 56) and one in the Wader counts table for the North-west expedition report (page 10).

The corrections are as follows:

Page 10, column 2, read "Oriental Pratincole" not "Oriental Plover".
Page 56, column 2, read "31, 31 and 51 hours" not "days".
Page 56, column 2, read "2 days before hatching" not "20".

My apologies to Clive and John for these.

Eric Woehler.

CHAIRMAN'S REPORT FOR 1987.

The AWSG had a successful year in 1987 with a mixture of achievements and initiatives which will stand the group in good stead in future years.

Perhaps the event that stands out is the very significant improvement in the quality and coverage of *The Stilt*. The amount of material published was more than twice that in the previous year and I'm sure that members will agree that the overall standard of contributions was excellent. The increased production cost caused by the larger size was kept within reasonable bounds by the change in format to smaller type size in a double column layout.

The main scientific activities, the Population Monitoring and Regular Counts Projects, continued successfully and reports on both were published in *The Stilt*. We are currently investigating the possibility of commencing a project on resident waders and this, if determined to be feasible, should commence within the next year.

A Conservation Officer was appointed in mid-1987 with the intention of ensuring that the Group's knowledge and expertise be used to the best effect in conserving waders and their habitat. We have already been involved in wetland conservation issues in Tasmania and Victoria. However, it is very important that members make us aware of conservation problems in their regions so that we can make suitable representations. A proposal has been developed to study the conservation status of waders in Australia, that is the extent to which important wader concentrations and habitats are effectively protected. A successful conclusion to this project will allow us to identify areas where protection is inadequate and consequently argue for proper safeguards to be instituted. We are hopeful of obtaining funding during 1988 in order to allow this project to proceed.

Membership numbers were static during 1987, 298 vs. 299 at the end of 1986. Pleasingly, the 35 members lost were replaced by a similar number of new members.

We have decided to increase the effort to expand and hold membership and have made this a specific duty of the Liaison Officer. One avenue taken is to co-operate with the Asian Wetland Bureau (AWB) and the Wader Study Group (WSG) in mutual efforts to gain more members for each other's organisations. The AWB has gained over 30 new members to date from the membership insert in the October 1987 *Stilt* and we will be making a similar appeal in a future AWB Newsletter. Similarly, the AWSG and WSG will be advertising in the April 1988 editions of each other's bulletins. The subscriptions mechanisms used are simple and are much cheaper than if membership is taken out directly.

ASWG members were involved in a comprehensive count of waders in The Coorong in February 1987 with some 130,000 birds being seen, confirming the region as the third most important in Australia and by far the most important in south-eastern Australia

Plans were developed during 1987 for an expedition to the Broome-Port Hedland area in March/April 1988 with the main objectives being banding and biometric data collection and study of departing waders by use of radar. Funds were obtained from the Australian National Parks and Wildlife Service to enable three Asians to take part for training purposes and for a skilled mistnetter to return with the Asians to continue the training effort in their own countries. Hopefully this will result in increased recoveries of banded birds in Asia and consequently an improved knowledge of wader migration routes.

Looking further ahead, the AWSG will be holding a joint Scientific Day with the RAOU in Melbourne in May 1989. Appropriately, this will mark the end of the most active decade of wader research in Australia and the opportunity will be used to summarize the achievements of the previous ten years. We also plan to conduct a workshop to identify fruitful areas for future investigation by the AWSG.

It was decided to increase membership subscriptions for 1988 by $5. The reason for this was due solely to the increased costs of producing and posting *The Stilt*. We trust that members will accept the increase as being good value for money.

I wish to express my thanks to the Committee, the Project Co-ordinators and the members who all, in their own ways, contributed to the successful year. With the projects and plans in hand, 1988 promises to be at least as successful.

Mark Barter.

APPOINTMENT OF MEMBERSHIP AND LIAISON OFFICER.

For the Group to thrive it is necessary that we maximise our membership and maintain an active group of regional representatives. A large membership will provide us with the manpower and financial resources to expand our activities and will give the Group added credibility. Effective regional representation is essential if our far-flung membership is to have the opportunity to be involved in the Group's activities and to make their needs known.

We have decided to add the responsibility for developing and maintaining membership to the existing duties of the Liaison Officer - thus the combined title.

I am pleased to announce that Peter Haward has agreed to take on these important tasks. Elsewhere he describes his future plans.

Mark Barter.

COX'S SANDPIPER IDENTIFICATION.

Those wishing to have information on identification details for the Cox's Sandpiper should read "Some Notes on the perplexing Cox's Sandpiper", by John Cox, which was published in the September 1987 issue of the South Australian Ornithologist.

Apart from dealing with nomenclature and discussing the validity of early records, the paper gives considerable detail on field identification features and includes a number of photographs.

RAOU members can borrow the journal from the RAOU Library.

Mark Barter.

NORTHWARD MIGRATION PROJECT

Further to the note in *The Stilt 11*, the Victorian Wader Study Group has proceeded to colour flag a total of 928 waders during the 1987/88 season comprising:

300 Red-necked Stint (red on tarsus)
271 Curlew Sandpiper (yellow on tarsus)
297 Sharp-tailed Sandpiper (green on tarsus)
22 Lesser Golden Plover (white on tarsus)
35 Red-necked Avocet (yellow on tibia)
3 Black-winged Stilt (yellow on tibia)

Flags made from PVC electrical tape were placed around the metal band.
The Asian Wetland Bureau is advising observers in south-east Asia of the project in the hope that some of the marked long distance migrants will be seen during northward passage.
To date one Red-necked Avocet has been sighted in southern N.S.W. and members are asked to keep a watch out for flags on all Avocets and Black-winged Stilts.

Mark Barter.

1988 RAOU CONGRESS.

The Bicentennial Congress and Campout will be held at the Shortland Wetlands Centre, Newcastle, N.S.W. from December 10-16, 1988.

The organisers would like to include some papers on water birds and any AWSG members who wish to make a presentation should contact Paul George at the Wetlands Centre, Box 130, Wallsend 2287 (Phone: 049-921879) by the end of April, or very shortly thereafter.

Campout projects will include studies on Old World Warblers, local egret movements and Little Terns.

Further information can be obtained by writing to the Congress Organiser at the above address.

Mark Barter.

THREE RAOU REPORTS OF INTEREST TO AWSG MEMBERS.

The following are of interest to members:

No.39. Waders in the Coorong, South Australia, in February 1987. Roger Jaensch and Mark Barter.

No.41. Kakadu National Park: A preliminary survey of migratory waders October/November 1987. Mike Bamford.

No.42. Wader expeditions to Northern Australia in 1986. Brett Lane.

These publications, as well as the Conservation Statement on Hooded Plovers, are available from the R.A.O.U.

CONSERVATION OFFICER'S REPORT FOR 1987.

As it has been less than 12 months since my appointment to this newly created office within the AWSG, the majority of matters so far dealt with are still in progress and it will undoubtedly be some time before any positive results are achieved.

Some of the issues proceeded with so far are: proposed marinas for Swan Bay and Williamstown in Victoria and development of the Cairns waterfront in Queensland (which is being dealt with through the RAOU Conservation Committee).

Other matters dealt with have included a planned drainage of Logan Lagoon in Tasmania, which at least for the present has been averted and a proposal that a Migratory Birds Agreement be instigated with Papua New Guinea, which is being considered by the Australian National Parks and Wildlife Service.

In the longer term, planning is underway on a proposal to carry out a research project on the conservation status of waders in Australia and investigations into financing this are currently being undertaken.

At present it may appear that there is a bias towards consideration of wader conservation issues in Victoria but in order to deal with more matters from elsewhere I rely on AWSG members, especially those of you from other states, to bring matters of concern to you to my attention, either directly or through your local AWSG Representative.

Jeff Campbell.

Recent Literature.

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

Aust. Birds 21(1) 1987

A possible Spotted Redshank in Queensland (Alan McBride), 18.

Aust. Birds 21(2) 1987

A Buff-breasted Sandpiper at Richmond, New South Wales (Dion Hobcroft), 56-57.

Aust. Bird Watcher 12(1) 1987

Observations at the west of a Painted Snipe *Rostratula benhalensis* in South-east Queensland (G.J. Leach, C.G. Lloyd & H.B. Hines), 15-19.

Baird's Sandpiper *Calidris bairdii* at Lake Connewarre, Victoria (Fred T.H. Smith), 25-27.

Aust. Bird Watcher 12(2) 1987

A record of Latham's Snipe *Gallinago hardwickii* in the Northern Territory (John Bywater and John L. McKean), 65.

Aust. Bird Watcher 12(3), 1987.

A note on the Banded Stilt *Cladorhynchus leucophalus* in Sunraysia (C. Sonter), 98-99.

Aust. Bird Watcher 12(4) 1987

A review of sightings of Red-necked Phalaropes in Australia (D.A. Saunders and C.P. de Rebeira), 118-121.

A melanistic Red-necked Stint (Clive Minton and Mark Barter), 127-128.

Brit. Birds 80(10) 1987

Taxonomic status of 'Lesser Golden Plovers' (Alan Knox), 482-487.

Corella 11(1) 1987

Flocking behaviour in the Hooded Plover (M. Schulz), 28-29.

Ibis 129(2) 1987

Mating system and nesting biology of the Red-necked Phalarope *Phalaropus lobatus* : what constrains polyandry? (John D. Reynolds), 225-242.

Ibis 129(4) 1987

Aggression in shorebirds in relation to flock density and composition (N.B. Metcalfe & R.W. Furness), 553-563 (Turnstones and Purple Sandpipers).

S. Aust. Ornithologist 30(3) 1987

First record of the Buff-breasted Sandpiper in South Australia (M.J. Arthur), 74.

S. Aust. Ornithologist 30(4) 1987

Some notes on the perplexing Cox's Sandpiper (John B. Cox), 85-97.

REPORT FROM MEMBERSHIP AND LIAISON OFFICER.

As Mark Barter has reported I have recently been appointed Membership and Liaison Officer to replace Jon Starks who is involved in some major AWSG projects. We are indebted to Jon for his most valuable and experienced contribution to setting up and developing this office.

For those who are not aware of what the liaison office role covers then, there are three objectives which are:

1. Liaise with AWSG Representatives.
2. Expand and hold membership numbers.
3. Develop, improve and maintain relationships with other like-minded organisations, national & international.

MEMBERSHIP DRIVE:

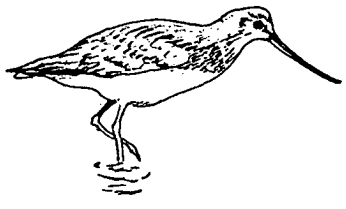
David Henderson and Brenda Murlis have both pointed out the URGENT need for financial support, even allowing for the increased membership rates. New members and/or donations are necessary to ensure that we can fund the planned important new activities of our Group. During 1988 we would like to increase our membership numbers by at least 50%, which amounts to about 150 people. Brett Lane's discussions with the WSG (Wader Study Group) in the U.K. and the reciprocal membership arrangements with the WSG and the IPT/AWB in Asia will greatly assist our profile and should lead to new members. Other activities to solicit new members include approaching all the major International Libraries/Educational Bodies and leaving our subscription forms with many local sympathetic organisations, for example Wilderness, Conservation, Bird Groups etc. If you consider there is a local organisation near you which could generate new members by holding a supply of our forms then I will be pleased to hear from you. It does not matter if you request 1 or 50 forms, the cost of printing is small compared to gaining a new member, therefore your requests for forms will be gratefully received - however small. IF EACH MEMBER COULD INTRODUCE ONE NEW MEMBER then many of our problems would be solved and new projects could be funded.

If you consider that I can be of assistance in any way, or you have any comments and ideas on the development of our membership numbers and communications with other groups then, please contact me or your Regional Representative.

Peter Haward.

TREASURER'S REPORT FOR 1987.

Subscription rates were unaltered for 1987 and our income from subscriptions was similar to that for 1986, although sales of "Stilt" back numbers declined by more than 50%. $200 was donated towards Doug Watkins' expenses incurred in attending the Interwader/IWB meeting in Malacca in March, but virtually all other expenses relate to production of our bulletin or to administrative costs. Production costs of "Stilt" have doubled in the past two years and further increases are inevitable, so with this in mind, and considering the desirability of our funding research projects and other wader-related activities, it has been decided to raise the subscription level to $15, a level we hope to be able to maintain for at least three years.



STATEMENT OF RECEIPTS AND PAYMENTS
FOR THE PERIOD 1st JANUARY - 31st DECEMBER 1987

Receipts		Payments	
Balance B/F	2352.32	Printing 'Stilt' 10	563.00
Subscriptions	3403.59	Typing 'Stilt' 10	450.00
Sale of 'Stilt' back numbers	161.20	Postage 'Stilt' 10	346.55
Donation	3.10	Envelopes	123.00
IPT/AWB subs.	262.00	Printing Letterheads	50.00
Bank Interest	171.99	Contribution to Doug Watkins' attendance Interwader meeting	200.00
		Printing Count sheets	30.00
		Copy of Tide Time-table	19.95
		Printing of Subs. Brochure	31.00
		Printing 'Stilt'11	650.00
		Typing 'Stilt' 11	396.00
		Postage 'Stilt' 11	364.50
		Printing Renewal Forms	31.00
		Secretary's exp.	327.82
		Chairman's exp.	120.25
		Treasurer's exp.	29.48
		State Govt. Tax	1.22
		Bank Charges	18.25
		Balance C/F	2602.18
	$6354.20		$6354.20

RAOU RESEARCH FUND (AWSG)

STATEMENT OF RECEIPTS AND PAYMENTS
FOR THE PERIOD 1st January - 31st December 1987

Receipts		Payments	
Balance B/F	307.02	R. Alcorn: Exp.	249.68
Donations	457.00	M. Hewish: Exp.	134.11
Bank Interest	32.54	State Govt. Tax	.19
		Bank Charges	4.50
		Balance C/F	408.08
	$796.56		$796.56

David Henderson.

A REPORT ON AWSG RESEARCH ACTIVITIES

This report briefly outlines progress on AWSG research projects and research-related activities. It discusses these under the following headings:

- population monitoring project;
- regular wader count project;
- expeditions;
- resident wader study;
- international liaison; and
- 1989 RAOU Scientific Day.

1. Population Monitoring Project.

This project is divided into two parts: counting and banding. The counts are done at selected disturbed and undisturbed sites on the Australian coast. The counts are designed to determine year-to-year changes in the population of waders. Banding is conducted to determine annually breeding success and mortality. For details of the approach to this project see "AWSG Research - 1986 and beyond" which appeared in *The Stilt* 7:27-30.

There have been four twice-yearly counts since the project began. The results have been reported by Marilyn Hewish, the count co-ordinator, in the following issues of *The Stilt*: Feb 1986 (No.9:21-29); July 1986 (No.11:18-22); Feb 1987 (No.11:23-31). The report on the July 1987 count will appear in the April 1988 edition of *The Stilt*.

Banding is being undertaken for the project in Perth, Hobart and at a number of sites in Victoria. Clive Minton is co-ordinating the banding part of the project. Close correlations have been found between count results and breeding success as determined by banding in those species for which sufficient banding data are available (see M. Hewish's report on the July 1986 count). Annual wader banding totals are published in *The Stilt* each year. The 1986 totals appear in a short report by Clive Minton in *The Stilt* 11:67. The Bird Banding Scheme kindly allows recent wader recoveries to be published in each *The Stilt*.

2. Regular Wader Counts Project.

The aforementioned article in *The Stilt* 7 gives details of the approach of this project. There are now forty-three sites being counted at least monthly for this project. Combined with the data from the RAOU Wader Studies Programme, the data now consists of 4,550 count sheets which include 31,685 species counts. The quantity of data being generated is enormous and the group is very fortunate indeed that the project co-ordinator, Richard Alcorn, is able to enter and analyse this data on his own IBM computer. Original copies of the data are forwarded regularly to the RAOU Headquarters (as is the case for the population monitoring counts). The techniques of analysis of these data were the subject of a successful informal workshop held at RAOU Headquarters in January 1987.

For progress reports on the project, *The Stilt* 8:23-25 and in *The Stilt* 10:4-5. A major report sumarising all results for migratory species will appear in a forthcoming edition of *The Stilt*.

3. Expeditions.

An expedition is being organised to the Broome-Port Hedland area of north Western Australia in March-April 1988 to study the northward migration of waders in the area and to band sizable samples of birds. The radar at Broome will also be used to track migrating flocks of waders and to quantify the amount of migration occurring each sunset. This information will be compared with the results of daily sample counts of the proportion of adult birds on the northern shore of Roebuck Bay. The results of this reseach should provide us with an indication of the comparative departure times of each species which uses the area. The article in *The Stilt* 11:4 by Clive Minton and Doug Watkins gives more details.

4. Resident Wader Study.

A proposal has been developed by the group for a study of Australia's breeding waders. The endorsement of the RAOU committee is required before the AWSG can proceed with a research project.

5. International Liaison.

5.1 The East Asian-Australasian Flyway.

The group continues to have fruitful and regular contact with wader researchers throughout south-east Asia. The group's chairman, Mark Barter, regularly visits Asian wader banders during spare time on business trips. The AWSG, together with the RAOU, provided partial funding for the fare of Doug Watkins to visit Malacca in Malaysia in

February 1987 to visit the Conference of Wetland and Waterbird Conservation in Asia organised jointly by Interwader and the International Waterfowl Research Bureau.

Interwader now has offices in Kuala Lumpur, the Philippines and Indonesia. Furthermore it has been brought under the umbrella of the Asian Wetland Bureau at the Institute for Advanced Studies at the University of Malaya. The Australian National Parks and Wildlife Service is providing a substantial contribution to Interwader's operations through the Australian National Section of the International Council for Bird Preservation. Interwader reports regularly on its activities in *The Stilt* and AWSG members can now subscribe to the Asian Wetland Bureau Newsletter through the group, paying in Australian currency.

The VWSG, together with banders at Auckland in New Zealand, are colour-flagging four species of waders this season and Interwader have set up a network of observers in Asia to search for these birds regularly. The species involved are Red-necked Stint, Curlew Sandpiper, Sharp-tailed Sandpiper and Red Knot. See the article by Mark Barter in *The Stilt* 11:1-2.

The Bird Banding Scheme has taken on the role of co-ordinating all wader colour-marking studies in the East Asian-Australasian Flyway

A joint paper on the waders of the East Asian-Australasian Flyway by Duncan Parish (Interwader), Brett Lane (AWSG), Paul Sagar (OSNZ) and Pavel Tomkovick (Zoological Museum, Moscow) was prepared for the publication "The Conservation of International Flyway Population of Waders" *Wader Study Group Bulletin* 50 (Supplement)/*IWRB Special Publication* No.7. A paper by Brett Lane and Paul Sagar on wader conservation in Australia and New Zealand also appeared in this publication. The document formed technical background to the May 1987 Ramsar Convention meeting in Canada.

5.2 The Wader Study Group.

From July to October 1987 Brett Lane visited Europe. During this visit various wader researchers were visited and a WSG committee meeting was attended. The WSG Annual General Meeting and Conference in Gdansk, Poland was also attended and a paper on the RAOU Wader Studies Programme and the AWSG research projects was presented. Similar papers were also presented to the Station Biologique de la Tour du Valat in the Camargue, to the Zoological Laboratory of the University of Groningen in Holland and to the British Trust for Ornithology.

As a result of these activities, the following joint arrangements between AWSG and WSG now exist:

- A joint subscription arrangement enabling WSG members to pay in their own currency to WSG for AWSG subscriptions and ASWG members to pay AWSG in Australian dollars for WSG subscriptions.

- Regular exchange of articles. The WSG will now publish a paper from *The Stilt* in their bulletin twice per year and the AWSG will publish a paper from *WSG Bulletin* in each edition of *The Stilt*. This will be done with the permission of the authors of papers.

These arrangements should increase the flow of ideas and information around the world and lead to still greater international co-operation in research and, hopefully, conservation.

1988 N.W. AUSTRALIA WADER EXPEDITION (19 MARCH - 10 APRIL).

There has been a strong demand for places on this year's N.W. Australia wader expedition. In spite of expanding the team to 24, there were still a number of people whose applications had to be deferred to a future occasion.

The team is the most experienced yet fielded - all but two have previous wader banding experience and 12 are veterans of previous N.W. Australia expeditions. It is also a diverse group with 13 from Australia (5 Vic, 4 WA, 4 NSW) and 11 from overseas (6 UK, 1 New Zealand, 1 Canada, 3 Asia).

The participation of three Asian wader banders, for further training, has been facilitated by a grant from the Australian National Parks and Wildlife Service to INTERWADER. This same grant will also enable Doug Watkins, a joint leader of the expedition, to visit several Asian countries in April/May to carry out further training of wader banders during the northward migration.

When in Broome the expedition will, for the first time, be based at the embryo Broome Wader Observatory. Two houses are now in place - at Fall Point, the beginning of Crab Creek Bay (about 2 km further along the Crab Creek Road than the usual camping site). Some facilities (water, electricity) may possibly be available by March also. It is intended to leave some of the expedition's equipment at the Observatory at the conclusion of this visit as a basis for future wader banding fieldwork.

By the time you read this, the expedition will be over. Let us hope it lived up to expectations!

Clive Minton.

DOUBLE-BANDED PLOVERS - A FURTHER PLEA.

In spite of calling for "one last effort" to look for colour banded Double-banded Plovers in Australia last winter, I have to ask for further assistance again this year!

The reason is that there were two sightings of birds in Australia at the end of last winter which had been banded in the North Island of New Zealand. These were the first from there, and compare with over 300 previous trans-Tasman movements of birds from the South Island population.

Consequently this spring/summer the banding effort in New Zealand has been continued at a high level (600 new birds):

(a) in North Island, where new distinctive colour band combinations have been used

(b) in the northern part of South Island, where relatively few birds had been marked previously.

Hopefully this one year of further work will finally delineate quantitatively which sections of the Double-banded Plover population migrate to Australia.

Would everyone please try and systematically examine all Double-banded Plovers for colour bands (noting colours on each leg and the position of the metal band - part of the combination). Try and visit good locations regularly throughout the autumn and winter - it is amazing how often a return visit produces a new bird.

Please send all sightings to Clive Minton, 165 Dalgetty Road, Beaumaris, Vic., 3193 (tel. (03) 589-4901 home and (03) 616-7301 work).

Clive Minton.

A NEW PROJECT FOR THE AWSG.

Despite its aridity and the unpredictability of many of its wetlands, Australia has 16 species of resident waders. The Banded Stilt is one of the most enigmatic waders in the world, breeding in colonies numbering over 100,000 on salt lakes in the middle of the desert and it illustrates just how specialised Australia's resident waders can be.

The resident waders are under siege on the beaches from excessive human disturbance during the warmer months when they breed and in the inland where their wetland habitats are being drained in increasing numbers or polluted by excess salt from irrigation areas. How are they bearing up under these stresses? Unlike the migratory species, Australia is responsible for its resident species all year round. If they are to survive in the future we need to know how they are coping.

Following a suggestion by Tasmanian member Mike Newman the AWSG has developed a new research project: the Resident Wader Study. Both the AWSG's current projects monitor the populations and movements of resident species and they give as much emphasis to these as they do to the migratory species. The objectives of the new project are:

a) to gather data on the breeding distribution, breeding seasonality and habitat requirements during breeding of the resident waders,

b) to gather data with which to estimate the reproduction rates of the resident waders and to identify the factors which may affect this,

c) to collect these data over as wide an area of the country as possible,

d) to determine the relationship between breeding and movements in the resident waders.

The project will run for five years, starting with the 1988-89 breeding season in southern Australia. There will be a major review of progress after two breeding seasons.

The study of breeding will be done through the RAOU Nest Record Scheme. Participants in the project will be encouraged to contribute data to this scheme on the waders. Currently there are not sufficient data in the scheme on waders to address the objectives listed above. This is significant for two reasons. First, such information is essential to develop plans for the conservation of these species. Second, the RAOU is currently preparing the Handbook to the Birds of Australia, New Zealand and the Antarctic. If it is to contain any up-to-date information on the biology of resident waders and if it is to be as comprehensive as possible then it is essential that new information is gathered over the next two breeding seasons (1988-89 and 1989-90).

An additional aspect of the study will involve banding, especially colour-banding, to determine local, regional and larger scale movements on a seasonal basis. One of the attractions of the study is the opportunity for people to do this banding outside the structure of the city-based banding groups.
We hope to identify some priority species in the coming months. More detailed material will be included in the next *Stilt*. In the meantime, we would like to hear from anyone who would like to help co-ordinate the project, or part of it (e.g. getting their state/region collecting nest record data; colour-banding their local resident waders; adopting a species and promoting its study among the AWSG membership and the wider birding community). If you think you have a little spare time and if you have a commitment to improving ornithological knowledge then please help! If you would like further details, please phone me on (03) 481-7753 or write to me at 11/272 Barkly Street, North Fitzroy, 3068.

Brett A. Lane.

AWSG TO RUN 1989 SCIENTIFIC DAY.

The Royal Australasian Ornithologists Union has kindly agreed to make waders the theme of their Scientific Day in Melbourne on Saturday, May 27 1989. This will be followed on the Sunday by excursions to various wader sites around Melbourne to see wintering waders, large flocks of Double-banded Plovers and resident waders. The AWSG will organise the event which has become very popular among RAOU members.

Much research has been done on waders since the last meeting of wader enthusiasts in Sydney in May 1981. It is timely to review what has emerged from this research which has involved many people throughout Australia, New Zealand and Asia. We hope to have a number of overseas wader researchers speak at the meeting as well as a good selection of speakers from Australia.

Place a note in your forward planner and watch this space....

Brenda Murlis.

AWSG COMMITTEE FOR 1988-1990

As no nominations were received for committee positions and as all existing committee members, elected and co-opted, are willing to stand for the new term, the new committee to take office from 1st June 1988 for two years is:

Chairperson	- Mark Barter
Administrative Secretary	- Brenda Murlis
Treasurer	- David Henderson
Research Co-ordinator	- Brett Lane
Membership and Liaison Officer	- Peter Haward
Editor	- Eric Woehler
Committee Members	- Clive Minton
	- Jeff Campbell (Conservation Officer)
	- Mick Murlis

Brenda Murlis.

WANDERING WADERS: AUGUST 1987 to JANUARY 1988.

The following reports have been received by either myself or the regional representative. In future, please pass on any records of unusual numbers and/or species or interesting sightings etc. to either the regional representative or directly to the Editor for inclusion in this section.

Queensland

1 Asian Dowitcher, Kinka Creek via Yeppoon, 3 January 1988.

Tasmania

1 Oriental Pratincole, Marion Bay, 17 April 1987.

AWSG REGULAR WADER COUNTS PROJECT. INTERIM REPORT TO JUNE 1987 : MIGRATORY WADERS.

Richard Alcorn, 17 Lawrence St., Horsham, 3400 Vic.

INTRODUCTION

The AWSG Regular Wader Counts Project, of five years duration, commenced in 1986. The main purpose of the Project is to determine and interpret the pattern of movement of the different species of waders across the continent (Lane 1985). Coverage of the continent for this project has improved significantly in the latter half of 1987 with new sites in several strategic regions. Three new sites are on the north-west coast, Lake Macleod, Derby and Cable Beach at Broome, and combined with results from the new Broome bird observatory, extremely valuable information will result. Other important new sites have been established in the Darwin area, the Centre (Uluru National Park), the southern coast of W.A. (Irwin Inlet and Oyster Bay, Albany), South Australia (Gulf St. Vincent), Victoria (Nicholson River) and Queensland (Reeves Lake and Boonooroo).
By June 1987, 53 observers were counting at 43 sites. The regular count data from this project and the RAOU Wader Studies Programme now total 4550 count sheets with 31685 records, each record being the number of individuals of one species observed at one site on a particular date.
The movement patterns of some north-south migratory waders are discussed in this interim report. Results are from counts submitted to the AWSG Regular Counts Project to June 1987 combined with data from the RAOU Wader Studies Programme 1981-1986.
Results for all years have been combined in an attempt to determine broad patterns of arrivals and departures that occur irrespective of the season. Establishing these broad patterns will allow future projects to examine the nature of variations that may occur from season to season.

METHODS

Participants count all waders at a site on a monthly basis for at least two years, producing 24 count sheets. There are 43 sites currently represented by 24 or more count sheets and only these sites have been considered in this report.
There are many published examples of data collected in the same way as during the Regular Wader Counts Project for individual sites (Thomas 1970, Jones 1983 and 1984, Close and McCrie 1986, Saunders and de Rebeira 1986). There are few examples of detailed analyses of the type of data gathered by this project, which involves comparisons between sites to elucidate migration and movements.
A very general summary of the regular wader count results in Australia to mid-1985 appears in Lane (1987). Recently, the Wader Study Group has organised inland wader counts to investigate the timing of (northern) autumn migration of typical European inland species, and some preliminary results were presented by Munster (1987). These results showed that of the 20 wader species examined, 16 showed no significant latitudal or longitudal trends in their migration dates. The "West Coast Spring Passage Project" in Britain involved 995 counts of Ringed Plover, Dunlin, Turnstone and Sanderling at 89 sites. In that project, a proportion of the waders at a site was trapped regularly and colour-marked to determine migratory turnover at the site independently from the counts. The Progress Report on this project (Moser *et al.* 1985) showed that "most individuals apparently focus on very specific staging areas". Although 1342 birds were marked, very few of these were sighted away from the site of capture, which suggested that "short 'hops' are not regularly undertaken."
Other than these studies and the one reported here, there are few published examples of similar co-operative projects and none of detailed analyses of differences and similarities between sites and what these reveal about movements and migration.

Data analysis.

Two questions need to be addressed in the analysis of the data from the AWSG Regular Counts Project:

1. What do the changes in numbers at a site reveal about movement through that site?

2. What do the comparisons between sites indicate about movements and migration within Australia?

These questions are considered separately below.

Changes in numbers at a site.

Since regular counts do not identify individual birds, changes in the number of birds of a particular species at a site do not themselves reveal anything about how many birds have arrived at or have left the site, but rather what net changes in population have occurred. The movement of birds across the continent may be regarded as a wave (or series of waves) and a regular count is a snapshot of the size of the resultant wave at a particular site.

Suppose that on a particular date at a particular site no birds of species X were seen, and that on the next count some time later 100 birds of this species were seen. This indicated not that 100 birds had arrived in the interval, but that:

arrivals + hatchings - departures - deaths = 100.

It may be that 1100 birds arrived, 950 left and 50 died, or that 500 arrived, 300 left and 100 died! The important point here is that for non-breeding species the number of birds that have arrived at a site in the interval between two counts must be greater than or equal to the difference in the counts:

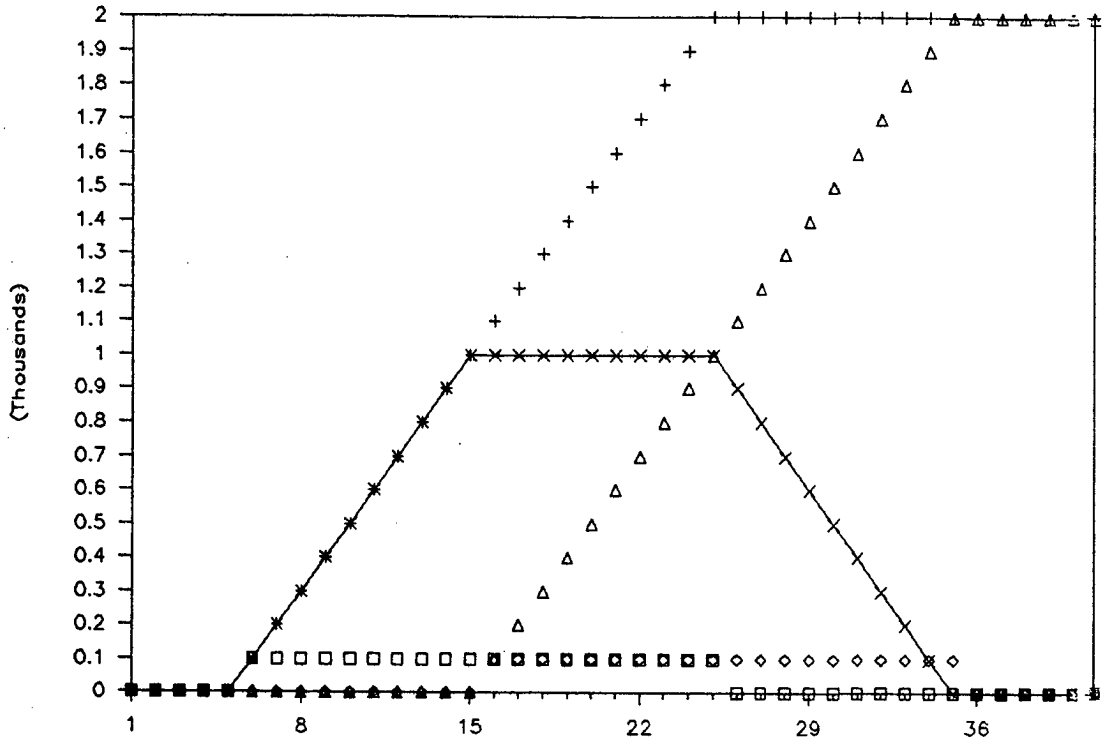
arrivals ≥ current count - previous count.

It follows from this that the number of birds passing through a site on migration is likely to be substantially greater than the maximum number recorded on any one count. Similarly, for non-breeding species a decrease in numbers between two counts means that more waders have departed or died than have arrived, but substantial numbers may still have arrived.
In this report the assumption has been made that the magnitude of change in numbers at a site is an index of the actual arrivals or departures, i.e. that a large change in numbers represents a higher turnover than a smaller change.

Some models.

To understand the patterns that emerge from regular counts some models of wader movements into and out of a wetland could be developed. A model can be developed for the simple situation where a species (the Precise Plover) passes through a site on migration. For simplicity, it has been assumed that the Precise Plover is a north-south migrant (hatchings=0) and hardy (death=0), so that only arrivals and departures need be considered. Suppose that accurate counts are performed daily, that Precise Plovers are not present at the first count, but start arriving soon after at the rate of 100 per day for 20 days. Suppose also that each individual bird stays for 10 days and then departs. Figure 1a shows the number of Precise Plover that arrive each day, the number that depart, the cumulative total that have arrived by a certain date, the cumulative total that have departed, and the actual count, given by:

a) Migration Site, Constant Arrivals



b) Migration Site, Normal Distribution

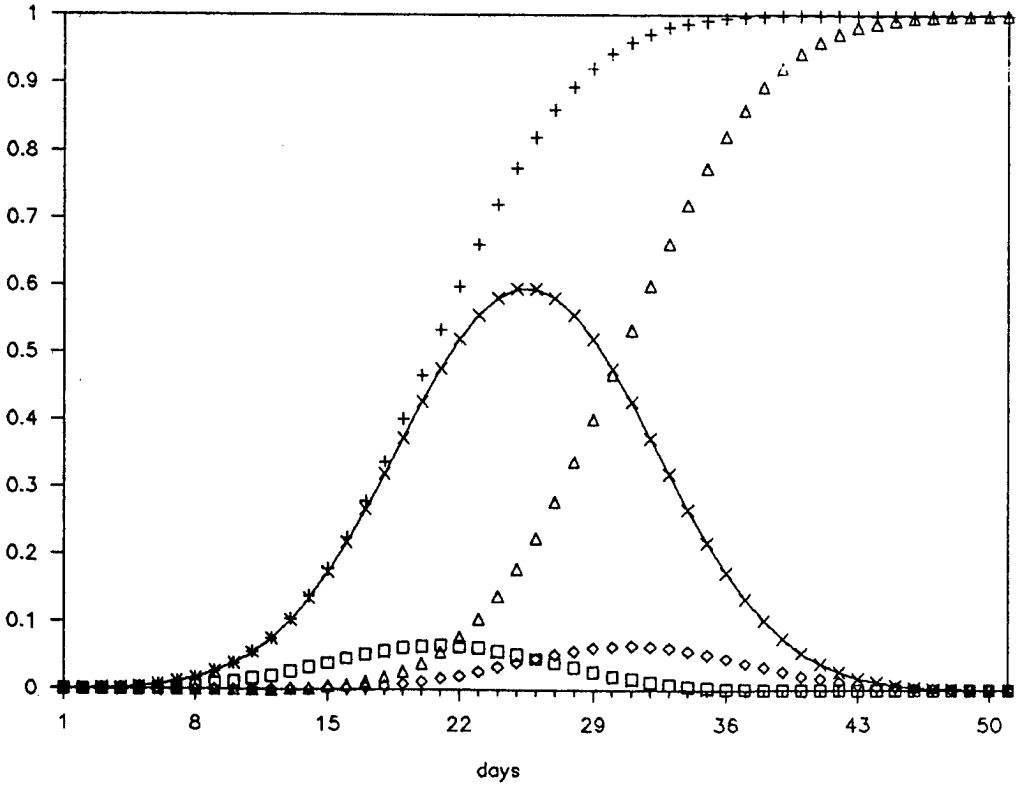
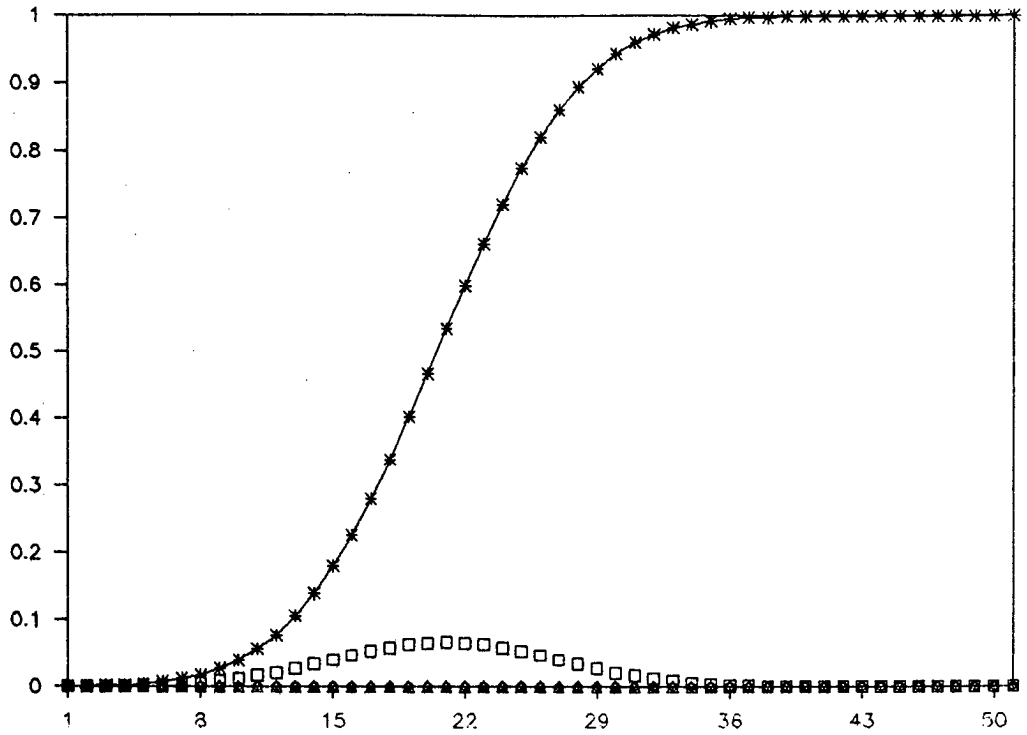


Figure 1. Models for changing wader numbers at a site.

□ Arrivals/day +Total Arrivals
◇ Departures/day △Total Departures
× Count

c) End–Point



d) 20% remain

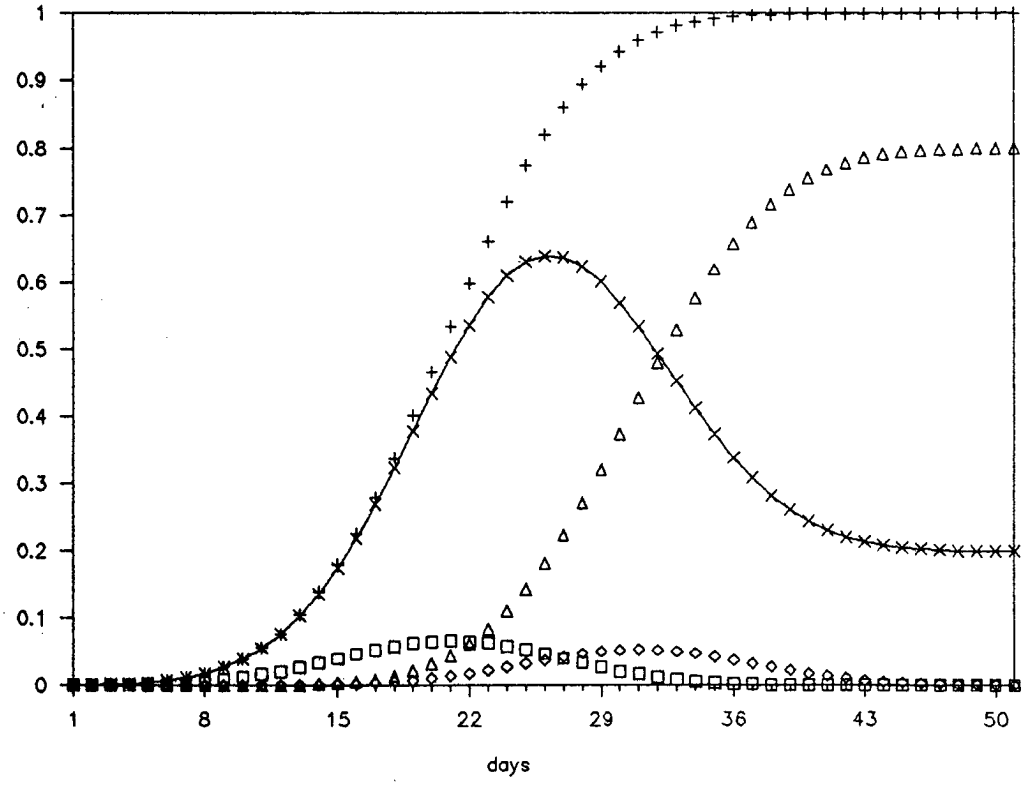
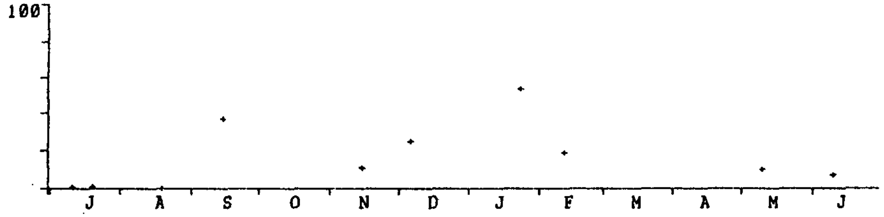
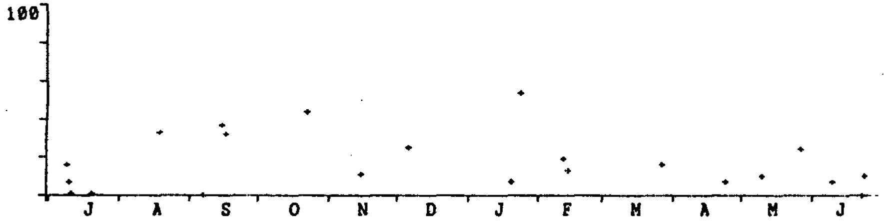


Figure 2 - Finlayson Point - Eastern Curlew after a) 10 counts b) 23 counts c) 41 counts. Each graph plots the average count for that day over all seasons against the day of the year the count was made. (February 28th and 29th counts are combined.) In Figure 2a), the maximum count of 54 occured on January 27th, 1983. In Figure 2b), the maximum count of 66 occured on August 19th, 1983, but when combined with a zero count on the same day in 1982 resulted in an average count of 33. In Figure 2c) the maximum count occured on September 16th, 1986.

R11 Finlayson Point Lat. 20.53 Long. 148.57 Period 11/07/82 - 10/06/83
No. of sheets = 10 No. of records = 9 Max count = 54



R11 Finlayson Point Lat. 20.53 Long. 148.57 Period 11/07/82 - 24/06/84
No. of sheets = 23 No. of records = 20 Max count = 66



R11 Finlayson Point Lat. 20.53 Long. 148.57 Period 11/07/82 - 20/06/87
No. of sheets = 41 No. of records = 37 Max count = 72

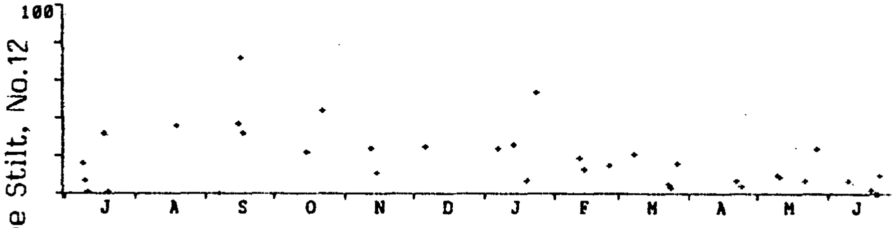
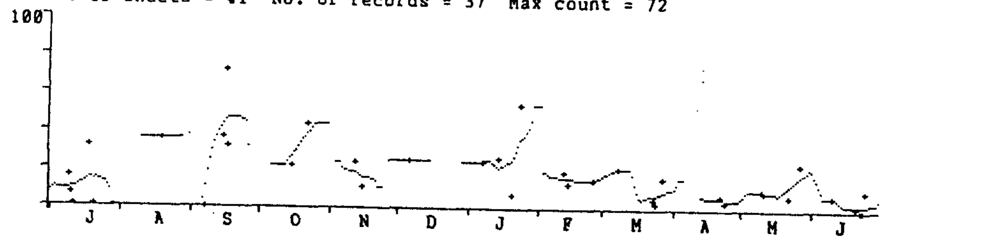


Figure 3. Weighted average lines applied to Figure 2c), using averaging intervals of a) 10 days, b) 20 days and c) 30 days.

Finlayson Point Lat. 20.53 Long. 148.57 Period 11/07/82 - 20/06/87
No. of sheets = 41 No. of records = 37 Max count = 72



Finlayson Point Lat. 20.53 Long. 148.57 Period 11/07/82 - 20/06/87
No. of sheets = 41 No. of records = 37 Max count = 72

Finlayson Point Lat. 20.53 Long. 148.57 Period 11/07/82 - 20/06/87
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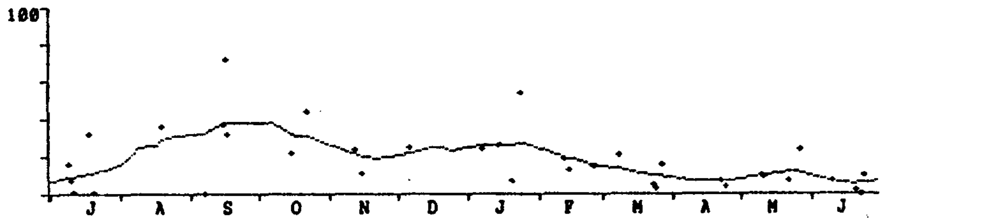


actual count = total arrivals - total departures

Note that the maximum count of 1000 is only half the actual number of birds that passed through the site. Note also that the centre of the peak count represents the middle of the migration, if the middle of migration is taken to mean the mid-point of the stay of the "average" bird.
In a different case, the arrival of a species could begin in dribs and drabs, but soon swell and then abate. The arrival pattern could be represented by a normal distribution. If the maximum number arriving per day is 100, and each bird stays for 10 days, the count pattern that results is shown in Figure 1b. It has the same general characteristics as the constant arrivals model, but is somewhat smoother. Again, the peak count represents the middle of the migration as defined earlier.
A site at the end-point of a southward migration would have birds arriving and none departing over the migration period. One might expect Tasmanian sites to fall into this category for most species. Figure 1c shows such a pattern.
Sites in northern Australia may be expected to show characteristics of both migration sites and end-point sites for some species, whereby most birds pass through the site, but a substantial number remain over the summer months. Figure 1d shows the count pattern when 20% of the arrivals remain.
It must be stressed that in these models there are many assumptions. Real sites will not normally show such clear or constant rates of arrival and departure, even if they are counted frequently and with perfect accuracy. Even when actual results fit these models quite closely, interpreting the patterns in terms of the models requires caution, since every graph can be accounted for by an infinite number of arrival and departure of rates.

Comparisons between sites.

An assumption made in this report is that the changes in numbers from season to season of each migratory species at a site are similar in form and timing if not in magnitude. The results for each site are presented for all seasons combined to determine a long-term average pattern. This may not be typical of what is happening in any one season. However this approach allows a direct comparison with the models developed earlier.

Graphical presentation of data.

Species have been included in this report only if there are at least 10 sites each with at least 24 count sheets in total and at least 12 records for the species concerned (except for the Sharp-tailed Sandpiper which has been left for a later report). Consistent changes in numbers become clearer with increasing numbers of counts. This is illustrated in Figure 2 for the Eastern Curlew at Finlayson Point in Queensland after 10, 23 and 41 counts.
A graphical presentation of the data is the easiest way to follow the changes in numbers at each site. Figure 2c shows a typical plot of the counts of one species at one site. Each point on the graph represents the average count for that day of the year, irrespective of which year the count was made. For this reason, in Figure 2b, the maximum count (66) on August 19 1983 has been averaged with the zero count on the same day of the year before. Zero counts are marked with crosses on the horizontal axis; any non-zero count shows as a cross above the horizontal axis, even if the count is small and the scale large.
One difficulty with interpreting Figure 2c is that the eye tends to follow the pattern of the higher counts and pay less attention to the lower counts. The eye also finds it difficult to average out the data when there is a wide range in counts clustered around a few days. Plotting a running average overcomes both of these problems. The method used here calculates a weighted average for each day of the year of all counts within 20 days of the chosen day. The weighting is applied in a linear fashion so that, for example, a count on the chosen day is weighted at 20, a count 10 days away is weighted at 10 and a count 19 days away is weighted at 1. The formulae and symbols are:

D is the day for which an average is being calculated

d is a day within 20 days of D for which a count was made

Count(d) is the count at day d, averaged over all years

Weight(d) is the weighting factor given to day d

Weighted count (d) is the weight given to the count at day d

Average (D) is the weighted running average at day D

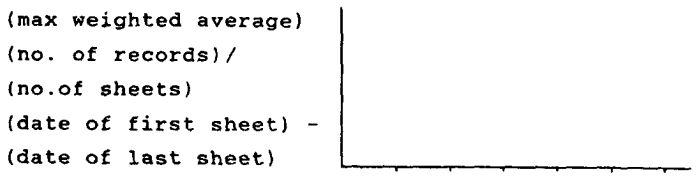
$$\text{weight}(d) = 20 - |D-d|$$

$$\text{weighted count}(d) = \text{weight}(d) \times \text{count}(d)$$

$$\text{Average}(D) = \frac{\text{sum of weighted count}(d)}{\text{sum of weight}(d)}$$

If there are no counts within 20 days of D, then the weighted average is not calculated. This leads to "holes" in the graphs if there are intervals of 40 days or more for which no counts were performed during that period in any year.
The interval of 20 days was chosen by trial and error. A shorter interval loses the averaging effect and a longer interval smooths out the graphs unnecessarily. Figure 3 shows the weighted average line applied to Figure 2c using averaging intervals of 10, 20 and 30 days.
There are several drawbacks in using the weighted average line method. Real and sudden changes in numbers, such as a sharp peak or a quick drop in numbers, are somewhat masked by the influence of counts either side of the period when the change occurred, particularly if the counts were made frequently (e.g. daily). On the other hand if the count interval was long (e.g. monthly), the weighted average line will show a sudden change mid-way between the two counts, which is unlikely to be a reflection of the actual change in numbers. Finally, the weighted average line method never interpolates the graph above the maximum count (or below a non-zero minimum count). This results in an underestimation of the peak counts (or an overestimation of the low counts).
For the reasons outlined above, the data for each species are presented as a series of weighted average line graphs for all selected sites (Figures 4-11). The graphs were then examined visually to identify any broad trends in the changes in numbers across the continent.
The weighted average line graphs are shaded below to allow an easy comparison between sites. Individual counts are not shown. Sites are arranged in order of increasing latitude to highlight any north-south trends.
The vertical scale used is determined by the logarithm of the maximum value of the weighted average line, although the vertical scale is a linear scale. This gives some indication of the relative importance of each site without introducing a huge discrepancy in the size of graphs between sites with large numbers and those with small numbers, as would happen if the same scale was used for all graphs. For example, a site with a maximum weighted average of 100 will produce a graph with a peak twice as high as a site with a maximum weighted average of 10.

A legend for each graph is shown below:



Species accounts are organized as follows:

* the main range of the species as given in Lane (1987) is compared with the distribution of regular count sites.
* dates and patterns of arrivals during southward migration.
* summer patterns and movements.
* dates and patterns of departures during northward migration.
* overwintering patterns and movements.
* summary

Dates are referred to as early, mid or late periods in a month, each period being approximately 10 days. This is an appropriate accuracy given the counting frequency and use of the weighted average graphs for analysis.

RESULTS

Lesser Golden Plover (Figure 4).

In Australia, the largest concentrations of Lesser Golden Plovers occur on the south-east coast of the continent, Tasmania, the south-east corner of the Gulf of Carpentaria and the north-west coast of the continent. These last two regions are not represented in the counts analysed here and discussion is limited to movements along eastern coastal sites and Tasmania.

Migration along the eastern Queensland coast north of Ross River (19°16'S) begins in late August. Substantial numbers do not appear at Alva Beach (19°27'S) until mid October, although small numbers arrive further south at Prospect Estate (28°51'S) and Pelican Island (32°25'S) in early September. Sites south of Pelican Island show a distinctly later arrival with a gradual build-up in numbers from late September across all sites. Numbers build up to high levels at these sites and at Pelican Island during December.
Most sites north of, and including Pelican Island, show a substantial drop in numbers from mid to late January. Sites further south show some fluctuations in numbers with no consistent trend.
Declines in numbers, which could be departures, start in late February at some southern sites. However, some southern sites and the majority of northern sites show a marked increase in numbers in late March just prior to departure.
Only small proportions of Lesser Golden Plovers overwinter along the eastern coast, and this proportion decreases from north to south. Most Lesser Golden Plovers that overwinter on the east coast appear to move north of Pelican Island (32°25'S). Several southern sites are devoid of overwintering Lesser Golden Plovers. Overwintering numbers appear to remain fairly stable at all sites.
Lesser Golden Plovers arrived along the north-east coast from late August to late October. Arrivals on the south-east coast did not appear until late September and continued through to December, but whether this influx was from a steady southward movement along the eastern coast in relatively short "hops", or from continued migration into the continent from further north is not known. Lesser Golden Plovers left the more northerly sites in December to January, but whether moving further south or leaving northwards is not clear. The pattern of declines and influxes over February to March supported the findings of Starks and Lane (1987) that a significant proportion of Lesser Golden Plovers moved northwards along the eastern coast on northward migration. However, the timing of the influxes into the north-eastern coast in late March was later than that given by Starks and Lane (1987). Overwintering levels were reached by late March to mid April, mostly in mid April. Few Lesser Golden Plovers overwintered at sites south of Pelican Island (32°25'S) on the eastern coast.

Mongolian Plover (Figure 5).

In Australia Mongolian Plovers are most numerous in the Gulf of Carpentaria and on the eastern Queensland and New South Wales coasts. Count sites were well distributed in the species' range with the exception of the Gulf of Carpentaria.

Lee Point Beach (12°22'S) near Darwin showed a large migratory passage from early September to early November, peaking in mid October. The Queensland sites from Ross River (19°16'S) northwards showed a migratory passage during September and another which started in mid October. Queensland sites south of Ross River showed variable patterns, with substantial numbers of Mongolian Plovers not appearing at Alva Beach (19°27'S) until late October, nor at Bowen Salt Works (20°00'S) until late December. However there was a large passage through Finlayson Point (20°53'S) in October and November. Sites south of Finlayson Point generally held much smaller numbers and arrival started during September and early October, with maximum counts being recorded between November and early January. Clinton Conservation Park (34°09'S) in South Australia showed fairly substantial arrivals in late August.
At Lee Point Beach, the number of Mongolian Plovers was stable from mid November to late February. By comparison, numbers at most Queensland sites from Finlayson Point (20°53'S) northwards showed large scale fluctuations during this period indicating movement, as did some sites south of Finlayson Point.
Mongolian Plovers had left Lee Point Beach by late February. At Clinton Conservation Park, Price saltfields (34°17'S) and Shallow Inlet (38°49'S) a gradual decrease in numbers occurs for 90 to 120 days before the last birds left in late April and early May. The remainder of the sites south of and including Deception Bay (27°10'S) showed a migration peak mid to late March prior to departure by late April and early May. At Bowen Salt Works and Finlayson Point, early declines in numbers started in late February and early March, whereas at sites further north in Queensland declines started between late March and mid April. Small influxes occurred in north-eastern sites in late March to early April, suggesting some through passage.
Virtually no Mongolian Plovers overwintered south of Finlayson Point (20°53'S). The overwintering populations at other sites were small by comparison with their summer populations. Numbers varied during this period with no consistent pattern, indicating movements among the overwintering population.
Mongolian Plovers arrived on the eastern coast of Queensland and the northern coast of New South Wales in a number of "influxes" between September and December. Large-scale movements are evident in this region between December and February, which may have been local or may have represented continued migration. In the south-east, where populations are smaller, Mongolian Plovers appeared to be more sedentary, with numbers gradually increasing from August to December. There was a

Figure 4. Lesser Golden Plover

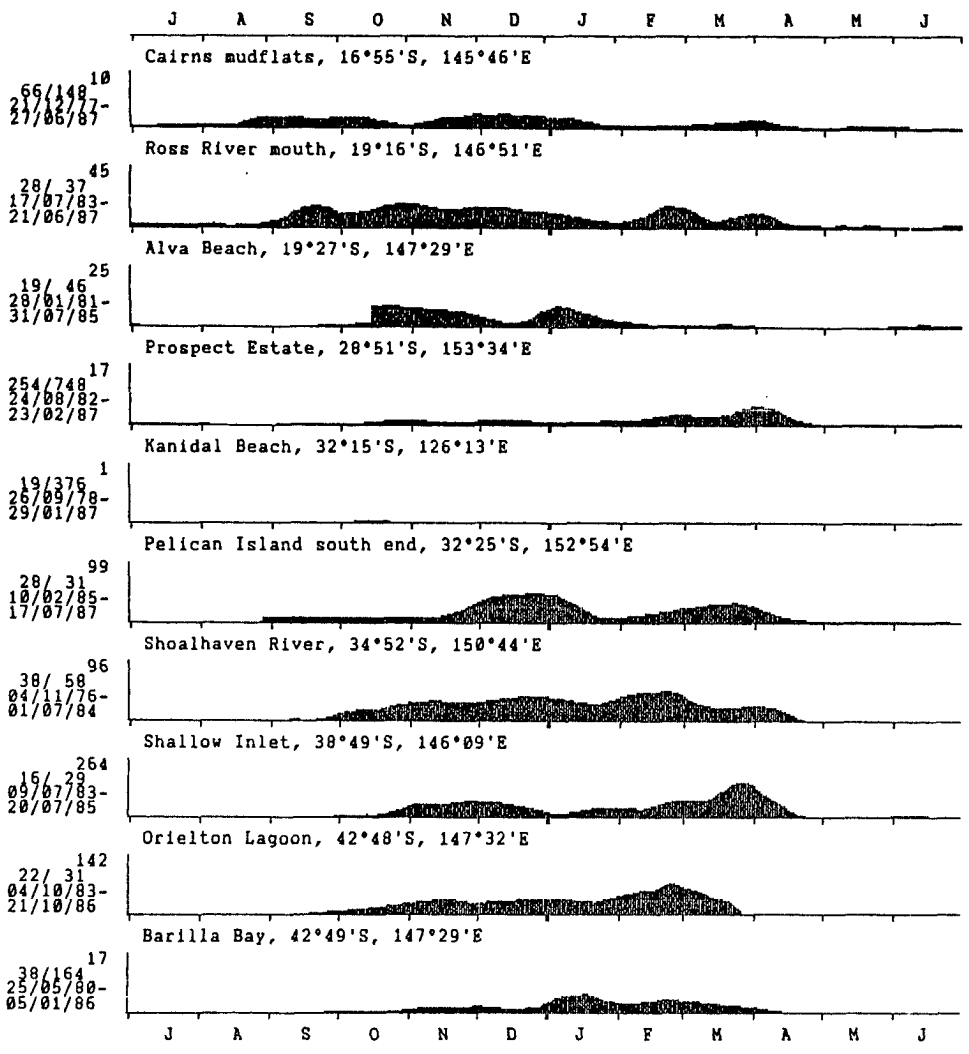
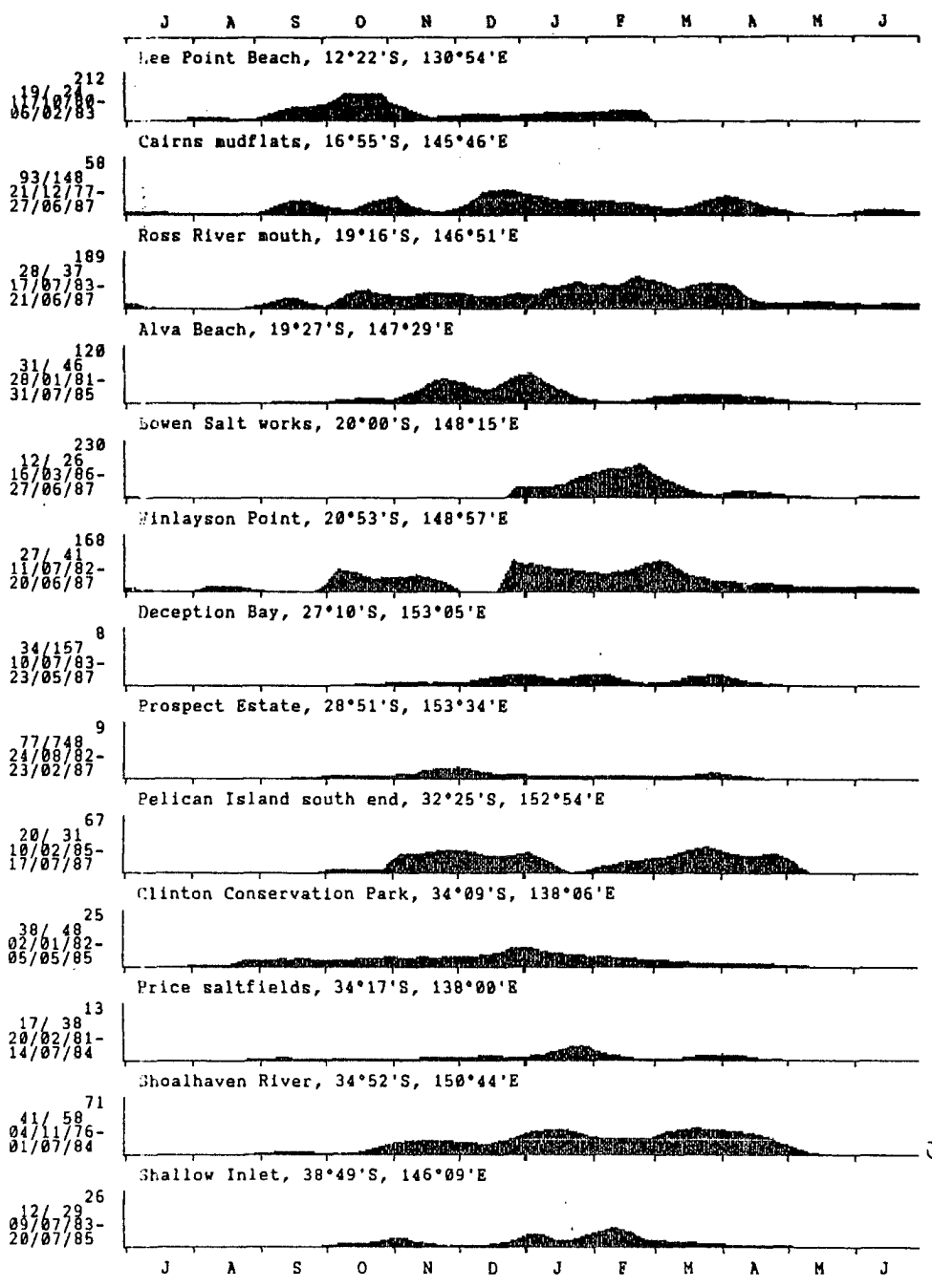


Figure 5. Mongolian Plover



suggestion of small influxes along the north-eastern coast in March and April, probably caused by the arrival of birds migrating from further south. Mongolian Plovers began leaving the north-east in late February, most having departed by late April. The overwintering population remained north of Finlayson Point on the eastern coast.

Eastern Curlew (Figure 6).

Eastern Curlews are most abundant along the eastern and south-eastern coasts and at Roebuck Bay in the north-west. No north-western sites were counted during this report period.

Increases in numbers on southward migration occurred uniformly at most sites on the eastern and south-eastern coasts from mid to late August, mostly in late August. Near-peak numbers are reached within 30 days. Numbers at Bowen Salt Works (20°00'S), Moreton Bay Fitzroy St. (27°32'S) and Pelican Island (32°25'S) continued to increase until late December.
Numbers were fairly stable at most sites from November to February. Counts at Queensland sites from Bushland Beach (19°19'S) northwards suggest movement out of the region throughout January. A corresponding substantial increase in numbers occurred at most sites south of Kinka Beach (23°25'S) from mid January to early February. This suggests that a general southward movement of Eastern Curlew was still occurring until mid-February.
Departures of Eastern Curlews occurred mostly from late February to late March along the entire eastern and south-eastern coast, with no north-south trend apparent. A few sites showed later fluctuations. A peak occurred at Moreton Bay Fitzroy St. (27°32'S) from late April to late May. Departure was later at Shoalhaven River (34°52'S) in late April. Influxes prior to northward migration were not evident.

A large proportion of the summer population overwintered at most sites. This proportion varied markedly between sites. These was no obvious north-south trend. Overwintering numbers were stable at most sites implying little population movement.
Eastern Curlews arrived uniformly along the eastern and south-eastern coasts mid to late August, suggesting that they flew directly into these regions on southward migration. There was a suggestion of a general southward drift until mid February. The general lack of influxes during the northward migration period suggests that Eastern Curlews flew directly out of Australia from all sites between late February and late March. A significant proportion of the summer population overwintered at most sites. There was no evidence of the late March to mid April peak of Eastern Curlews on the Queensland coast as noted by Starks and Lane (1987), which was interpreted as possibly a "second wave of birds that had departed from southern Australia".

Red-necked Stint (Figure 7).

Red-necked Stints occur in large numbers in all coastal areas except eastern Queensland and are also encountered inland. Sites presented in this report cover only the eastern and southern coasts, the south-eastern inland region and one site near Darwin.

Substantial arrivals on southward migration commenced between late August and early September at most sites in all regions. Sites on the eastern coast north of Finlayson Point (20°53'S) generally showed erratic numbers at various times from September to December. Kanidal Beach (32°15'S) on the southern coast of WA showed a migration passage from October until early December, perhaps of birds moving eastward along the coast. Eastern and south-eastern sites south of Prospect Estate (28°51'S) typically showed end-point patterns with a long steady increase in numbers from late August to November.
A second influx occurred at most sites on the south-eastern coast and in Tasmania from mid November to mid December. A similar influx occurred in mid December at Clinton Conservation Park and Price saltfields in South Australia. At Lake Moondarra (20°35'S), Five Bough Swamp (34°32'S) and Lake Bathurst (35°03'S) in the inland no decrease in numbers occurred at this time. Most Red-necked Stints had left Lee Point near Darwin by November. Queensland sites north of Finlayson Point (20°53'S) showed large-scale erratic fluctuations of Red-necked Stints in December and January, with most having left the more northern sites by the end of February.

South of Prospect Estate (28°51'S) numbers of Red-necked Stints started to decline at many sites in late February and early March, while other sites in this region showed peaks. Most Red-necked Stints had left southern sites by mid April, with overwintering levels being reached at all sites by the end of April. Kanidal Beach on the southern coast of WA showed a very late migration extending from March to May, perhaps of overwintering birds moving westward. Lake Forrestdale on the Swan coastal plain in Western Australia showed a large migratory peak in late March when extensive suitable habitat develops as the lake dries, with most birds departing by mid April. Red-necked Stints had largely left the Queensland sites of Bowen Salt Works (20°00'S) and Finlayson Point (20°53'S) by mid March. Migration peaks were also evident on northward migration at Price saltfields and Lake Bathurst.

Overwintering Red-necked Stints occurred at most sites with no fluctuations in numbers evident during this period. Particularly large proportions overwintered at Cairns and Price saltfields.

Red-necked Stints arrived simultaneously at many sites on the southern and eastern coasts in late August and early September. Migration through the north-eastern sites occurs until the end of December, and numbers kept building up south of Bowen Salt Works (20°00'S) until late November, with a December influx at a number of sites. Red-necked Stints had largely left north-eastern sites north of Alva Beach (19°27'S) by the end of February, but whether they had moved north or south is not evident. Large declines in numbers occurred in more southerly Queensland coastal sites in mid-March, and most birds had left all southern sites by mid April, with overwintering numbers being reached at all sites by the end of April. Migration peaks in March at ICI Saltfields (Close and McCrie 1986), and in mid-April at Price saltfields, Kanidal Beach and Lake Bathurst support the suggestion of Starks and Lane (1987) that "Red-necked Stints undertake a north-westward migration from south-eastern Australia...". However a large proportion of the population may initially move westwards, using a migration route through coastal south-western Australia, as shown by large northward migration passages at Lake Forrestdale in late March, at Wilson's Inlet in April (Alcorn 1987) and at Rottnest Island in the March to May period (Saunders and de Rebeira 1986). Overwintering Red-necked Stints were found at most sites, with no north-south difference in proportions being evident.

Figure 6. Eastern Curlew

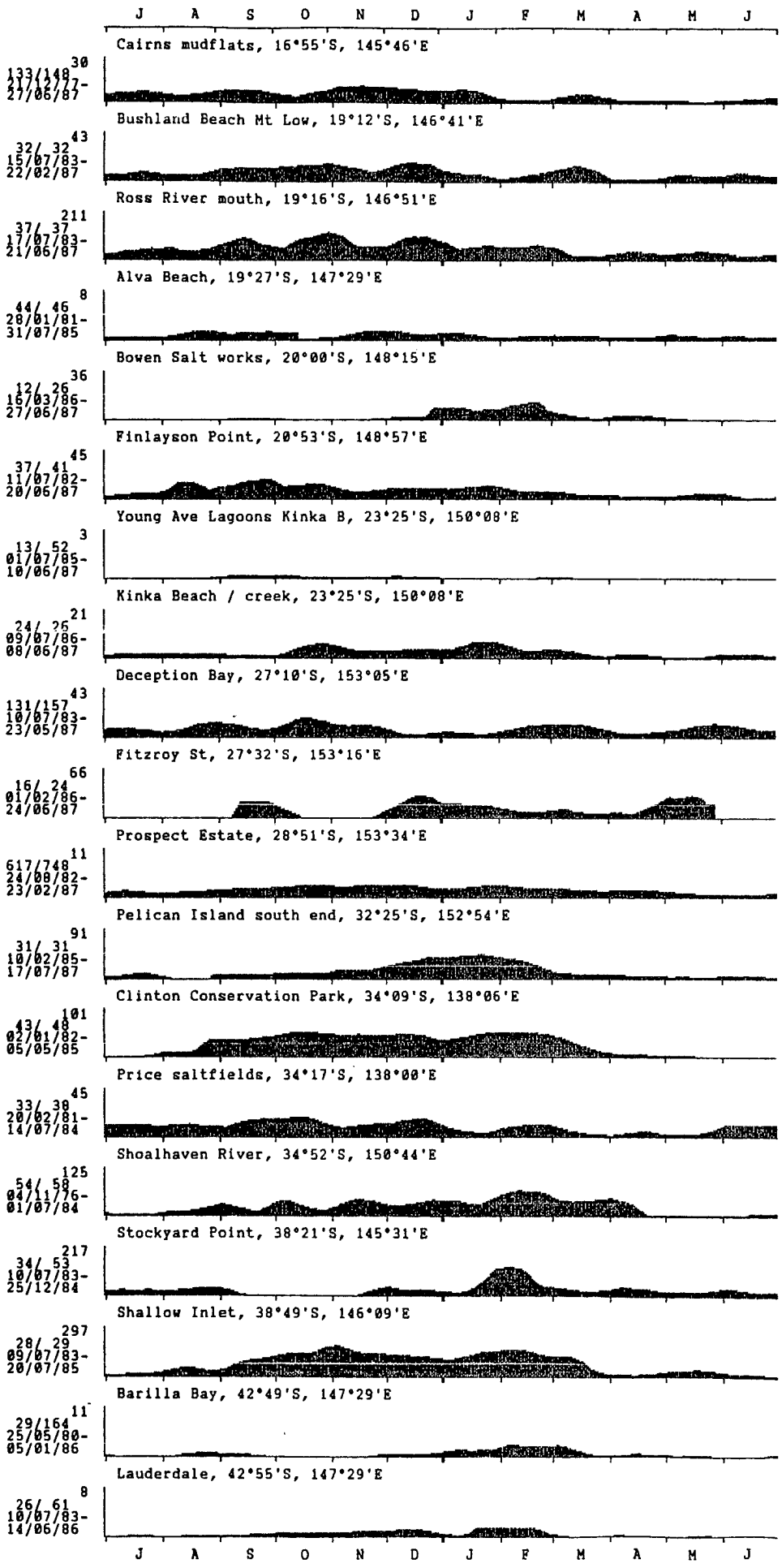
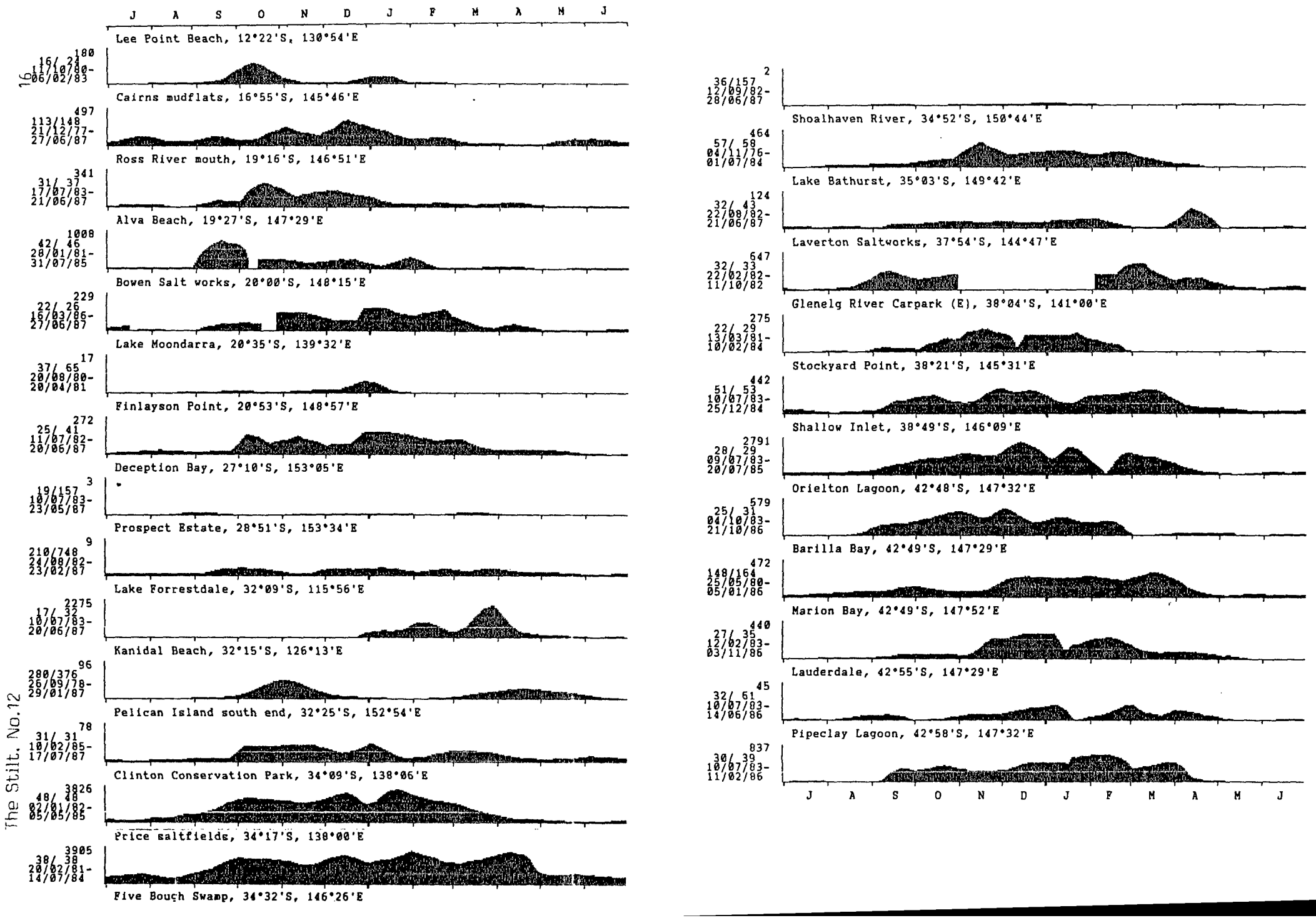


Figure 7. Red-necked Stint



Whimbrel (Figure 8).

The greatest numbers of Whimbrels occur on the northern coast. The only part of this range covered in this report is the eastern coast of Queensland and one site near Darwin.

Influxes of Whimbrel started at Cairns (16°55'S) in early August, but did not occur at other Queensland sites until September or October. These influxes were only temporary at most sites, with numbers soon dropping to lower levels over summer. A small migration passage occurred at Lee Point Beach (12°22'S) near Darwin in early October, and at Price saltfields in South Australia in mid October. Numbers at almost all sites were lower from mid November to mid February than during southward migration, with exceptions being a small passage peak at Moreton Bay Fitzroy St. (27°32'S) in December and a large population at Pelican Island (32°25'S) from November to February. Numbers were not stable at many sites, indicating that Whimbrels move about over this period.

Influxes occurred again at most sites from early March to early April prior to northward migration. Whimbrels left all sites at approximately the same time from early and mid April to late April. these was no difference between northern and southern sites in the timing of departure.
Some Whimbrels overwintered at all sites. Between Cairns (16°55'S) and Deception Bay (27°10'S) overwintering numbers were a substantial proportion of the summer population in comparison with sites further north and south. Numbers at all sites were very stable during this period, suggesting that overwintering Whimbrels move little.
Whimbrels arrived on the northern and north-eastern ocast over a long period from August to October. Summer numbers were lower than those during southward migration at most sites, supporting the suggestion by Lane (1987) that Whimbrels disperse widely, flocking only on migration. Influxes occurred again prior to departure at many sites. Departure was complete by late April. Greater proportions overwintered at the more favoured summer sites north of Deception Bay (27°10'S).

Bar-tailed Godwit (Figure 9).

Bar-tailed Godwits occur in two main regions, the east and south-east coast westwards to Gulf St. Vincent and on the north-west coast. Of these two regions only the first is covered in this report.

Alva Beach (19°27'S) in north-eastern Queensland and Orielton Lagoon (42°48'S) in Tasmania showed an influx of Bar-tailed Godwits in late August, but the general pattern in all other sites was a sharp rise in numbers in late September. Lee Point Beach (12°22'S) near Darwin and several sites on the eastern coast in Queensland and New South Wales showed peaks in numbers from late September to early November.
The majority of sites showed fairly stable numbers from October to February, indicating that mass movements were not occurring. The exceptions of Finlayson Point, Kinka Beach, Clinton Conservation Park and Marion Bay suggest that substantial local movements occur at this time.

All but overwintering birds had left the two Tasmanian sites by the end of February. Departures elsewhere were later from early February to mid-April. Numbers declined slowly at most sites, with clear departure dates only for Orielton Lagoon in late February and Finlayson Point in early April. Overwintering numbers were reached at most sites between early March and late April, with no north-south differences being apparent in these dates. Migration peaks prior to departure were absent, with the exception of Price saltfields in South Australia, and Deception Bay and Bushland Beach on the north-east coast.

During the overwintering period of mid April to late August, Tasmanian and South Australian sites contained no Bar-tailed Gotwits or comparatively small numbers compared with peak counts. Along the eastern coast a substantial proportion of the summer population overwintered at most sites. Overwintering numbers were stable at most sites indicating a lack of widespread movement.
Numbers of Bar-tailed Godwits rose more or less synchronously over the eastern and south-eastern coast in September, with influxes continuing into October and early November at some sites, with some Tasmanian arrivals later still. Numbers at most sites were generally stable from October to February, indicating little movement over this period. Migration peaks along the north-eastern coast during northward migration were generally absent, suggesting that Bar-tailed Godwits flew directly out of the continent rather than stopping along the eastern coast as suggested by Starks and Lane (1987).

Greenshank (Figure 10).

Greenshanks are found across the continent with largest numbers on the northern coasts and in the south-east. Included in this report is one site near Darwin, one site at Alice Springs, one inland site in south-eastern Australia and a number of sites on the eastern, southern and Tasmanian coasts. Numbers of birds observed at most sites are fairly low so only pronounced changes in numbers can be regarded as significant.

Numbers started to rise in late August at the two South Australian sites of Clinton Conservation Park and Price saltfields. Apart from these there was a slow increase in numbers at most sites over the August and September period. Larger increases occurred from October to November in such widely dispersed sites as Cairns, Ross River, Alice Springs, Moreton Bay, Fitzroy St. and Orielton Lagoon, but at other sites numbers remained fairly low. There appeared to be no north/south or inland/coastal differences in the timing of arrival.
Numbers were stable at most sites from December to February. Influxes occurred in December at Price saltfields and Shallow Inlet but not at other sites in the south-east. Numbers increased again in February at Shallow Inlet, and also at Orielton Lagoon, Bowen Salt Works and Finlayson Point, but not at other sites.
An influx occurred at Lake Forresdale, in the south-west, in late March. Influxes prior to northward migration occurred in April in most sites in the south-east. North of Prospect Estate (28°51'S) such influxes were not so evident, but some sites showed influxes in March, earlier than in the south. A sharp uniform decline in numbers across Australia accurred during April and overwintering numbers are reached at all sites between late April and early May.

Overwintering numbers were very low with the majority of sites devoid of an overwintering population. Only the two South Australian sites held significant numbers of Greenshanks during this period. Numbers at this time were very stable there, indicating little movement.
Greenshank numbers built up slowly at most sites between August and December after which numbers were stable until the end of February. Numbers started declining on the eastern coast north of Prospect Estate (28°51'S) from March onwards, although temporary influxes occurred at some sites. In south-eastern Australia more pronounced influxes occurred later, from late March to April, strongly suggesting that Greenshanks from the south-east did not stop off along the eastern coast on northward migration. Overwintering levels were reached uniformly across all sites between late April and early May. Only a very few sites held significant overwintering numbers.

Figure 8. Whimbrel

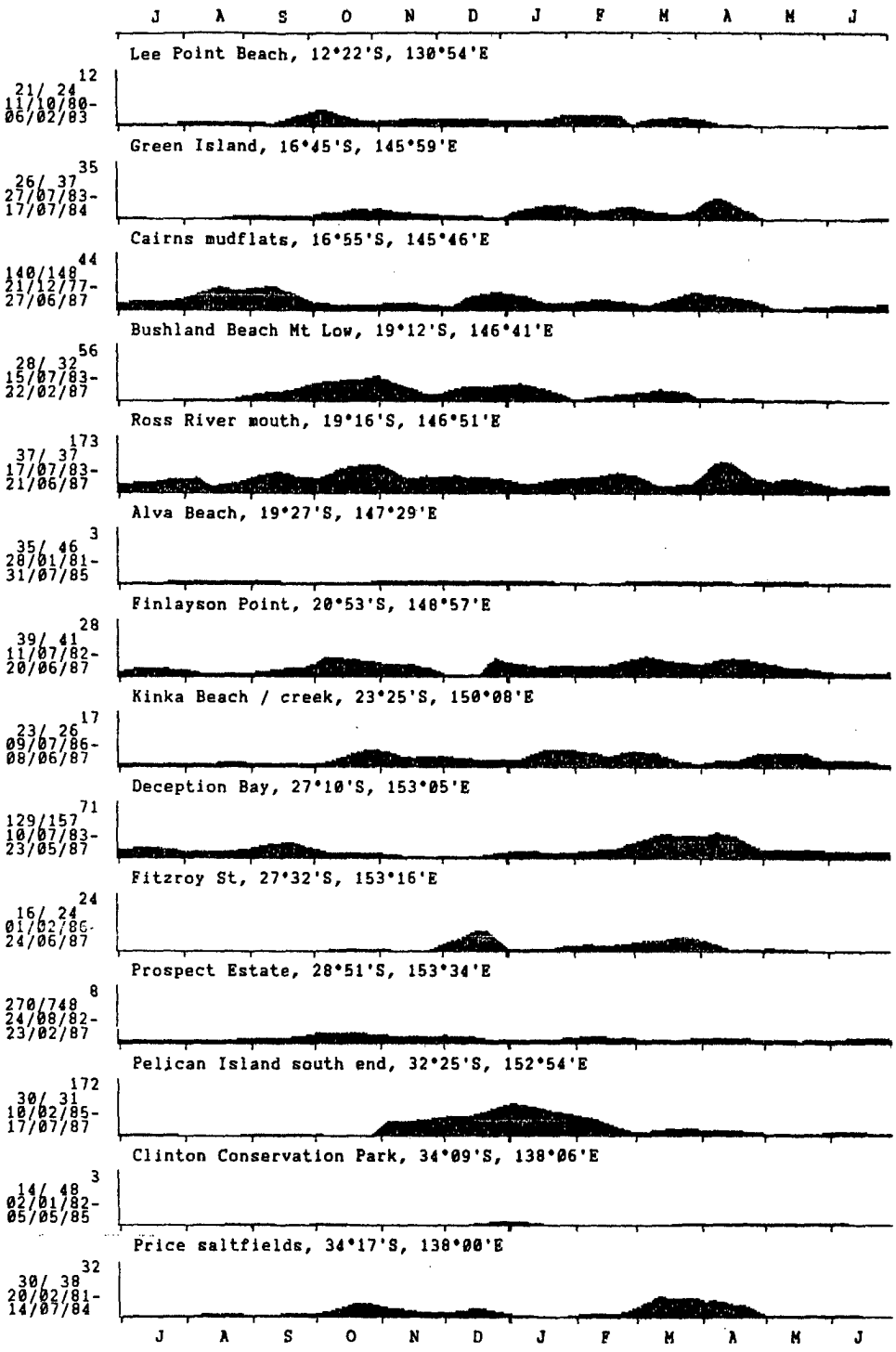


Figure 9. Bar-tailed Godwit

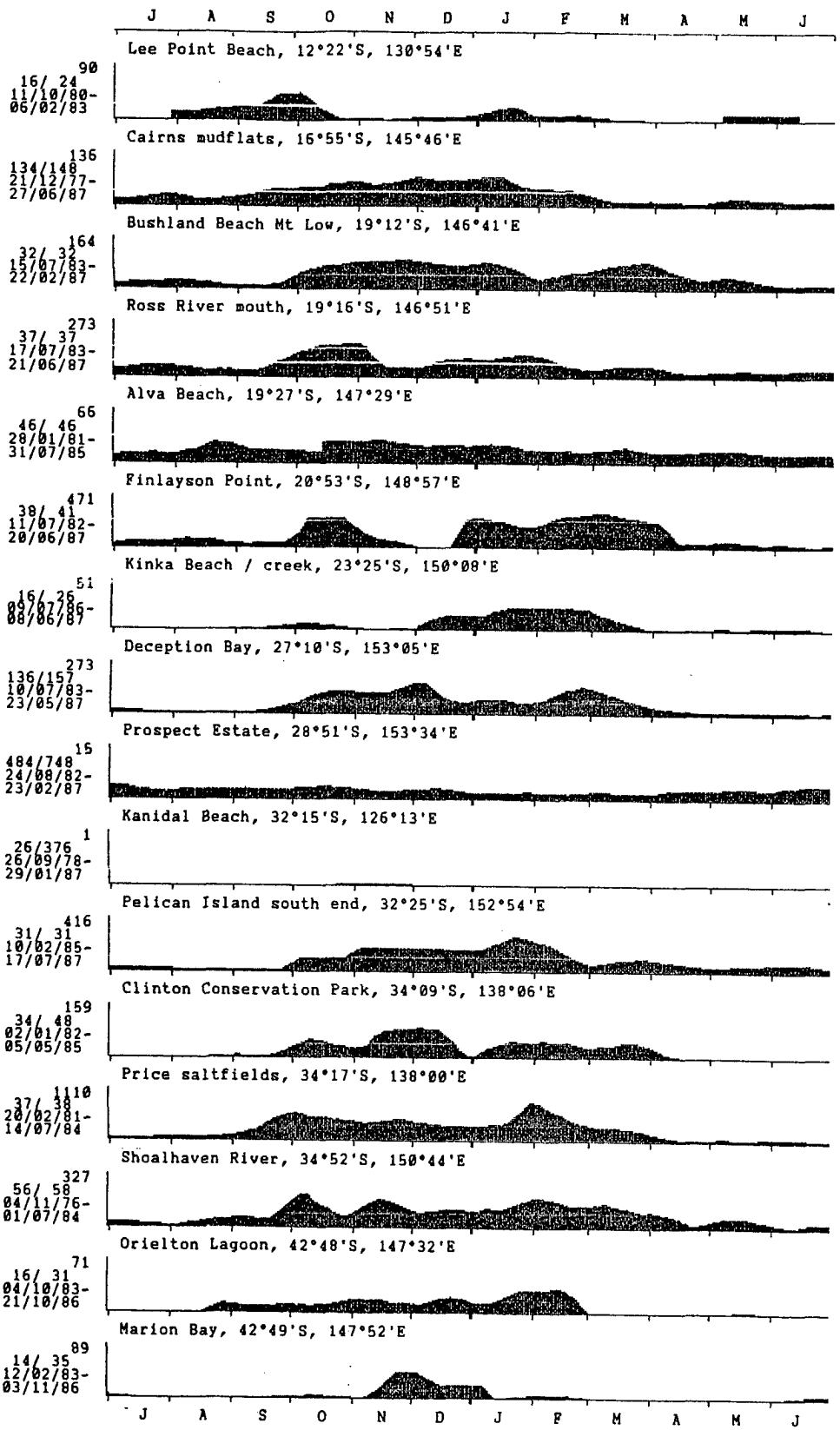
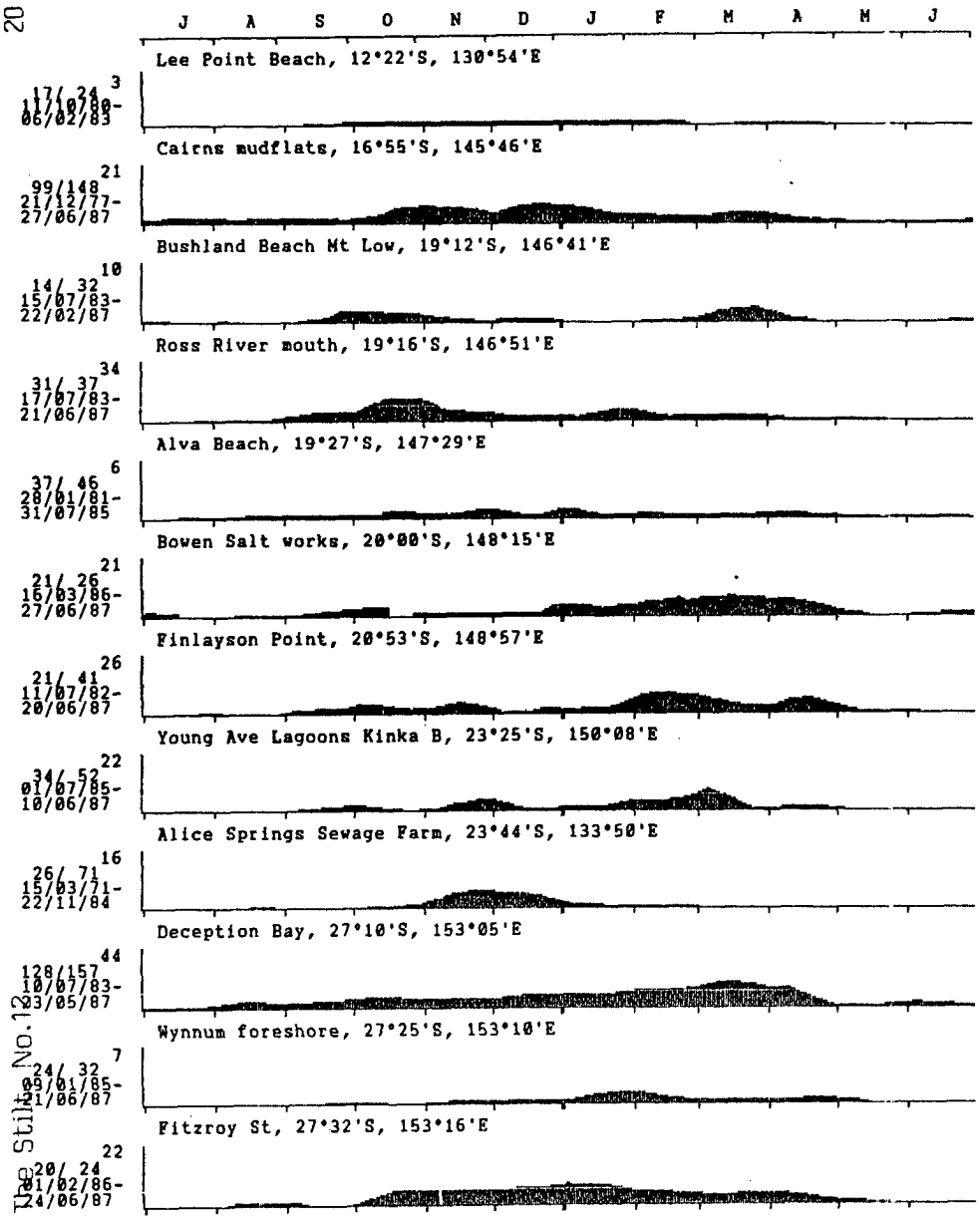
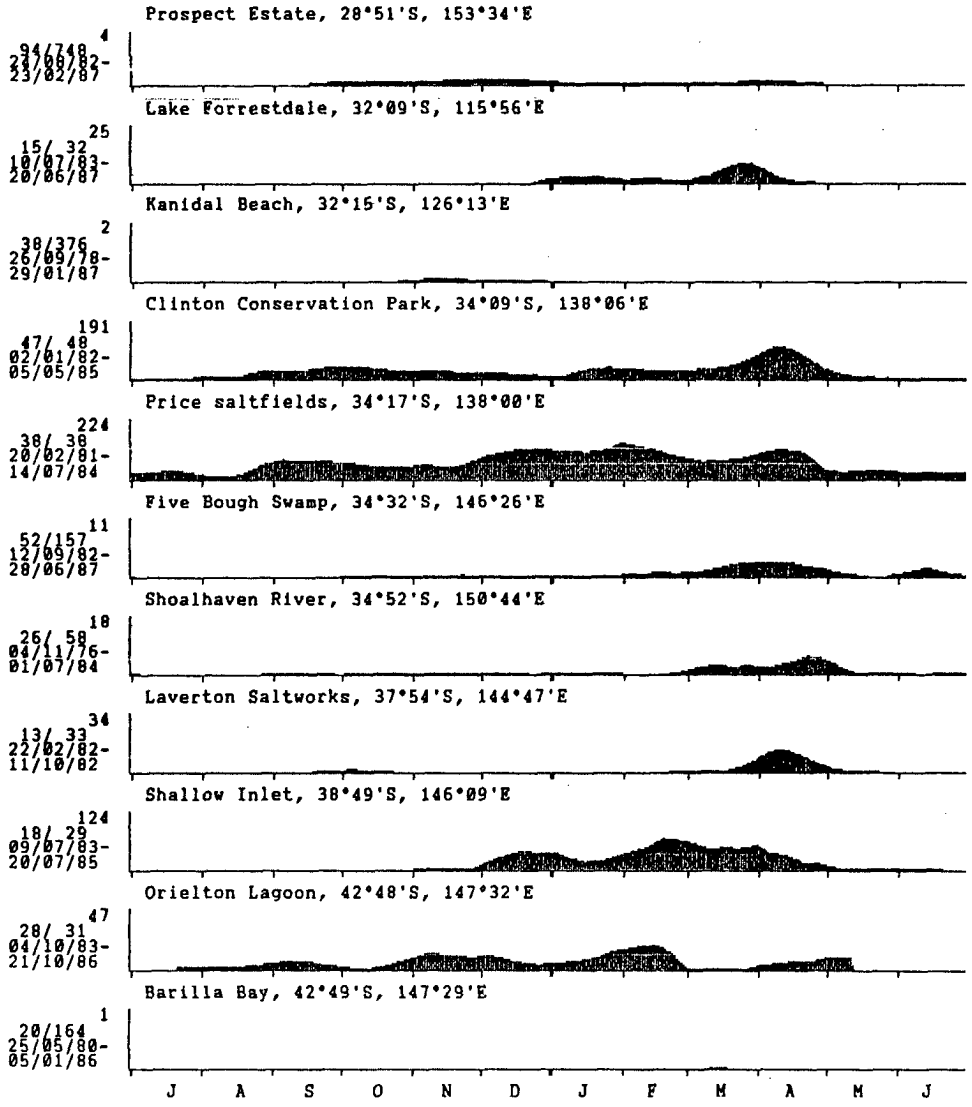


Figure 10. Greenshank





Curlew Sandpiper (Figure 11).

In Australia, Curlew Sandpipers occur predominantly in southern Australia and on the north-west coast during migration. Of these two areas data were collected only at the southern sites. Also included in this report are sites on the eastern Queensland coast.

Numbers of Curlew Sandpipers began to increase along the eastern Queensland coast from early September to late October, indicating steady arrivals over this period. The south-east inland site of Lake Bathurst showed a peak in numbers in early August and a larger one in September. At Clinton Conservation Park and Price saltfields in South Australia, a steady increase in numbers occurs in late August and September. The majority of sites in Victoria and Tasmania also showed a small increase in numbers at this time, with more substantial peaks during October.
At sites north of Shoalhaven River (34°52'S) on the eastern coast, stable numbers occur from October to February except for a substantial peak in numbers at Alva Beach (19°27'S) in December and January. Numbers were also stable and high at the two South Australian sites from October to February. Curlew Sandpiper numbers remained stable and low at Lake Bathurst from mid-October to late March. All Victorian and Tasmanian sites (except Laverton Saltworks for which there are no data for this period) showed substantial changes in numbers from November to February, possibly only locally between sites. A substantial number of Curlew Sandpipers arrived at Lake Forrestdale on the south-western coast in late January when lower lake levels provided more extensive habitat.
Curlew Sandpiper numbers declined at sites along the eastern Queensland coast at varying times between mid-January to mid-April. No pre-departure influxes were evident. Most Curlew Sandpipers had left Lake Forrestdale in the south-west by late March. In South Australia, Clinton Conservation Park showed a large exodus from mid-February to mid-March, but declines at Price saltfields were slower with overwintering levels not being reached until late April. Numbers were relatively high at most Victorian and Tasmanian sites in mid-March prior to departure. Departure here commenced in mid-March and was mostly completed during April, although departure was later at Stockyard Point (38°21'S) with overwintering numbers not being reached until early May. A strong peak in numbers occurred at Lake Bathurst in April.

Overwintering numbers varied between sites, with most sites holding very small proportions of peak counts in this period. The exception was Price saltfields in South Australia where large numbers of Curlew Sandpipers were found throughout the overwintering period.
Curlew Sandpipers arrived in a steady stream over southern and eastern Australia during September and October. Victorian and Tasmanian sites showed substantial movements, possibly local, from November to February. Outside these states numbers were stable over the summer period indicating little movement. Curlew Sandpipers commence departing from most sites in mid March, but on coastal north-eastern Queensland, departures commenced earlier, between January and March, making it conceivable that these birds may have moved further south at this time. The migration peak at the inland New South Wales site of Lake Bathurst suggested that at least some south-east birds flew over the continent. Departures were complete by late April, this date being one month later than that found by Starks and Lane (1987). Only very small proportions overwintered at most sites.

FUTURE DEVELOPMENTS

Many sites currently being counted for this project were not included in this interim report because the number of counts acquired by June 1987 had not reached the required number. When sufficient data have been received for these sites, along with the inclusion of data from sites new to this project, further clarification of the changes in numbers of all species will result. These will be described in future reports.
Of particular importance in gaining an overview of changes in numbers across the continent are the new sites on the north-west coast. Additional sites are sought from all regions, and particularly from the northern coast and Central Australia.

Sites represented by a long count series (there are eight sites currently with four or more years of regular count data) will enable the variation at a site in the timing of the changes in numbers of different species from season to season to be determined.
Wader species not discussed in this report will be the subject of future reports. These include resident species, Double-banded Plover and Sharp-tailed Sandpiper.

ACKNOWLEDGEMENTS

My thanks go to the co-ordinators Denis Watson, Lindsay Bone, Mike Bamford, Niven McCrie and Jamie Matthew for their help in organizing counts in their region. My sincere thanks also go to all participants in this project (listed below) and the regular count project of the RAOU Wader Studies Programme, many of whom have now collected a great quantity of valuable count data far beyond the minimum requirements of this project. I am also grateful to Brett Lane for criticising a draft of this paper.

AWSG REGULAR COUNT PROJECT PARTICIPANTS

Pat Ashford, Ted Biggins, Noel Billing, Lindsay Bone, Peter Britton, Lola Broadhaurst, Alec and Beth Brodie, John Brooke, John Burfoot, Greg Clancy, Gordon Claridge, John Cornelius, George Cornwall, Molly Crawford, Nora and John Davenport, Ron Dowling, Rodney Dyke, Nick Dymond, Eileen Eves, Vic Fazio, Mike Fleming, Bob Goodfellow, Ron Harmer, Jan & Rob Hill, Joyce Hill, Gail Hooper, Peter Hirst, Pat Hutchins, Keith Hutton, David James, Richard Johnson, Wally Klau, Terry Korn, Michael Lenz, Mike McKelvey, John Malone, Noela Marr, Elizabeth Pearse, Joan Phillips, Andy Reimanis, Joan and Peter Rogasch, Douglas Ross, Brian Ryan, Bronwyn Summers, Neville Schrader, John Tarr, Peter Taylor, M.T. Templeton, Andrew Tom, Joanne Van Oostdam, Bryce Wells, Eric Woehler, Jon Wren.

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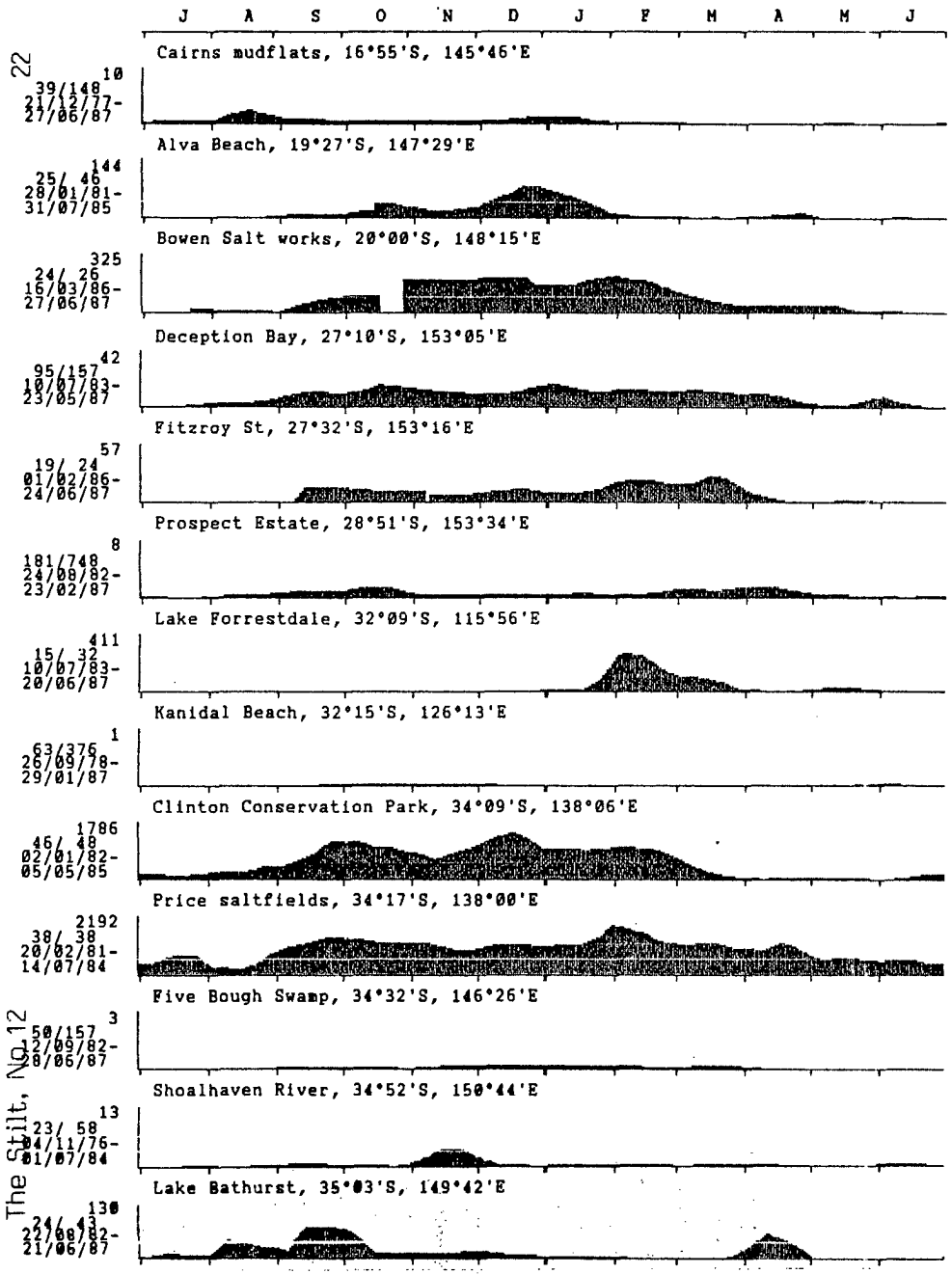
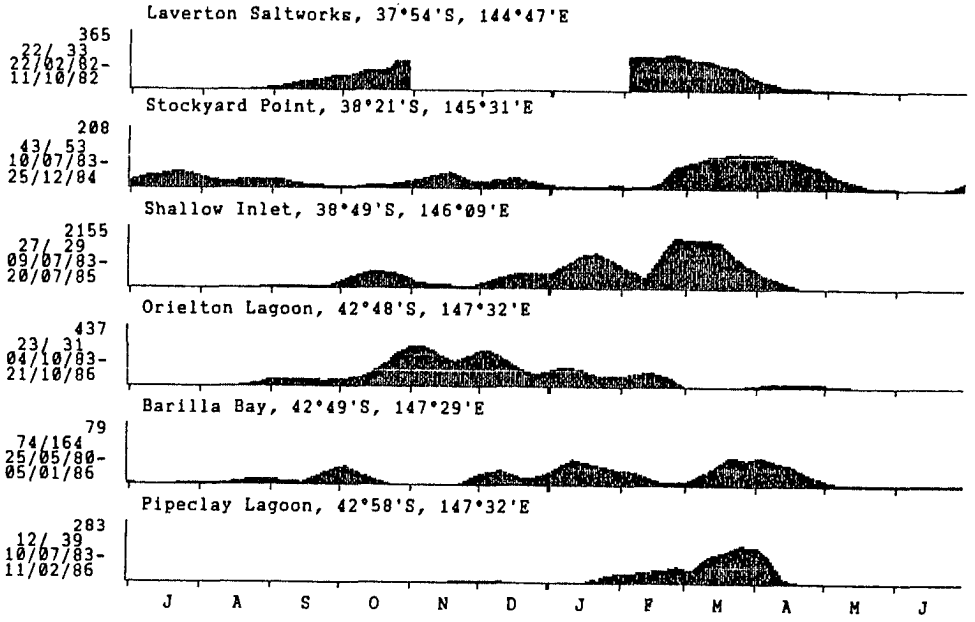
Figure 11. Curlew Sandpiper





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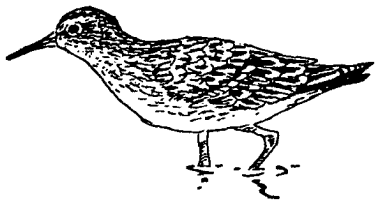


WADER FREQUENCY COUNTS AT PEEL INLET, WESTERN AUSTRALIA, BETWEEN 1983 AND 1985.

Gordon F. Baker, 36 Riverside Drive, Furnissdale, W.A., 6120.

SUMMARY

This report summarises results of periodic wader counts at Peel Inlet, Western Australia, as part of the national R.A.O.U. study programme on wading birds. Observations were made for a 12 month study (1983 to 1984) and for the Northwards Migration Project (first quarter 1985).
Results for various species are tabulated and plotted. These illustrate the movement patterns of both trans-equatorial migratory and indigenous species. The first study covers the 12 month cycle while the second shows in more detail the departure trends.
The data provides the basis for a generalised model of wader movement patterns for typical northern shoreline habitats in Peel Inlet.

INTRODUCTION

This report gives details of consecutive wader counts along a portion of the northern shoreline of Peel Inlet, which is considered to be the most important wader and waterbird habitat in the southwest of Western Australia. The area hosts significant numbers of both indigenous and trans-equatorial waders. The counts were made over 2 periods as part of recent R.A.O.U. wader study projects. Observations were made in accordance with R.A.O.U. recommendations as part of a national programme which included:

a) a 12 month study consisting of monthly recordings between July 1983 and July 1984 inclusive.

b) a Northwards Migration Project, a more restricted programme of weekly counts between February 23 and April 20, 1985.

The results have been submitted to the R.A.O.U. as part of the Australia-wide programme but are documented here to highlight the significance of some movement trends in west coast wader populations.

LOCALITY AND HABITAT

Peel Inlet is located 60km south of Perth on the West Australian coast. Together with the Harvey Estuary it forms an almost enclosed body of water approximately 130 km² in area with a restricted northern outlet to the sea. Three major drainage systems, the Murray, Serpentine and Harvey Rivers flow into the estuary system. Shallow peripheral sands and muds support significant waterbird and wader populations, particularly on the southern and eastern shores of the inlet.

For the R.A.O.U. 12 month study, two and a half kilometres of the northern shoreline of Peel Inlet between Creery Island and the mouth of the Serpentine River was chosen for wader counting, chiefly because of accessibility. The 1985 Northwards Migration count was restricted to the eastern 0.5km of this sector near the Serpentine River outlet.

COUNT DETAILS

a) July 1983 to July 1984

Results of counts over this period are shown in Table 1. From this tabulation a number of general population features over the 12 month period have been determined. These are summarised as follows:

- The most common species ranked in numerical order are: Red-necked Stint > Black-winged Stilt > Sharp-tailed Sandpiper > Curlew Sandpiper > Red-necked Avocet. Together these 5 species comprise 94% of the total counts made, leaving the remaining 9 species plus the unidentified category to account for only 6% of the count.

- The most consistently present species were, perhaps surprisingly both migratory waders: the Red-necked Stint and Greenshank. This was due to the presence of relatively small numbers of over-wintering, non-breeding birds using the area.

- The rarest species ranked in numerical order are: Pectoral Sandpiper < Black-tailed Godwit < Mongolian Plover < Banded Stilt < Red Knot < Bar-tailed Godwit. These 6 species were each observed on a single monthly count (not necessarily the same month) and together comprise only 0.5% of the total count.

- The absence of Banded Stilts was notable and only 5 were recorded in February. This contrasts with previous February counts in 1982 and 1983 when respective counts of 250 and 230 were obtained in the same area for the R.A.O.U. National Wader Census. These differences could be related to bird movements in response to water levels of inland lakes.

- Total frequency data for both individuals and species collectively are shown in Figure 1. These data suggest that species diversity builds up sharply from October onwards reaching a fairly consistent level between December and March after which a rapid decline in the number of wader species occurs.

  In comparison, wader numbers appear to build up somewhat later, from December onwards, rising to a sharp peak in February. After this a high rate of decline occurs until all migratory birds (apart from over-wintering juveniles) have left by May.

- Where sufficient data has been obtained, monthly counts for individual species are plotted to study comparative trends. These are detailed in Figures 2 to 4 and where possible species with similar variations have been grouped. The main features are as follows:

  * Observations on *Calidris* Sandpipers are shown in Figure 2. Curlew and Sharp-tailed Sandpiper movement patterns are similar and were recorded as both arriving and departing relatively earlier than Red-necked Stints. The frequency distributions for these species are highly peaked which suggests that although the time range covers 3 months, population movements are fairly dynamic with individuals consistently entering and leaving the count area. The average individual length of stay is approximately 1.5 months (half the time range of the frequency model).

  * Greenshanks and Grey Plover movements are plotted in Figure 3 and show a completely different arrival and departure as they are more solitary birds and occur in much smaller numbers. Greenshanks were recorded over a longer cycle time than Grey Plovers (9 months versus 6 months), and the frequency distributions are much flatter than for *Calidris* Sandpipers.

  * The indigenous wader count frequencies are shown in Figure 4. The species include the Black-winged Stilt, Avocet and Red-capped Plover. The distributions are relatively similar for each species with spring and summer peaks and a minor influx during winter 1983. Stilts were exceptional in having only one main population peak in summer.

b) Northwards Migration Project: Feb-April 1985

This project was mainly designed to study departure trends for migratory waders as they leave Western Australia for their breeding habitats in Asia. Count results for the 2 month period are summarised in Table 2 and plotted in Figures 5 to 8.

From this information the following observations are drawn:

- Total counts indicate the species number to fluctuate between 5 and 8 with the lowest being in February (Figure 5). Total percentage frequencies of all birds however, increased dramatically from around 5% to about 35% at the end of March, decreasing almost as quickly to low levels by the third week of April. This rapid rise and fall in bird numbers results mainly from the through passage of trans-equatorial migratory waders.

- Data in Figure 6 show Plover counts. The indigenous Red-capped Plover appears to increase and decrease in number coincident with the main wave of migrants. The Grey Plover, although relatively much less numerous, shows a decline in numbers from late February to mid-March. The departure of this migrant appears earlier than any other migratory species in the study area.

- Figure 7 gives count data for the other indigenous species: Black-winged Stilts and Avocets. Stilts were consistent in numbers throughout while Avocet numbers were highly variable, probably due to chance local movements.

- Data on Scolopacid waders are plotted in Figure 8. These include Greenshank, Red-necked Stint and Curlew Sandpiper. All exhibit the peak at the end of March coincident with the through passage of the main wave of birds. Curlew Sandpipers provide a distinct secondary peak at mid-April and to a less extent this is also exhibited by the other two species.

- Counts for species such as the Black-fronted Plover and the Black-tailed Godwit were made over a week or two and very clearly indicate small flocks on passage.

TABLE 1
12 Month Wader Count, North Peel Inlet
July 1983 - June 1984

Species	MONTH J 1983	A	S	O	N	D	J 1984	F	M	A	M	J	Count months (Total months)	Total Count (per specie
Banded Stilt								5					1(12)	5
Black-winged Stilt	66					26	88	362	250	182			6(12)	974
Red-necked Avocet	52				124	30		97					4(12)	303
Red-necked Stint	8		10	2	3	118	22	631	780	1			10(12)	1575
Greenshank			2	6	2	7	4	5	4	2			8(12)	32
Unident. Waders			70				100			10			3(12)	180
Red Capped Plover				11	4	2		9	1				5(12)	27
Grey Plover					6	4	7	2	3				5(12)	22
Mongolian Plover						3							1(12)	3
Black-tailed Godwit						2							1(12)	2
Sharp-tailed Sandpiper						3	463	422	80				4(12)	968
Pectoral Sandpiper						1							1(12)	1
Curlew Sandpiper						18	366	136	40				4(12)	560
Bar-tailed Godwit								7					1(12)	7
Red Knot									6				1(12)	6
Totals	126	0	82	19	139	214	1050	1676	1164	195	0	0	Total	4665
%	2.7	0	1.8	0.4	3.0	4.6	22.5	35.9	25.0	4.2	0	0	Birds	

TABLE 2
Northwards Migration Wader Count, North Peel Inlet
February - April 1985

Species	DATE 23/2	2/3	9/3	16/3	23/3	31/3	6/4	13/4	20/4
Pied Oystercatcher	2								
Grey Plover	5	2	7	1	1	1			
Red-capped Plover	2	5		5	11	32	16	1	12
Black-fronted Plover				4	1				1
Black-winged Stilt	78	69	135	32	88	80	76	148	82
Banded Stilt									10
Avocet	14		7	37		2		5	20
Common Sandpiper					2				
Greenshank	2	1	3	3	3	10	3	4	1
Black-tailed Godwit							13	1	
Sharp-tailed Sandpiper	2				1	5	1	2	
Red-necked Stint	13	200	27	89	122	1520	855	750	127
Curlew Sandpiper						44	1	31	
Totals	118	277	179	171	229	1694	965	942	253
%	2.4	5.7	3.7	3.5	4.7	35.1	20.0	19.5	5.2

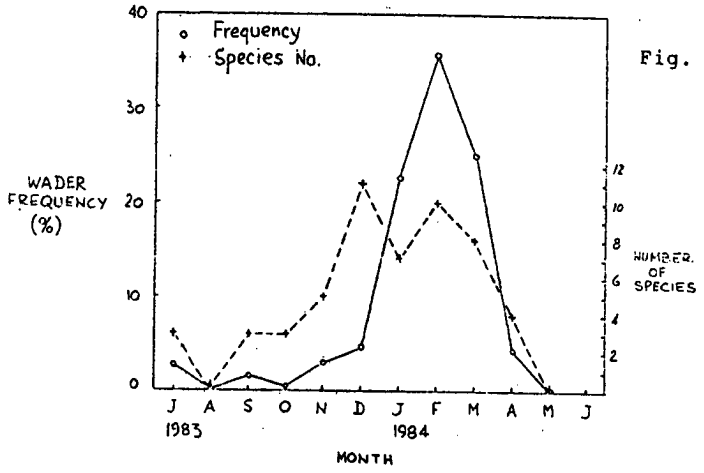


Fig. 1. Wader frequency and species diversity.

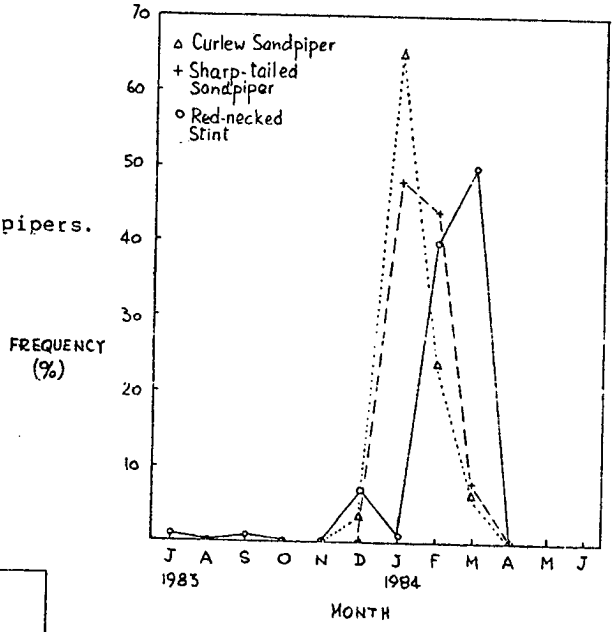


Fig. 2. Frequencies of Calidris sandpipers.

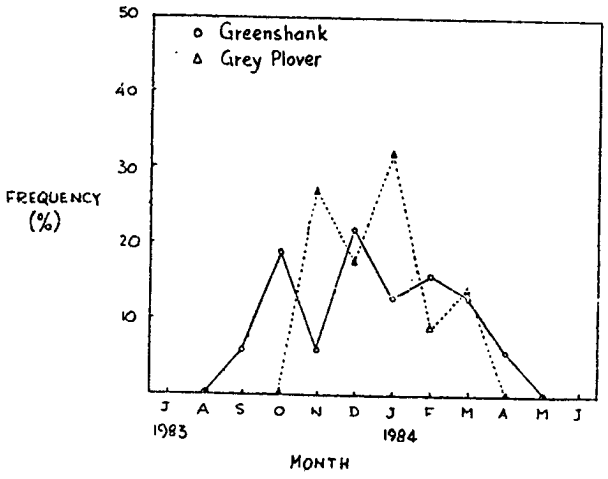


Fig. 3. Frequencies of Greenshank and Grey Plover.

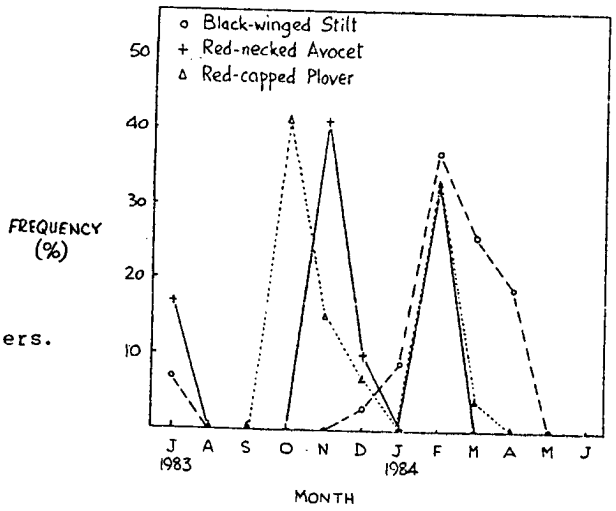


Fig. 4. Frequencies of indigenous waders.

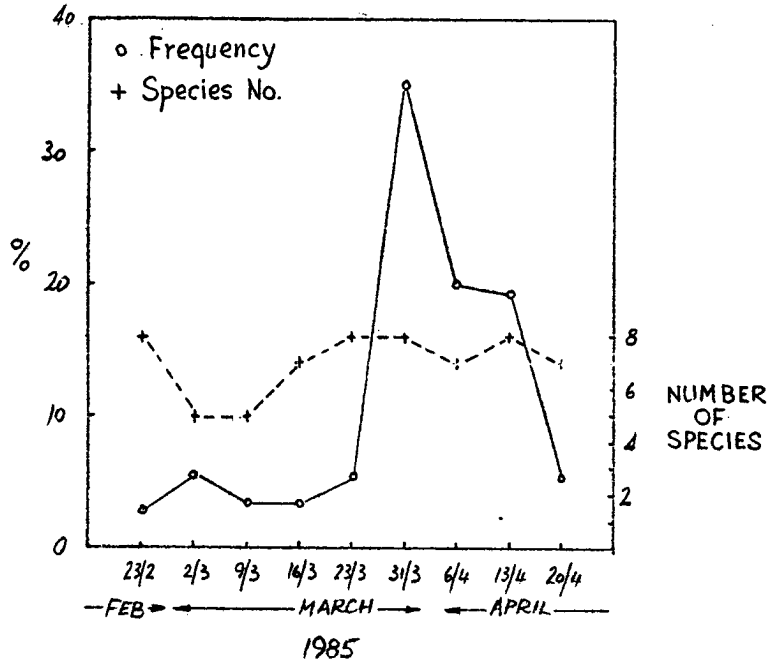


Fig. 5. Wader frequencies and species diversity, Northwards Migration Project.

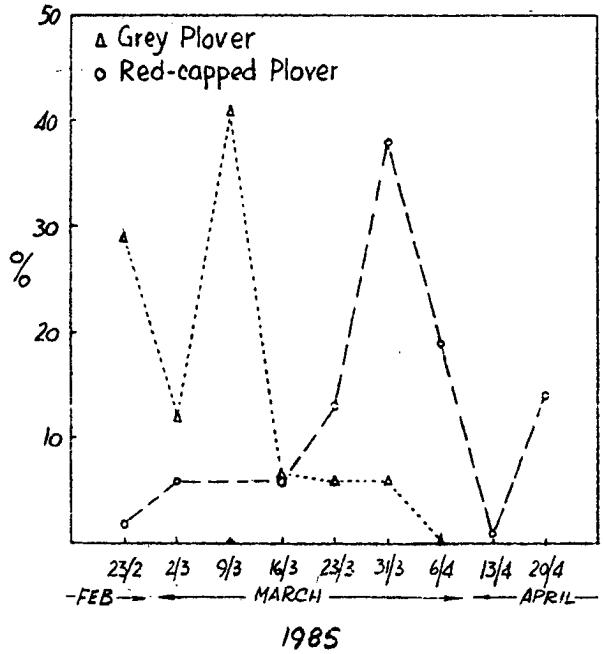


Fig. 6. Frequencies of Charadriid waders, Northwards Migration Project.

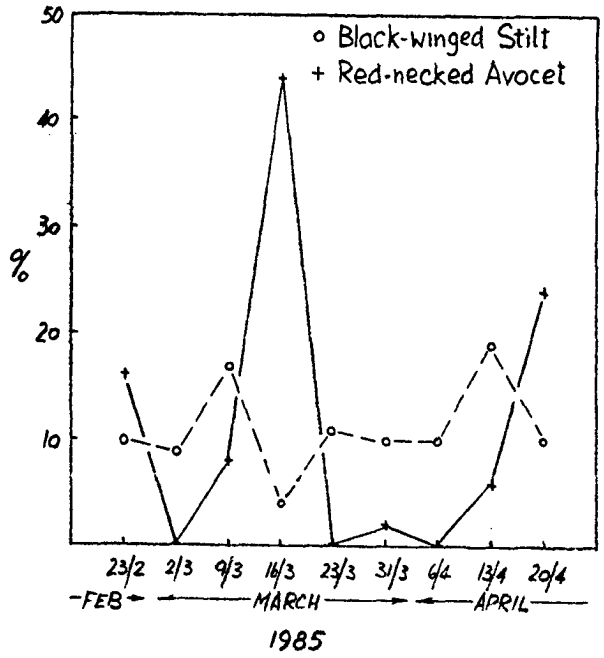


Fig. 7. Frequencies of indigenous waders, Northwards Migration Project.

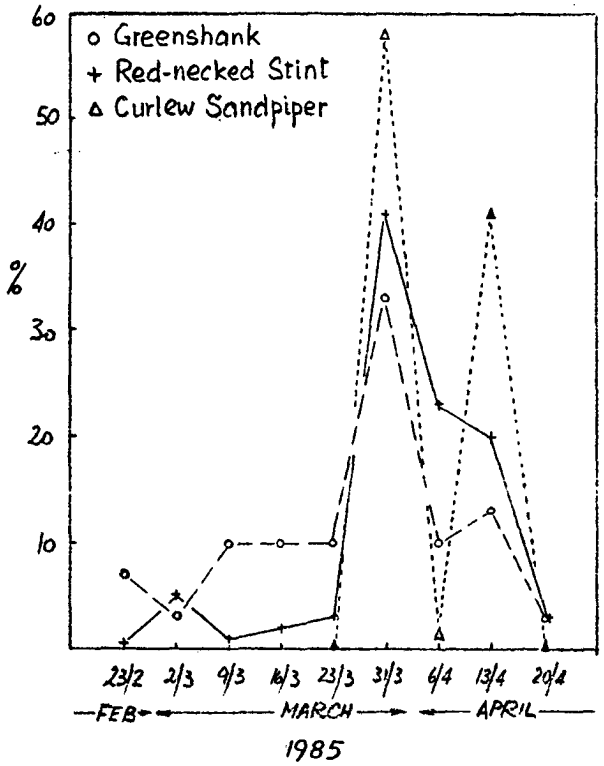


Fig. 8. Frequencies of Scolopacid waders, Northwards Migration Project.

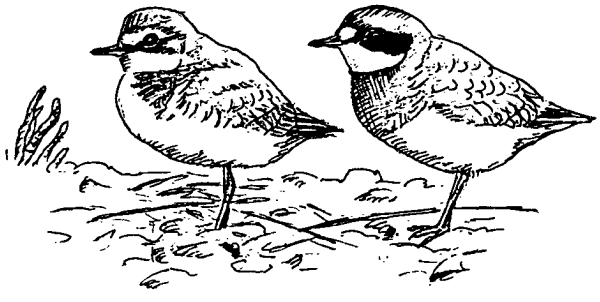
CONCLUSIONS

a) This study summarises counts of wading birds, both migratory and indigenous, observed along the northern shoreline habitat of Peel Inlet. Two count periods were involved, July 1983 to July 1984 (monthly) and February to April 1985 (weekly).

b) In the first study a total of over 4,500 birds were counted including 14 separate species. Two separate movement patterns occur: i) major habitat usage by migrants during their summer period in Australia, with minor numbers of over-wintering juveniles and ii) extensive presence of indigenous waders during summer and less frequently and more variably during other seasons.

c) The second study highlighted population decay curves for various species as birds leave the area during the late summer and autumn in the following year. The major feature of this period was a major wave of migrants on passage over a two week period and the occurrence of a minor secondary wave a week or two later.

d) The counts show that the study area is used extensively by both resident and migratory waders; the former variably throughout the year, the latter mainly in summer. Small numbers of juvenile migrants also over-winter. The area is also used temporarily by migrating waders passing through in either northward or southward directions. This data provides a generalised model of wader movement patterns for appropriate shoreline habitats in Peel Inlet.



RED KNOT *(Calidris canutus rogersi)* IN AUSTRALIA. Part 1 : Sub-Species Confirmation, Distribution and Migration.

Mark Barter, 21 Chivalry Avenue, Glen Waverley, Vic 3150.
Angela Jessop, 14 Myrtle Grove, Altona, Vic 3018.
Clive Minton, 165 Dalgetty Road, Beaumaris, Vic 3193.

SUMMARY

Average wing (165.3mm) and bill (32.9mm) length measurements taken from approximately 700 adult Red Knots caught in Australia confirmed that the subspecies present is *Calidris canutus rogersi*. It is estimated that at least 160000 Red Knot spend the non-breeding season in Australasia with the greatest numbers being in northern Australia and New Zealand. There are 13 recorded overseas movements of banded birds linking Australia with China and New Zealand. It appears from weight measurements that Red Knots are capable of making long non-stop flights, such as between north-Western Australia and China. However, little is known about staging sites for birds migrating to and from Victoria and New Zealand.

INTRODUCTION

Four sub-species of Red Knot *Calidris canutus* are now widely recognised (Cramp and Simmons 1983) Separation of the sub-species can be achieved on the basis of measurements, particularly bill and wing, and breeding plumage (Cramp and Simmons 1983, Roselaar 1983, Dick *et al.* 1976, Morrison 1975, Prater *et al.* 1977, Portenko 1972, Conover 1943, Ridgeway 1919, Matthews 1913).

Summaries of sub-species wing and bill length data from various sources are given in Tables 1 and 2.

Information on the breeding and non-breeding distributions of the sub-species is given in Cramp and Simmons (1983) and Roselaar (1983). The full ranges of *rufa* and *islandica* are well known, with the former breeding in the Canadian arctic and spending the non-breeding season in Argentina and the latter nesting in the high Canadian arctic and Greenland and migrating to north-western Europe in the northern winter. The non-breeding ranges of *cantus* and *rogersi* are well defined, being West and South Africa and Australasia respectively, but the exact locations of their breeding grounds in Siberia have not yet been satisfactorily established.

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 these birds and those from Alaska form a fifth population that migrates along the Pacific coast of North America to unknown non-breeding sites. More recently Tomkovich (1987) has distinguished four Siberian breeding populations from morphological differences but was unable to assign *rogersi* to any of these. He supports Roselaar's contention that Alaskan, Wrangel Island and migrant Red Knots along the American Pacific Coast are from the same population.

Information on the non-breeding distribution and numbers of Red Knots in Australasia is incomplete as few counts have been done in northern Australia during the non-migratory period. Maximum numbers counted in the main arrival areas, north-Western Australia and the Gulf of Carpentaria, in August to October are 80,000 in each, but numbers have fallen to less than half in north-Western Australia by November (Lane 1987). Better information is available for non-breeding concentrations in southern Australia and New Zealand, where numbers

are around 10,000 and 50,000, respectively (Lane 1987, Sagar 1986). It seems that the *rogersi* population in Australasia during the non-breeding season is at least 160,000 and could be closer to 200,000.

Estimated population sizes of the other sub-species are 400,000-500,000 for *canutus* (Dick *et al.* 1987), 430,000 for *islandica* (Cramp and Simmons 1983), and at least 160,000 for *rufa* (Harrington and Twitchell 1982).

This paper records average bill and wing-length data for approximately 1200 Red Knot which have been caught and banded in north-Western Australia (NWA) and Victoria (in south-eastern Australia) during the period 1978 to 1987. The sample size involved is by far the largest ever achieved for the *rogersi* sub-species. The limited amount of information concerning possible migration routes which has been obtained from banding studies and counts is reviewed. A more detailed analysis of biometric and moult data within Australia is in preparation.

METHODS

Approximately 1050 Red Knots have been caught in Victoria and 970 in NWA during the study period. Biometric data was obtained from the majority of Victorian birds and from about half of the NWA Knot. Catches in Victoria have been fairly evenly spaced throughout the non-breeding season i.e. October to March (with some first-year birds being caught in June and July), whilst NWA data has been obtained during five expeditions made in the late August/early September, late October/early November and late March/first-half April periods.

The great majority of birds have been caught by cannon-netting.

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 completion of primary moult in either age group and both are then aged as 2+. Three+ and 2+ birds are often referred to as adults.

RESULTS AND DISCUSSION

Wing and Bill Length.

Wing and bill length data for the four age-groups are given in Tables 3 and 4. Data for all birds of each age-group, from both Victoria and north-Western Australia have been combined. Wing-length measurements were taken to the nearest mm. Bill lengths were measured at various times to accuracies of 0.1, 0.5 and 1.0mm. The results obtained using the different accuracies were not significantly different ($p>0.05$) and have been combined.

The wing length differences between 3+ and 2+ birds are not significantly different ($p>0.05$), whilst those between adults (3+ and 2+) and second-year birds, and second-years and first-years are ($p<0.005$).

The wing-length differences between the age-groups is to be expected. It is quite usual for first-year birds to have shorter wings than adults (see, for example, various data in Prater *et al.* 1977). Second-year birds may be expected to have shorter wings than first-years, due to greater feather wear, but some replace all their primary feathers during the first year (Barter *et al.* in prep), thus raising the average wing-length above that for first-year birds.

The average adult wing-length of 165.3mm (3+ and 2+ combined) agrees well with the *rogersi* data quoted by Roselaar (1983) (see Table 1) and is shorter than that given for the other sub-species.

The bill-lengths of the various age-groups are not significantly different from each other ($p>0.05$) and the overall average of 32.9mm agrees well with Roselaar's (1983) data for *rogersi*. It is much shorter than bill-lengths given for the *canutus*, the other Siberian breeding sub-species (see Table 2).

Migration.

There have been 13 overseas movements of banded Red Knots and these are summarised in Fig. 1. All but one of the birds were banded in Australia with the exception being one banded in New Zealand and recovered in Australia. For full details see *The Stilt* 10:44 and *The Stilt* 11:61-62.

There have been eight exchanges between New Zealand and Australia (six with Victoria and one each with Queensland and Western Australia (Perth) and five between Australia and the east coast of China (three from South Australia and one each from New South Wales and Western Australia (Broome)).

The nominate and *islandica* sub-species of Red Knot are known for their long non-stop flights during migration (Cramp and Simmons 1983, Dick *et al.* 1987) and *rogersi* appears to be no exception. Using the Summers and Waltner (1979) flight distance equation and assuming a flight speed of 75 km/h and an average fat-free weight of 100g (lowest weights of new arrivals are in the 90-100g range) it can be calculated that a Knot weighing 150g can fly approximately 4400km on its fat reserves, one of 170g can travel 5800km and at 200g a distance of about 7700km can be flown. These distances are based on still-air conditions. However, it is known that waders generally start their migration under favourable wind conditions (Lane and Jessop 1985, Richardson 1979) and therefore their potential flight range may be in excess of the calculated distances.

Four Victorian-banded Red Knots caught in New Zealand at the end of February had an average weight of over 150g (S. Davies *pers.comm.*) which would enable them to comfortably reach the Gulf of Carpentaria (4000km), a known Red Knot site. The Queensland recovery (late March) of the NZ banded birds could well have been a Knot attempting to fly this route.

If an average weight of 170g could be achieved prior to departure, New Zealand Red Knots would be capable of reaching the north-Western Australian coast (5500km), which is another major Red Knot site.

Few Red Knots have been caught in Victoria just prior to northward migration, but a catch of 21 adult birds on 22nd March 1980 ranged from 150 to 200g in weight with an average of 175g. The lightest bird could easily reach NWA (3100km) even under adverse conditions, whilst the heaviest would be theoretically capable of flying non-stop to the south-west coast of China (7500km). Although it seems unlikely that Red Knots would attempt such a long flight, it is interesting to note that they are rarely seen in south-east Asia (Lane 1987) and it is presumed that they overfly this region during both northward and southward migration. Red Knots

flying non-stop from Victoria to China would pass over, or close to, extensive wetlands during the flight and could use these if adverse weather conditions precluded them from making a non-stop flight.

Expeditions to NWA have preceded the main departure period for Red Knots. However, some of the heavier Red Knots have reached and many are approaching the weight (i.e. at least 150g) necessary for flying non-stop to the southern Chinese coastline (4400 km).

On southward migration large numbers of Red Knots pass through NWA and the Gulf of Carpentaria presumably to south-eastern Australia and New Zealand. Some at least of these birds stage in Victoria on their way to New Zealand as shown by the recapture of three adult Knots in New Zealand which had been banded in Victoria in the October-November period. One movement was within the same season. The flight from Queenscliff to Auckland is only 2800km and Red Knots would only need to reach 130g in weight in order to fly this distance.

There have been two movements of first-year Red Knots banded in Victoria in June which were later controlled in New Zealand as 3+ birds. It is not known whether these birds spent their first non-breeding season in New Zealand and then moved to Victoria during the following southern winter or whether they stopped first in Victoria before moving on as second-year birds or adults to New Zealand.

ACKNOWLEDGEMENTS

It is our pleasure to thank members of the Australasian Wader Studies Group, the Victorian Wader Study Group and the Miranda Naturalists' Trust, New Zealand, for obtaining the data on which this paper is based. We would also like to thank William Dick and Brett Lane for their helpful comments on the first draft and Karen Barter for typing the various drafts.

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Table 3. Wing length averages.

Age	Sample Size	Mean (mm)	S.D.
3+	381	165.2	4.5
2+	336	165.4	4.4
2	98	161.1	6.8
1	356	159.2	5.7

Table 4. Bill length averages.

Age	Sample Size	Mean (mm)	S.D.
3+	336	32.8	1.7
2+	347	33.0	1.7
2	135	32.9	1.7
1	385	32.8	1.8

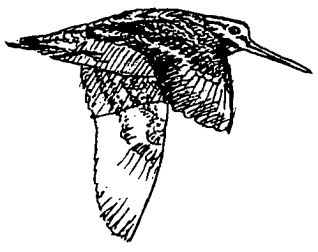

Table 1. Summary of wing-length data from various sources.
NB: Data for Morrison is for live birds.

		MALE				FEMALE			
Sub-species	Source	Sample Size	Mean (mm)	S.D.	Range (mm)	Sample Size	Mean (mm)	S.D.	Range (mm)
canutus	Cramp	47	167	2.93	161/173	41	170	2.84	165/176
	Roselaar	59	167.3	2.86	161/173	53	170.5	2.69	165/176
islandica	Prater	29	167.9		166/176	17	170.5		167/177
	Cramp	25	169	3.18	162/173	36	173	3.69	168/181
	Roselaar	46	169.0	3.34	160/174	45	173.2	3.71	167/181
	Morrison				173.4 (n = 741)				
rufa	Roselaar	14	165.8	2.66	159/169	17	171.6	2.73	167/175
rogersi	Roselaar	17	164.4	4.31	157/172	15	168.4	3.58	164/174

Table 2. Summary of bill-length data from various sources.
1 = Morecambe Bay, 2 = Greeland/Ellesmere Island,
3 = Greenland (live brids). Morrison data for live birds.

Sub-species	Source	Sample Size	Mean (mm)	S.D.	Range (mm)	Sample Size	Mean (mm)	S.D.	Range (mm)
canutus	Prater	26	34.5	SE±0.2		17	35.9	SE±0.3	
	Cramp	48	34.7	1.35	32.8/37.2	41	36.6	1.46	33.9/40.4
	Roselaar	60	34.6	1.34	32.3/37.2	53	36.5	1.33	33.9/40.4
islandica	Prater	28	32.6		29/36	18	34.2		31/37
	Cramp	26	32.6	1.11	30.5/34.4	38	34.4	1.54	31.4/36.5
	Roselaar	48	32.2	1.19	29.8/34.6	47	34.3	1.50	31.4/36.7
	Dick et al[1]	92	32.2	SE±0.2		71	34.0	SE±0.2	
	Dick et al[2]	22	31.8		30/34	13	33.7		32/36
	Dick et al[3]				32.5 (n=20, SE±0.3)				
	Morrison				32.7 (n=741)				
rufa	Prater	9	34.7		33/38	8	36.5		35/38
	Roselaar	14	34.8	1.08	33.3/36.4	17	36.7	1.38	35.0/40.2
rogersi	Roselaar	17	31.7	1.20	29.3/33.3	15	33.7	1.36	30.9/36.2

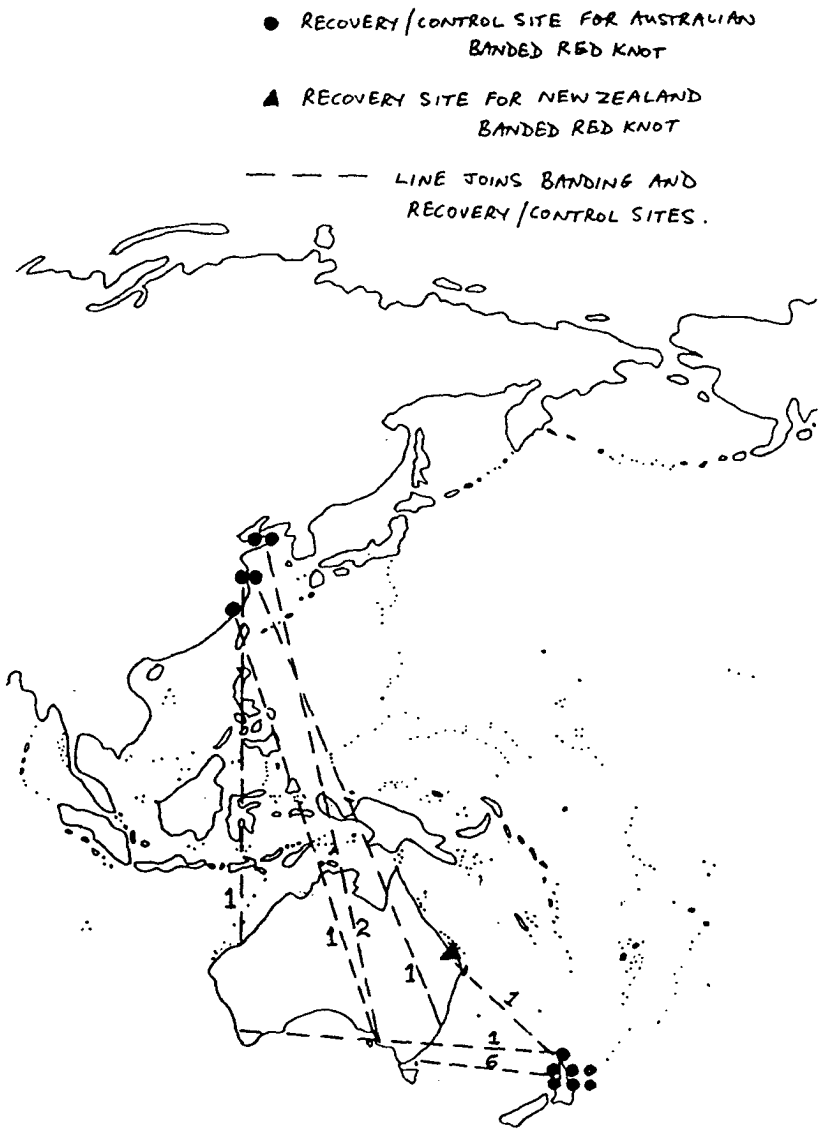

Fig. 1. Long distance movements of Red Knot banded in Australia (12) and New Zealand (1)

BIOMETRICS, MOULT AND MIGRATION OF LARGE SAND PLOVER (*Charadrius leschenaultii*) SPENDING THE NON-BREEDING SEASON IN NORTH-WESTERN AUSTRALIA.

Lisa Barter and Mark Barter, 21 Chivalry Avenue, Glen Waverley, Vic 3150.

SUMMARY

A preliminary analysis is presented of data obtained from 1681 Large Sand Plovers caught in north-Western Australia from 1981 to 1985. The average adult wing and bill-lengths of 143.8 and 23.8mm respectively, are reasonably consistent with those given in the literature for *C.i. leschenaultii*. Wing-lengths of second and first-year birds are significantly shorter than those of adults whilst bill-lengths are similar. Adult and second-year birds weigh on average 73-76g and first-years 67-69g in the non-migratory period. Most adults are in active primary moult immediately following arrival, from mid-August onwards, and at least 25% arrive in Australia in suspended moult. Primary moult in second-year birds is more advanced than in adults in August-September but adults have caught up by October-November. Large Sand Plovers exhibit very high non-breeding site fidelity. First-year birds arrive at the same time as, or shortly after, adults.
Most adults have departed by early April, whilst those remaining in mid-April may be second-year birds which are staying in Australia during the breeding season.

INTRODUCTION

This paper presents the results of a preliminary analysis of data obtained from Large Sand Plover caught by the Australasian Wader Studies Group from 1981 to 1985. During this period five major catching expeditions were mounted, the numbers caught on each being:

August/September 1981	52
March/April 1982	72
August/September 1982	575
October/November 1983	540
March/April 1985	442

The various expeditions covered three basic periods: arrival in Australia, mid-season and departure from Australia. The total of 1681 birds caught includes 86 retraps.

The three sub-species of Large Sand Plover breed in a zone stretching from the Middle East to Mongolia. The nominate *leschenaultii* is the most easterly breeding of the three and spends the non-breeding season in south-east Asia and Australia. Wader counts in Australia during the 1981-5 period show that the Large Sand Plover population in north-Western is approximately 60000 and that this probably represents in excess of 90% of the total number spending the non-breeding season in Australia.

Data from Cramp and Simmons (1983) on the wing and bill-lengths of the three sub-species are given in Tables 1 and 2 respectively.

METHODS

All birds were caught with cannon-nets. Biometric data were obtained using standard methods. Birds were aged by plumage and primary feather wear and the following codes were used:

3+ - in third year and older
2+ - in second year and older
2 - in second year
1 - in first year

Second-year birds become indistinguishable from 3+ birds when primary moult is complete and at that stage all 2 and 3+ birds become 2+. Birds aged 3+ and 2+ are also referred to as adults in this paper. Ages change on August 1st.

RESULTS AND DISCUSSION

Wing length.

Average wing-length for the three age groups is given in Table 3. Field measurements were taken to the nearest whole mm.

The combined average wing-lengths of the age-groups for the three catching periods are significantly different from each other (3+/2+ vs.2 and 2 vs.1, both $p<0.005$), with adult birds having an average wing-length of 143.8mm, second-year birds of 141.1mm and first-years of 138.3mm. Wing-lengths of adults over the three periods are not significantly different ($p>0.05$). However, wing-lengths of second year birds are significantly longer ($p=0.01$) in October-November compared to August-September although no birds had completed moult by the latter period. Those of first-year birds are significantly shorter ($p<0.005$) in March-April compared to either of the earlier catching periods, probably due to severe feather abrasion during the intervening period.

The average wing length of adult birds is consistent with that given for the nominate *leschenaultii* (Table 1) especially when allowance is made for shrinkage in museum specimens.

No published data have been found for first-year *leschenaultii* wing-lengths and the results of this analysis are apparently the first to be published.

Bill Length.

Table 4 presents the average bill-length data for the three age groups. Only those measurements taken to an accuracy of 0.1mm have been included in the analysis. Bill-lengths for each age group are not significantly different ($P>0.05$) for the three catching periods and have been combined.

Adult and first-year bill-lengths average 23.8mm and second-year birds average 23.6mm. The differences between ages are not significant ($p>0.05$).

The bill-lengths best match those given for the nominate *leschanaultii* (Table 2) although they are slightly longer than those recorded for museum specimens where shrinkage may occur.

Total Head-Length.

Average total head-length data are presented in Table 5. Field measurements were taken to the nearest 0.1mm. The total head-length of first year birds is significantly shorter ($p=0.005$) than that of adults, i.e. 54.4mm vs 54.7mm respectively whilst that of second-year birds is not significantly different from adults ($p>0.05$).

Tarsus plus toe.

Field measurements were taken to the nearest whole mm and involved measuring from the back of the ankle to the tip of the middle toe pad. Details of the average measurements for adult and first-year birds are given in Table 6. Averages are the same for both age groups, i.e. 61.5mm.

Weight.

A summary of the average weights for the age groups in the different catching periods is given in Table 7. The results are shown diagrammatically in Fig.1.

Adult and second-year birds have an average weight of 73-76g in the non-migratory period. The adult weight increases to about 104g in early April before declining to around 88g in mid-April. First-year birds have an average weight of 67-69g. There is a small weight gain to 75g at the same time that adults reach peak weight in early April but the average weight falls back to normal levels in mid-April.

Use of the flight distance equation developed by Summers and Waltner (1979) indicates that birds weighing 110g or more can fly non-stop the 4500km distance between north-Western Australia and the coast of south-west China. In the calculation it is assumed that the average fat-free weight is 70g and that still-air conditions apply. This latter assumption is conservative in that it is known that migratory waders generally commence migration when favourable wind conditions apply (Richardson 1979, Lane 1985).

The heaviest birds in the March-April period weighed around 120g with approximately 5% being in excess of 110g in late March, 28% in early April and none in mid-April. It seems likely that birds fly directly from north-Western Australia to China and they do not leave until a take-off weight of 110g or more is reached.

First year birds are some 6g lighter on average than adult birds during the non-migratory period but have reached adult weight by the time they enter their second year.

Evidence based on the percentage of first-year birds in catches (Table 8) shows that the majority of adult birds have left by early April. The large decline in average weight of adults between early and mid-April, together with the less well developed breeding plumage of adults in mid-April compared to late March-early April (54% with well developed forehead line and black breast-band in early April, 8% in mid-April), indicates that adults still present in mid-April are probably second-year birds which are either departing late or are to remain in north-Western Australia during the breeding season.

The possible effect of capture-stress on weight was examined from the weights of 26 birds which were recaptured within 3 days of original capture. It was found that 23 birds had lost weight with the greatest decline being 9g (Fig.2). The average weight loss of the 23 birds was 4.3g.

Primary Feather Moult.

Moult data for the three age groups are given in the Tables 9-14.

A total of 68% of adult birds had commenced primary feather moult in the earliest sample (20 August) and the median primary moult score (MPMS) increased steadily with later catches, except for the latest September catch which probably consisted of very recent arrivals (Table 9). Approximately 25% of adults were in suspended moult (Table 10) implying that a proportion of adult Large Sand Plovers are undergoing a partial primary moult in Asia before completing their journey to Australia. This conclusion is consistent with Cramp and Simmons (1983) in which it is stated that "primary moult starts shortly after nesting, when birds are still in or near the nesting grounds, and that 0-4 inner primaries are replaced within one month". In the present study, of 95 birds in suspended moult, only two had replaced more than four primaries. The most common numbers replaced were three (37 birds) and two (29 birds).

By late October-early November, almost all adults were moulting and the MPMS value had reached 29-33 (Table 9).

Second-year birds were more advanced in primary moult than adults in late August-early September and all birds were in active moult (Table 11). The average MPMS value for the period was 19. However by late October-early November the MPMS value was similar to that of adults implying that primary moult in second-year birds is more leisurely than with adults. The more advanced state of moult in second-year birds compared to adults is also shown in Table 12, which gives moult scores for second-year birds which were retrapped a year later as adults. This difference in timing of primary moult is also reported in Cramp and Simmons (1983) where it is stated that second-year birds commence with P1 in June and finish moulting in September (although this is not confirmed in the present study), whilst adult birds complete primary moult in November-December.

More than 50% of first-year birds undergo some degree of primary moult which almost invariably commences at the innermost primary. The MPMS score falls from around 20 in late March to 4 in mid April (Table 13) suggesting that some first-years leave the non-breeding quarters following a partial primary moult leaving late or non-moulters behind. However, the weights of first-years in suspended moult are not significantly higher than of those which are not moulting and thus the former group does not appear to be putting on weight prior to an early departure. By the March-April period, a small number of first-year birds (3%) had completed primary moult, 40% had not commenced moult and 9% were in suspended moult which ranged from replacement of P1 through to P7, with the most common being the innermost three primaries (Table 14).

Moult data for individual birds retrapped in a later year are shown in Fig.3. The average rate of increase in moult score is 0.42/day which implies a primary moult duration of about 120 days, if it is assumed that the moult rate is constant throughout the moulting period.

Non-breeding site fidelity.

A total of 86 retraps was made of which two comprised birds recaptured for a second time. All birds were recaptured close to their original banding site indicating that Large Sand Plovers exhibit very high fidelity to a specific non-breeding site.

Migration.

Adult Large Sand Plovers are the first wader species to return in numbers to north-Western Australia and do so from mid-August onwards. Whilst juvenile Plovers are present from late August onwards, those of other species do not arrive until later (Minton 1982).

The percentage of first-year Large Sand Plovers caught at different times is recorded in Table 8. The results indicate that first-year birds arrive at much the same time as adults (perhaps a little later) and that the majority of adults, i.e. greater than 80%, have left by early April.

There have been two overseas recoveries of Large Sand Plovers banded in north-western Australia. Both are of birds caught on the south-western Chinese coastline in the first half of August, presumably whilst fattening prior to departure for Australia.

CONCLUSIONS

The results show that:

(a) The average wing-length of adult Large Sand Plovers is 143.8mm and this is consistent with that given for museum specimens of *C.l. leschanaultii*. Wing-lengths of second and first-year birds, at 141.1 and 138.3mm, respectively, are significantly shorter than that of adults.

(b) The average bill-length of adult birds is 23.8mm and those of second and first-year birds are not significantly different from this. The adult bill-length best matches that of *C.l. leschenaultii*.

(c) The average total head-length of adults is 54.7mm and of second-years is 54.6mm. First years, with a length of 54.4mm, have a significantly shorter total head-length than adults.

(d) The tarsus plus toe measurement for both adult and first-year birds is 61.5mm.

(e) Adult and second-year birds have an average weight of 73-76g in the non-migratory season. First-year birds have an equivalent average weight of 67-69g.

(f) On average, adults weighing 110g should be capable of flying non-stop to the Chinese coast. In late March 5% of birds were in excess of this weight, in early April 28%, and in mid-April none. There is evidence from breeding plumage development that the low-weight adults present in mid-April are mainly second-year birds which are insufficiently mature to breed and may be remaining in north-Western Australia during the breeding season.

(g) The majority of adults are in active primary feather moult immediately following arrival in the second-half of August. At least 25% arrive in suspended moult indicating that this age-group undergoes a partial moult prior to departing for Australia. Second-year birds are more advanced in moult than adults in August-September, but adults have caught up by October-November. On the basis of retrap data from birds caught in different years, moult duration appears to be about 120 days.

(h) Large Sand Plovers exhibit very high non-breeding site fidelity.

(i) First year birds arrive in Australia at the same time as, or shortly after, adults, i.e. in the second-half of August. Most adults have departed by the beginning of April.

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Table 1. Wing-length data for aged and sexed museum specimens of the three subspecies (Cramp and Simmons 1983).
(n = sample size, $\bar{x}$ = mean, sd = standard deviation).

		Male			Female		
Age	Race	n	$\bar{x}$	sd	n	$\bar{x}$	sd
3+/2+	leschenaultii	20	141	3.35	32	144	3.52
"	crassirostris	15	146	2.82	23	147	4.55
"	columbinus	15	144	3.64	27	143	4.27
1	crassirostris	5	142	3.27	9	143	3.41
"	columbinus	11	137	2.33	16	138	3.98

Table 2. Bill-length data for sexed museum specimens (un-aged) of the three sub-species (Cramp and Simmons 1883).

	Male			Female		
Race	n	$\bar{x}$	sd	n	$\bar{x}$	sd
leschenaultii	52	23.3	0.88	67	23.2	1.10
crassirostris	20	24.5	1.02	32	24.4	1.32
columbinus	27	22.6	1.04	43	22.6	1.20

Table 3. Wing-length data in mm.

	3+/2+			2			1		
Period	n	$\bar{x}$	sd	n	$\bar{x}$	sd	n	$\bar{x}$	sd
Aug/Sept	190	143.9	4.38	65	140.1	5.25	28	142.2	3.94
Oct/Nov	359	143.8	3.42	64	142.1	4.39	46	142.0	2.93
March/April	156	143.5	4.78				123	136.0	4.09
Combined	705	143.8	4.02	129	141.1	4.93	197	138.3	4.82

Table 4. Bill-length data in mm for all catching periods combined.

	3+/2+			2			1		
n	$\bar{x}$	sd	n	$\bar{x}$	sd	n	$\bar{x}$	sd
215	23.8	1.09	29	23.6	1.24	90	23.8	0.96

Table 5. Total head-length data in mm for all catching periods combined.

3+/2+			2			1		
n	$\bar{x}$	sd	n	$\bar{x}$	sd	n	$\bar{x}$	sd
423	54.7	1.16	72	54.6	1.19	126	54.4	1.06

Table 6. Tarsus plus toe data in mm for March–April period.

2+			1		
n	$\bar{x}$	sd	n	$\bar{x}$	sd
126	61.5	1.77	94	61.5	1.56

Table 7. Weights in grams.

Period	Age	n	$\bar{x}$	sd	Range
Aug/Sept	3+	199	76.1	5.02	63–87
	2	50	76.0	4.33	66–88
	1	12	68.9	6.00	56–81
Oct/Nov	3+	400	74.1	4.00	64–86
	2	80	73.4	5.23	58–86
	1	45	68.5	5.13	55–85
March/April					
24–26/3/85	2+	46	91.6	10.87	68–120
	1	25	69.5	4.35	67–80
30/3–1/4/82	2+	27	94.7	9.47	75–111
3–5/4/85	2+	50	103.5	8.94	82–121
	1	9	75.3	3.91	71–82
17–19/4/85	2+	126	87.8	8.72	66–114
	1	153	67.1	4.66	56–85

Table 8. Numbers and percentages of the three age-groups at different times.

	3+/2+		2		1	
Date	n	%	n	%	n	%
20/8–24/8/82	60	74	17	21	4	5
30/8–2/9/81	31	66	12	26	4	8
2/9–8/9/82	344	72	91	19	40	9
22/10–5/11/83	423	75	79	14	49	9
24–26/3/85	49	66			25	34
30/3–1/4/82	27	49			28	51
3/4–5/4/85	54	86			9	14
17/4–19/4/85	137	45			166	55

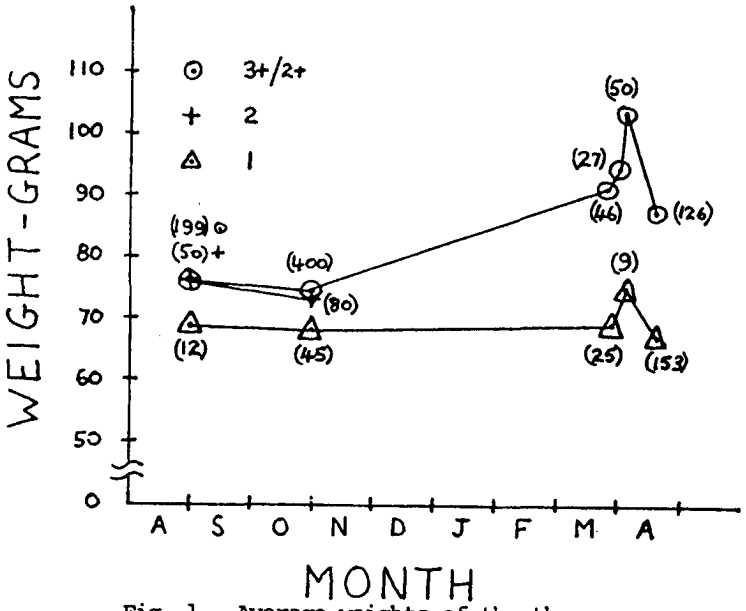


Fig. 1. Average weights of the three age groups ( ) = sample size.

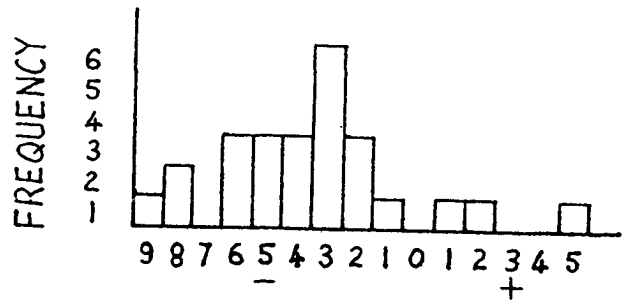


Fig. 2. Weight variation over one to three days in retrapped birds.

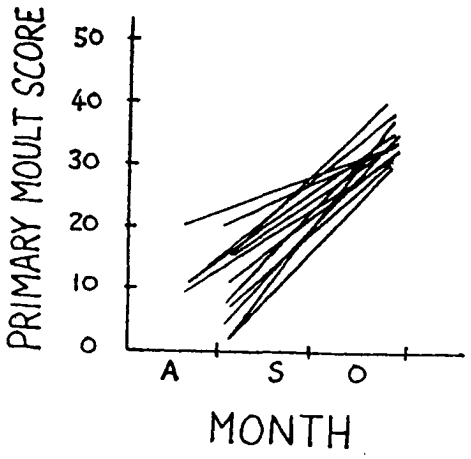


Fig 3. Primary moult scores of individual birds, measured in different years.

Table 9. Moult data for 3+ birds

Date	n	MPMS	% not started	% in moult
20/8/82	41	3	32	68
24/8/82	17	4	29	71
30/8-2/9/81	28	5	18	82
2/9/82	93	10	20	80
4/9/82	210	8	18	82
8/9/82	17	0	59	41
25/10/83	80	29	2	98
27/10/83	66	32	0	100
28/10/83	38	32	0	100
2/11/83	16	32	0	100
3/11/83	65	32	0	100
5/11/83	56	33	0	100

Table 10. Moult status of 3+ birds following arrival.

Date	n	% not started	% moult suspended	% in moult
20-24/8/82	58	31	28	41
30/8-2/9/81	30	23	20	57
2-4/9/82	306	13	23	63
8/9/82	17	53	12	35

Table 11. Moult data for second-year birds.

Date	n	MPMS	% in mouli
20/8/82	8	22	100
2/9/82	8	10	100
4/9/82	16	25	100
8/9/82	6	7	100
25/10/83	10	25	100
28/10/83	11	31	100
5/11/82	14	37	100

Table 12. Moult score comparisons for individual birds caught as both second-year and 3+.

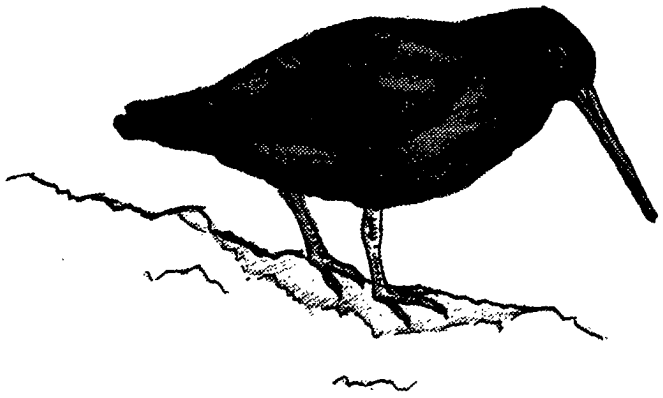
Age	Date of banding	PMS	Age	Retrap date	PMS
2	1/9/81	28	3+	20/ 8/82	1
2	4/9/82	34	3+	25/10/83	20
2	4/9/82	34	3+	25/10/83	40
2	4/9/82	46	3+	25/10/83	24
2	4/9/82	39	3+	27/10/83	30

Table 13. Moult data for first-year birds.

Date	n	MPMS	% not started	% in moult	% completed
24-26/3/85	25	15	20	72	8
30/3-1/4/82	28	26	29	71	0
3-5/4/85	9	0	56	44	0
17-19/4/85	164	4	43	55	2

Table 14. Suspended moult status of first-year birds.

n	PMS
4	5
3	10
5	15
3	20
2	25
1	30
1	35



THE WINTER 1987 POPULATION MONITORING COUNT: LESSER GOLDEN PLOVERS OVER-WINTERING IN AUSTRALIA

Marilyn Hewish, 74 Wellington St., Bacchus Marsh, Vic. 3340.

The austral winter 1987 wader count was held on the weekends of 20/21 and 27/28 June. Wader species and numbers at the 23 monitored sites are given in Table 1. A total of 113 count sheets were returned, listing a total of 32 species and 36674 individuals, including 16172 migratory waders from the northern hemisphere, 17519 resident waders, 2748 Double-banded Plovers, and 235 unidentified waders.

This count was considerably lower than that of winter 1986 (63342) and this decrease was evident in the counts of both migratory waders from the northern hemisphere (23032 in 1986 vs. 16172 in 1987) and resident waders (35817 vs. 17519), declines of 30% and 51% respectively.

Resident Waders.

Among resident wader species, the most noteworthy decreases occurred in Banded Stilts (21516 to 4676) and Red-kneed Dotterels (338 to 38). Most of the decline in Banded Stilt numbers occurred at Port Phillip Bay, Vic. (6994 to 49) and Gulf St. Vincent, SA (14447 to 4524), two of the most important areas for Banded Stilts among our monitored sites. Winter counts from 1981-5 at Port Phillip Bay ranged from 250-3067 and at Gulf St. Vincent from 6017-7267. By comparison, the winter 1986 counts were unusually high, and the winter 1987 counts unusually low, so that the decline between the two years was particularly noticeable.

Because many resident wader species occur in large numbers inland (Lane 1987), our 23 coastal sites probably do not provide adequate coverage for monitoring their populations. The counts are nevertheless useful in understanding distribution and movements from year to year. Numbers of Red-kneed Dotterels, Black-winged Stilts, Banded Stilts and Red-necked Avocets at coastal sites are usually higher in summer when many inland wetlands are dry (Wheeler 1955, Storr 1965, Lane and Jessop 1983, Blakers *et al.* 1984, Close and McCrie 1986 and Lane 1987). Movements also occur in response to drought and flood inland, which led to dramatic fluctuations in numbers of these species at coastal sites between 1982 and 1984 (Lane & Jessop 1984). The decline in Red-kneed Dotterel and Banded Stilt numbers between winter 1986 and winter 1987 therefore probably indicates a difference in rainfall patterns inland between the two years. The numbers of Black-winged Stilts (2972 to 2295) and Red-necked Avocets (4107 to 4089) were more consistent. In 1981-5, there were also differences between resident wader species in the nature and timing of their response to inland conditions (Lane & Jessop 1984, Lane 1987).

Migratory Waders (northern-hemisphere breeding).

The lower count in 1987 was attributable mainly to substantial decreases for some of the more common wader species at the monitored sites; especially Red-necked Stint (8864 in 1986, 3923 in 1987) Red Knot (3356 in 1986, 1896 in 1987), and Curlew Sandpiper (3235 in 1986, 2191 in 1987). Lower counts in winter 1987 were also noted for some of the less common species; Grey Plover (402 to 123), Lesser Golden Plover (83 to 32), Ruddy Turnstone (340 to 212) and Greenshank (493 to 338).

Some notable increases occurred among the less common species: Mongolian Plover (98 to 308), Large Sand Plover (34 to 102), Whimbrel (311 to 512), Grey-tailed Tattler (167 to 322), Marsh Sandpiper (5 to 66), Terek Sandpiper (89 to 253), Black-tailed Godwit (47 to 164) and Sanderling (5 to 104).

Such marked fluctuations in winter numbers may indicate differences in breeding success rates for these species between the two years, as over-wintering migratory waders are mainly first-year birds. For those species which use inland wetlands (e.g. Marsh Sandpiper and Black-tailed Godwit), numbers at coastal sites may also vary in response to rainfall or dry conditions inland. The influence of these factors will be examined when the National Wader Count results for our monitored sites have been collated for all of these species, and over-wintering percentages (winter count as a percentage of summer count) from 1982-7 have been calculated.

Over-wintering percentages have been calculated for Red Knots and Grey Plovers, which in 1986 showed unusually high winter counts and the highest over-wintering percentages recorded since the counts began (44% and 21% respectively). This indicated that 1985 was a year of excellent breeding success for these two species (Hewish 1987). In 1987, lower winter counts and over-wintering percentages (20% for Red Knots, 6% for Grey Plovers) fell within the range obtained from 1982-5, and reflected a year of lower breeding success in 1986.

Lesser Golden Plovers and Sharp-tailed Sandpipers are unusual among migratory waders in Australia. Only a very small percentage of their summer populations over-winter, and it has been suggested that the first-year birds of these species move north of Australia for the southern winter (Lane & Jessop 1984). Very few Sharp-tailed Sandpipers have been counted in the winter counts of the Population Monitoring Project. In winter 1986, 14 birds remained from a summer population of 27612 at our monitored sites and in 1987 13 birds remained from 29864: in both years an over-wintering percentage of less than 1%.

Lesser Golden Plovers.

There were greater variations in the winter numbers and the over-wintering percentages of Lesser Golden Plovers in 1986 and 1987. Although there are literature reports of Lesser Golden Plovers over-wintering in Australia, this has been reported as a regular occurrence only in Torres Strait (Draffan *et al.* 1983). It is worthwhile to examine the count results from 1982-7 to determine whether Lesser Golden Plovers over-wintered regularly anywhere else in the country, and if so to look into their numbers and winter distribution.

Table 2 shows the over-wintering percentages of Lesser Golden Plovers from 1982-7, calculated from summer and winter counts at the monitored sites. In any year sites which were not counted consistently in summer and winter are omitted.

The total over-wintering percentage from all monitored sites never exceeded 4%, confirming the suggestion of Lane and Jessop (1984) that the majority of first-year birds leave Australia for the winter. However, there was considerable geographic variation in the over-wintering percentages, with a greater proportion of birds remaining further north in Australia. In the southern states (Tas, Vic, SA, WA and NSW), the proportion of birds over-wintering was always extremely small (0-2%). In NT it was high on one occasion and in Qld it was consistently high, varying between five and 41%.

The average over-wintering percentage from 1982 to 1987 has been calculated for each monitored site which held ten or more Lesser Golden Plovers in any summer count. For large sites, the latitude approximately mid-way between the northern and southern boundaries is used. Average over-

wintering percentages were low at all southern sites, with a progressive increase northwards along the eastern Australian coast above latitude 29°10'S (Clarence/Richmond estuaries in northern NSW). Average over-wintering percentages were high at all Queensland sites, and exceeded 100% above latitude 21°25'S (Mackay). At the northernmost site at latitude 12°25'S (Darwin, NT), the average over-wintering percentage was low.

Table 3 shows that the northerly distribution in winter is also evident when absolute numbers of birds at monitored sites are considered. The only sites at which winter counts ever exceeded ten were the Clarence/Richmond estuaries (northern NSW coast), Moreton Bay, Mackay, and Cairns (Qld).

Clarence/Richmond had a single high winter count (19) and an over-wintering percentage of 25% in 1984. In NSW as a whole, the low over-wintering percentages at the other four sites masked this 1984 increase at Clarence/Richmond (Table 2). The National Wader Count results show that two other sites in northern NSW held more than ten birds during a winter count. Jerseyville (30°52'S) held 12 birds in 1985 and Port Stephens (32°45'S) held 16 birds in 1985. Although birds were regularly found at Botany Bay, Shoalhaven (NSW) and Port Phillip Bay (Vic.), numbers were low.

Summer and winter counts in 1982-7 for Moreton Bay, Mackay and Cairns are shown in Table 4. At Moreton Bay, the over-wintering percentage ranged from 0-18% over six years of counts, reaching 10% or more in four of those years. The over-wintering percentages at Mackay and Cairns were more variable, as summer numbers were generally low. Winter numbers regularly approached those obtained in summer and occasionally exceeded them, indicating an influx of first-year birds between the summer and winter counts (Cairns in 1984; Mackay in 1986). This gave rise to average over-wintering percentages exceeding 100% at both sites. It is interesting that Cairns seems to have become less attractive to Lesser Golden Plovers in both summer and winter from 1985 onwards, while over-wintering numbers at Moreton Bay have increased in that same period. In 1984 and 1985 winter counts at Queensland sites were not unusually high, so that the higher numbers at Clarence/Richmond in 1984 and at Jerseyville and Port Stephens in 1985 do not seem to have arisen from overflow from more favoured sites.

Among the northern sites, Darwin was the exception, with winter sightings occurring sporadically. Darwin's highest winter count (8) in 1983 gave rise to a high over-wintering percentage, as summer numbers in Darwin are generally low (21-72 birds). As Darwin is our only monitored site in NT, the high over-wintering percentage listed for NT in 1983 (Table 2) may not reflect the situation for the Territory as a whole.

It therefore seems that first-year Lesser Golden Plovers occasionally winter in appreciable numbers in northern NSW (Clarence/Richmond, Jerseyville, Port Stephens) but are more numerous and occur more regularly further north. The important winter sites, Moreton Bay, Mackay, and Cairns, together with Torres Strait Islands (Draffan *et al.* 1983), suggest a main winter range extending along the length of the Queensland east coast. The Torres Strait islands may hold a considerable population, as numbers comparable to those at Queensland sites are regularly found (S. Garnett, *pers.comm.*), and the birds' widespread distribution in summer indicates that suitable habitat occurs on many islands (Draffan *et al.* 1983). There may well be undiscovered winter sites along the Queensland coast, perhaps among the Great Barrier Reef islands, where Lesser Golden Plovers are abdundant in summer (M.J. Carter in Lane 1987).

In summer the most important sites for Lesser Golden Plovers are in coastal south-eastern Australia and extend from eastern SA to Moreton Bay (Lane 1987). A northward shift in distribution occurs between summer and winter, with an area of overlap including Moreton Bay, and occasionally, the north coast of NSW. The high Queensland over-wintering percentages, particularly in Mackay and Cairns, are a reflection of the fact that birds occur in winter at some sites were summer numbers are low (Table 3).

Lane and Jessop (1983) found that for Red-necked Stints, Curlew Sandpipers, Bar-tailed Godwits and Eastern Curlews over-wintering percentages in 1983 were higher in NSW and Qld than in the southern states. They suggested three possible explanations (in quotes below), which are discussed with one other explanation which could apply to Lesser Golden Plovers.

1) "Juvenile waders do not move into far south-eastern Australia to join the adults there until their second summer in Australia". For Lesser Golden Plovers, this can be discounted. First-year birds have been found in summer in Victoria, and often form a significant proportion of Lesser Golden Plover catches (Victorian Wader Study Group, *pers.comm.*)

2) "Waders further north in Australia belong to separate breeding populations which (last year) had different breeding success rates". This is extremely unlikely for Lesser Golden Plovers. The over-wintering imbalance has persisted in favour of Queensland from 1982-7 and the over-wintering percentages in the southern states, at 2% or less, do not indicate a breeding success rate that could maintain a viable population.

3) First-year birds in the south leave Australia for the winter, while those in northern areas remain at their summer sites. Lesser Golden Plovers are unusual among the migratory waders in that the majority of first-year birds leave Australia for the winter, so that a 'leap-frog' migration of southern birds is a possibility. However, if birds in the north are more likely to remain over winter, it is difficult to explain the generally low over-wintering numbers and percentages in Darwin.

4) "Juvenile waders move north during the winter away from far south-eastern Australia". In 1983, there was strong evidence for a northward movement of first-year Eastern Curlews and this was also considered to be the most likely explanation for the high over-wintering percentages of Red-necked Stints, Curlew Sandpipers and Bar-tailed Godwits in NSW and Qld (Lane & Jessop 1983). First-year Red-necked Stints and Curlew Sandpipers are more mobile than adults in Australia (Paton *et al* 1982, Fletcher *et al* 1982, Minton 1981), and have been shown to move north from Tasmania between summer and winter (Newman *et al* 1985). That this explanation is the correct one for Lesser Golden Plovers is suggested by the influx of birds into northern sites between the summer and winter counts (Cairns in 1984, Mackay in 1986).

Studies of the northward migration of Lesser Golden Plovers suggest that adults move up the east coast of Australia (Starks & Lane 1987). The sites at which first-year birds regularly occur in winter are on this migration route, which suggests that they have followed the path of the adults, with some birds 'dropping out' along the east coast north of latitude 30°S (approximately). This is further suggested by the generally low over-wintering percentages in the Darwin area, which is the northernmost of the monitored sites, but does

not lie along the migration route. Some of the first-year Red-necked Stints and Curlew Sandpipers, which move north from Tasmania to winter along the eastern mainland coast leave with the adults on northward migration (Newman *et al.* 1985), and this may also be the case with Lesser Golden Plovers.

As there have been few large summer catches of Lesser Golden Plovers from 1982-7 we cannot make a long-term comparison between trends in breeding success and trends in over-wintering numbers or percentages in Queensland. However in good catches in summer 1986 the proportion of first-year birds in the population was high (48%), indicating an excellent breeding year in 1985 (Victorian Wader Study Group, *pers.comm.*). This was reflected in unusually high numbers in Queensland in the winter of 1986. In Moreton Bay, Mackay and Cairns, the total count in winter 1986 was 63, by comparison with 27 (1982), 15 (1983), 20 (1984), 24 (1985), and 20 (1987).

Therefore, when the first-year population was very high, greater numbers were found in Queensland in the following winter. However in other years the numbers may be too low for meaningful analyses. Numbers in Queensland in winter may also be influenced by factors affecting the birds' flight range and the attractiveness of potential destinations, such as weather and feeding conditions. Any change in the southernmost point at which 'dropping-out' begins or in the proportion of birds flying beyond Australia could dramatically affect over-wintering numbers. There are areas elsewhere in the non-breeding range, particularly in the Pacific Island, where Lesser Golden Plovers regularly remain during the southern winter: the Hawaiian Islands (Henshaw 1910), the Leeward chain of the Hawaiian Islands (Bailey 1956), Polynesia (Stickney 1943), Holyoak & Thibault 1984), Canton Island (Murphy et al 1954), the northern Cook Islands (Burland 1964), the Fiji islands (Morgan & Morgan 1965), the Marshall Islands (Johnson 1973), the North Solomon Islands (Hadden 1981) and Niue Island (Kinsky & Yardwyn 1981). All of these areas are north of latitude 30°S, above which Lesser Golden Plovers over-winter in Australia. The National Wader Counts in New Zealand, south of 30°S have shown that over-wintering Lesser Golden Plovers are extremely rare there and winter counts between 1984 and 1986 never exceeded two birds (Sagar 1984, 1985, 1986). It seems therefore that birds leave extreme southern areas across their non-breeding range in the southern winter. Johnson and Johnson's prediction (1983) that "over-summering" (i.e. northern summer = southern winter) in the non-breeding range should involve more birds and become more prolonged with increasing distance from the breeding grounds, is thus not found to be true in the extreme south.

In Hawaii, Johnson and Johnson (1983) found that those first-year birds which migrated became fat and acquired some breeding plumage: those which "over-summered" (northern summer) remained lean and drab. They suggested that a greater proportion of birds migrated from sites where resources were abundant enough to allow birds to gain weight and acquire breeding plumage. Nevertheless, we cannot infer that the birds departure from Australia, which is virtually complete in the south, arises from an abundance of resources in summer. The destination of the first-year birds which leave Australia is not known and they may either migrate (return to the breeding grounds) or move to more northerly parts of the non-breeding range. Studies at the breeding grounds during the northern summer indicate that many first-year birds are present (Connors 1983) but their point of origin is not known. Movements within the non-breeding range would require less energy than migration, and may be driven by a scarcity of resources and/or the harsher winters in southern areas.

If first-year birds move north within the non-breeding range, they would be expected to gain weight prior to departure, but less than the adults, which return to the breeding grounds. On 1 March 1986 the Victorian Wader Group caught 10 first-year and 18 adult Lesser Golden Plovers at Inverloch in Victoria. Average weights indicated that both first-year birds and adults had gained weight and that the increase was smaller in first-year birds. The sample is thus far very small and any conclusions tentative but these results are nonetheless intriguing. Weight gain in first-year birds is a promising area for future study for estimating flight ranges and locating potential destinations. If there are concurrent studies of plumage and moult in first year-birds like those of Johnson and Johnson (1983) in Hawaii, it should be possible to differentiate between migratory and other movements.

The presence of Lesser Golden Plovers in their non-breeding range during the southern winter is of great taxonomic interest. The species has until recently been thought to comprise two forms with over-lapping breeding ranges in the Arctic. The Pacific Golden Plover (*Pluvialis dominica fulva*) spends the non-breeding season (southern summer) in north-east Africa, southern Asia, Pacific Islands, and Australasia. The American Golden Plover (*Pluvialis dominica dominica*) spends the non-breeding season in central South America.

The suggestion that they are actually separate species (Stresemann & Stresemann 1966, Kinsky & Yaldwyn 1981, Connors 1983) has recently been accepted by the British Ornithologists' Union Records Committee (Knox 1987). The grounds for the decision included differences in migration pattern. Most American Golden Plovers leave their non-breeding range during the northern summer and return to the breeding areas. For Pacific Golden Plovers Johnson (1985) concluded from studies in the Pacific islands that "over-summering" is the norm south of Hawaii and that first-year birds do not return to the breeding areas until their second or even third northern spring, i.e. after 19 or 31 months in the non-breeding range (Johnson & Johnson 1983).

In Australia we have also observed that some Pacific Golden Plovers remain during the southern winter. However, the situation is more complex than appears to be the case in the Pacific Islands. Birds do not remain at all sites and even when they stay within the non-breeding range they may yet have moved considerable distances from the areas where they spent the southern summer. Not all of the birds which leave southern sites 'migrate' in the sense of returning to the breeding grounds. It is quite possible that different patterns of migration and movement may exist in different parts of the non-breeding range, which spans a wide latitude range and a variety of environmental and climatic conditions. There is a need for observations from elsewhere in the non-breeding range, and for other people, especially in southern areas, to emulate Johnson and Johnson's (1983) elegant study of plumage, moult and weight gain in first-year birds.

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- first and foremost, the wader counters.
- the regional co-ordinators: Margaret Cameron (Bellarine Pen.); Peter Menkhorst (Mud Is.); Richard Loyn (Werribee/Avalon); Mark Barter (Altona); Mike Carter (E Pt. Phillip Bay); Val Curtis (Westernport); Clive Minton (Corner Inlet); Martin Schulz (Shallow Inlet); Jim

Table 1. Results of the winter 1987 wader count at 23 selected sites

	NSW							VIC					QLD				SA		WA			TAS			NT	TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Pied Oystercatcher	9			15	7	1009	238		19	35	98		122	32	2	3	15	14		493	61	26	8	2206
Sooty Oystercatcher					11	144	1				1				2					39	4	27		229
Masked Lapwing	4	10	6	4	53	60	292	76	30	275	346	36	10	30		4	11			222		34	45	1548
Grey Plover						18				3	3				23		65	2					9	123
Lesser Golden Plover		4		4	2				1	1				20										32
Red-kneed Dotterel										25				1			12							38
Hooded Plover						29					4					11				2	26	12		84
Mongolian Plover						2					1	4	50	13	3								235	308
Double-banded Plover	85			135	150	132	449		87	560	436	1		51		39	23			213	45	342		2748
Large Sand Plover						8	2					1		4				1					86	102
Red-capped Plover	41	15	4	60	69	132	84		139	215	428	16	65	84	22	21	411	30	3	94		103	20	2056
Black-fronted Plover			2				6	125	2	108	27		1	8				11				6		296
Black-winged Stilt	4	302	76	5				90	104	85	304	2	7	884			302	100	30					2295
Banded Stilt										4	45						4524	103						4676
Red-necked Avocet		2000					31		59	846	349			218			341	229	16					4089
Ruddy Turnstone	2	7				62	10			5	10		7	42	3	5	15						44	212
Eastern Curlew	54	162		50	62	43	224				7	1	83	148			10			2			6	852
Whimbrel	8	8			1	3	10				2	2	47	344			2						85	512
Grey-tailed Tattler	21			36		26	7				2	120	5	20			14						71	322
Tattler Sp.														104				1						105
Common Sandpiper																							3	3
Greenshank	2	1			1	2	38		4	22	98			10	15		102	29	1	5			8	338
Marsh Sandpiper										26	5						35							66
Terek Sandpiper				1		2	7			1		6	25	20			4						187	253
Black-tailed Godwit		110			2					1	1						50							164
Bar-tailed Godwit	269	603	18	158	280	1878	64			1	119	6	92	177			48	24		8			86	3831
Red Knot						1264	1			30	52		6				533						10	1896
Great Knot						65					2	2	38	15			18	72					610	822
Sharp-tailed Sandpiper											11					2								13
Red-necked Stint	4	4	4	20	60	243	122		115	265	478	177	10	61	80	60	2066	7		16			131	3923
Curlew Sandpiper	11	50		2		6	40			804	56	21		96			1049	54		2				2191
Sanderling						8																	96	104
Australia Pratincole																							2	2
Unidentified small wader	50					50																		100
Unidentified large wader	50												85											135
Total	614	3276	110	490	698	5186	1626	291	560	3312	2885	395	653	2382	150	145	9650	677	50	1096	136	550	1742	36674

Key.

1. Clarence/Richmond.
2. Hunter Estuary.
3. Paramatta River.
4. Botany Bay.
5. Shoalhaven Estuary.

6. Corner/Shallow Inlets.
7. Westernport.
8. East Port Phillip Bay.
9. Altona.
10. Werribee/Avalon.
11. Bellarine Pen./Mud Is.

12. Cairns area.
13. Mackay area.
14. Moreton Bay.

15. Western Eyre Pen.
16. South East coast.
17. Gulf St. Vincent.

18. Albany area.
19. Swan coastal plain.

20. East Derwent/Pittwater.
21. Marion Bay.
22. Cape Portland.

23. Darwin area.

Perry (Hunter est.); John Martindale (Clarence/Richmond est.); Alan Morris (rest of N.S.W.); Denis Watson (Moreton Bay); Lindsay Bone (Mackay); Dawn Magarry (Cairns); Nivern McCrie (Darwin); Mike Bamford (WA); Jamie Matthew (SA); Cathy Bulman (Tas).

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Table: 2 Over-wintering percentages of Lesser Golden Plovers, 1982-7

	1982	1983	1984	1985	1986	1987
All monitored sites	4	1	2	2	3	1
Tas	0	0	0	0	1	0
Vic	1	0	0	1	1	0
SA	0	0	0	0	0	0
WA	0	*	*	*	0	0
NSW	0	0	2	2	1	1
Qld	41	5	7	18	21	9
NT	0	13	2	0	0	0

* No birds recorded in summer count.

Table 3. Maximum summer and winter counts (1982-7) of Lesser Golden Plovers at monitored sites, listed in order of increasing latitude.

SITE	SUMMER COUNT	WINTER COUNT	
	Maximum	Maximum	No counts present
Darwin, NT	72	8	2/6
Cairns, Qld	21	13	3/6
Mackay, Qld	33	21	5/6
Moreton Bay, Qld	301	42	5/6
Clarence/Richmond, NSW	333	19	3/6
Hunter est, NSW	800	4	1/6
W Eyre Pen, SA	44	0	0/4
Paramatta River, NSW	54	0	0/6
Botany Bay, NSW	208	7	4/5
Shoalhaven, NSW	224	2	4/5
Albany, WA	41	0	0/4
South-eastern SA	319	0	0/6
Pt Phillip Bay, Vic	365	8	4/6
Westernport, Vic	89	0	0/6
Corner Inlet, Vic	303	0	0/6
Cape Portland, Tas	151	2	1/6
Derwent/Pittwater, Tas	219	0	0/6

Table 4. Summer and winter counts of Lesser Golden Plovers at Queensland sites from 1982-7

	Moreton Bay, Qld (27°15'S)		Mackay, Qld (21°25'S)		Cairns, Qld (16°55'S)	
	Summer	Winter	Summer	Winter	Summer	Winter
1982	31	3	14	13	21	11
1983	301	0	10	7	10	8
1984	235	5	30	2	2	13
1985	125	23	4	1	1	0
1986	287	42	4	21	5	0
1987	187	20	33	0	0	0

INTERWADER

MIGRATION MONITORING 1987.

Seven countries actively participated in the programme during 1987: West Malaysia, Brunei Darussalam, People's Republic of China, Hong Kong, Philippines, Thailand and Taiwan. Some incidental information was received from Pakistan, Japan, India, Singapore and Indonesia.

1. West Malaysia: Maximum counts of c. 8000 birds at Kuala Selangor, predominantly *Charadrius mongolus, Calidris ferruginea* and *Tringa totanus* during both northward and southward migration. Tanjung Karang, max. count 2500, predominantly *C. mongolus* and *Xenus cinereus* during both migrations.

2. Brunei Darussalam: At Seria the dominant species throughout the January to April migration was *Pluvialis fulva* with small influxes of *Calidris subminuta* in March and April. Towards the end of April all numbers decreased with only small numbers of *C. mongolus, C. subminuta* and *C. ruficollis* summering at Bera. The co-dominant species were *C. subminuta* and *C. dubius* throughout the early part of the year with *T. glareola* increasing during April and all birds decreasing at the end of the month. During May a small influx of *C. ruficollis* occurred but no birds summered at this site. During southward migration in the rice-growing scheme at Wason nineteen shorebirds species were found, including a first record of *Rostratula benghalensis* for Brunei. The highest count was c. 3000 birds during October, the majority of which were *T. glareola*.

3. People's Republic of China: Three sites within the Yangtze delta were monitored from March to October. A total of 34 wader species were found during the surveys with a maximum count of c. 2000 during April and c. 500 during September and October and small numbers during the summer months. During the northward migration in April the commonest species were *Calidris tenuirostris, C. alpina*. During April 8 *T. guttifer* were at the Hangzhou Bay site on the 15th. During August, September and October, the commonest species were *Numenius phaeopus, T. nebularia* and *C. alpina* respectively.

4. Thailand: Pattani Bay had 27 species of shorebird, with maximum monthly counts of 4165 during February and 4555 during September. The commonest species during northward migration were *T. glareola, P. fulva, C. ruficollis, C. mongolus* and *T. totanua*. A total of 104 *Limnodromus semipalmatus* was seen in August decreasing to 53 in September. At Samut Sakhon at total of c. 8000 shorebirds in September consisted predominantly of *C. ferruginea, C. mongolus* and *T. stagnatilis* and 22 *L. semipalmatus*. Counts during August and September at Bangpoo revealed low numbers of waders (1000), with *C. mongolus, C. ferruginea* and *T. totanus* the common species. At Ko Libong, counts in September recorded a maximum of c. 1800 birds, with *C. mongolus* and *T. totanus* comprising over 65% of the total. In the rice fields of Kao Lieow, small numbers of waders were passing through in April and May, with the freshwater species predominating.

5. Taiwan: On the east coast the Tadu River estuary was counted during March, April and May, monthly maxima were 144, 1708 and 1015 respectively. The most abundant species were *C. ferruginea, C. alpina, C. ruficollis, C. acuminata* and *T. nubularia*.

6. Hong Kong: The Mai Po Marshes/Deep Bay area was monitored regularly during the entire northward passage. The maximum count during northward migration was 6775 on 17 April numbers remained at around 4-5000 until the end of the month. An estimated 33 *T. guttifer* and 16 *Eurynorhynchus pygmaeus* were seen during this period as well as unusual records of possible *C. minutus* on 21 April (2nd record for Hong Kong) and *C. melanotos* on 4 April, 16 May and 23 May (2nd and 3rd records). Perhaps the most exciting day of the spring passage was on 20 May when 5 *E. pygmaeus*, 8 *T. guttifer* and 1 *C. melanotos* were found.

7. Philippines: Counts were made at eight sites in Luzon, Visayas and Mindanao during April and May. The maximum count was c. 8000 birds at Manila Bay with smaller numbers elsewhere, the most common species found at all sites during these months were *C. ruficollis* (30% of total count), *T. stagnatilis* (12%), *P. fulva* (12%) and *C. ferruginea* (11%). Counts were made during August and September at sites in Bohol and Cebu, the major site at Olango Island held c. 50 *L. semipalmatus* and 376 *C. tenuirostris* on 20 September.

NEWS FROM THE REGION.

Russian Waders with Leg Flags.

Dr. Goldovushkin (of Kiev) succeeded in colour-marking with leg flags pulli of Asian Dowitcher (1), Pied Avocet (5) and Common Redshank (6) at Torejskie Lakes, in the region south-east of Lake Baikal in the Soviet Union in summer 1987.

Dr. Tomkovich had further success ringing shorebirds on the Chukotski Peninsula in 1987, marking with coloured leg flags a variety of species, most notably 28 adult and 55 juvenile Spoon-billed Sandpipers. Other species marked include Grey Plover (7), Ringed Plover (18), Ruddy Turnstone (17), Dunlin (58), Red-necked Stint (11) and Temminck's Stint (23). His colour marking study in 1986 has yielded some interesting results - about 60% of adult Spoon-billed Sandpipers marked in 1986 returned in 1987, and marked Dunlin and Turnstone also returned to the study area. Breeding success in his study area was again very low due to Arctic Fox predation.
(Source: P. Tomkovich).

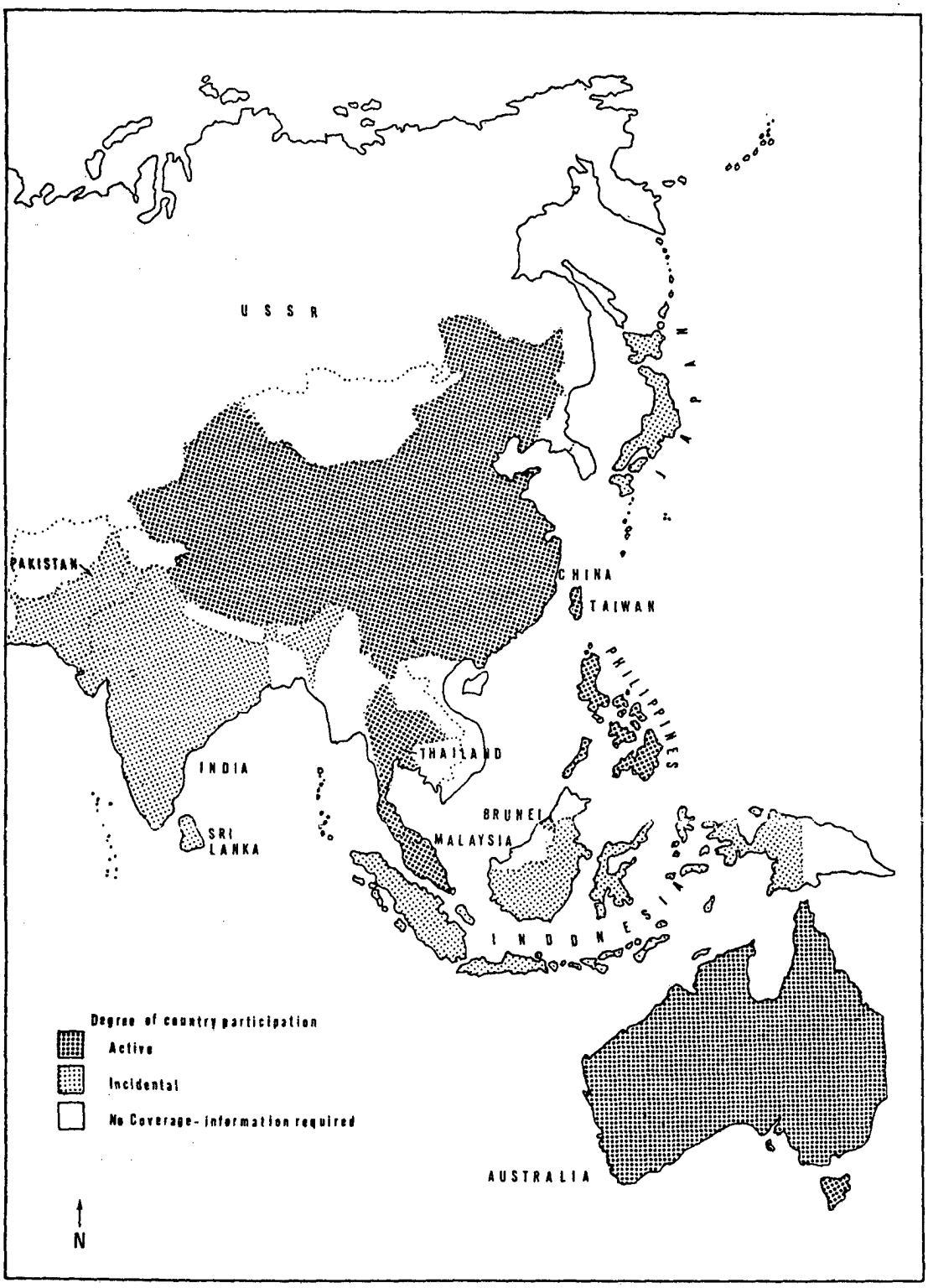
PULAU BRUIT PROTECTION IN PROGRESS.

Pulau Bruit was first identified as a site for migratory waterbirds in October 1985 during an INTERWADER aerial survey of the western Sarawak coastline carried out in conjunction with the National Parks and Wildlife Office of Sarawak Forest Department (NPWO). A follow-up ground survey confirmed the importance of the site when at least 16000 waders of 25 species were recorded, including Asian Dowitchers, an endangered species. As a result of these surveys, NPWO is now marking out the boundaries for a proposed Wildlife Sanctuary covering the northern tip of the island (the most important area of mangrove forest with extensive mudflats). The protection of this site will be a major step forward for wetland conservation in Malaysia and will help to safeguard East Asian shorebird populations.

AWB ACTIVITIES.

INDONESIAN FOREST DEPT SIGNS ARRANGEMENT WITH INTERWADER.

On 20 October 1987 the Department of Forestry, Republic of Indonesia (PHPA) and the INTERWADER programme of AWB signed an Arrangement at Universiti Malaya, Kuala Lumpur. This was the result of two years of close co-operation with PHPA



MIGRATION MONITORING : 1987

developing a joint programme and conducting pilot field surveys in Indonesia.

Professor Dr. Ir. Rubini Atmawidjaja, Director General of PHPA signed the Arrangement for the Indonesian Government and Mr. Duncan Parish signed for INTERWADER in the presence of Dr. David Wells, Chairman of the AWB Committee of IPT.

The Arrangement lays the foundations for co-operation to conduct a survey programme on coastal wetlands in Indonesia especially for migratory and resident waterbirds. Under it INTERWADER will provide technical assistance, training, information, research staff, equipment and funding for the programme, while PHPA will arrange the necessary government clearance and actively participate in the programme by providing facilities and counterpart staff.

The agreement is a milestone for wetland management and conservation in Indonesia. In December survey projects were initiated in Irian Jaya and the Brantas Delta and Cilacap areas of West Java as part of the joint programme.

AWB PHILIPPINES PROGRAMME PINPOINTS KEY WETLAND.

Surveys by AWB Philippines between August and November 1987 gathered data on Olango Island, a key site for migratory waders in the Central Philippines. The southern part of the island has extensive sand and mudflats and mangrove forest. Over 10000 waders have been recorded at one time and the total number using the site may be in excess of 20000 birds. The birds include over 50 Asian Dowitchers *Limnodromus semipalmatus*, an endangered species, making Olango Island the most important site in the Philippines for this species. The island is also an important stopping place for Great Knot *Calidris tenuirostris* and Eastern Curlew *Numenius madagascariensis*. AWB has made representations to the local authorities for immediate protection of the area.

KUALA SELANGOR NATURE PARK.

The opening of the Kuala Selangor Nature Park on 27 September 1987 by Datuk Ng Thian Hock of the Selangor State Government represents both a triumph for wetland conservation in Malaysia and a new venture for South East Asia - this is the first time that wetland habitats have been created specifically for conservation purposes.

The idea of a Nature Park was first conceived in January 1987 by the members of the Malayan Nature Society (MNS) and AWB. This idea became a reality when a senior official of the State Government requested MNS to submit a proposal for the development of a Nature Park. AWB carried out an initial environmental evaluation and designed the park in conjunction with a local drainage engineer, Mr. Akhir Othman, an active member of MNS. The park is situated in degraded mangroves beside Kuala Selangor town on the west coast of Peninsular Malaysia. The development of the park involved the creation of four shallow lakes (totalling c 6 ha) with artificial islands topped with shell grit. The lakes are filled by pumping from a canal so that fresh and salt water can be mixed to give any desired salinity. Two observation hides overlook the lakes and a trail has been cut through the degraded mangroves.

The nature park is contiguous with one of the largest tracts of good quality mangrove forest with associated mudflats in Selangor State. Moves are also underway to protect the adjacent Banjar North and South Forest Reserves as reserves for wildlife, thus ensuring the protection of the whole ecosystem. Up to 8000 waders have been recorded roosting on an adjacent area cleared for housing development. This area will be built over in 1988, and it is hoped that the nature park will provide an alternative roost site.

SOUTH THAILAND SURVEY.

In late August 1987 Mr. Kees Swennen of the Netherlands Institute of Sea Research (NIOZ) joined AWB staff on a survey of three sites in southern Peninsular Thailand, as folow-up to an initial survey in 1985 (see INTERWADER Publication No.8). The trip started at Prince of Songkhla University, Pattani, where Mr. Swennen and Crawford Prentice (AWB) met Nukul Ruttanadakul and Surapol Ardseungnurn of PSU Biology Department. Ao Ban Don was visited next where shorebird observations were made and benthic biomass samples taken in the north-western sector of the bay. John Howes of AWB joined the group on Ko Libong where observations of roosting and feeding shorebirds were made using light-intensifying equipment. Observations included 500 waders near Ao Ban Don, 1500 waders at Ko Libong and 2500 including 53 Asian Dowitchers *Limnodromus semipalmatus* at Pattani where local hunters had caught 15 Dowitchers in the previous month.

EDUCATION.

AWB's training and education programme is off to a strong start, with the printing of a mangrove ecosystem poster in Bahasa Malaysia/Chinese and Bahasa Malaysia/English. This was the culmination of a joint AWB (INTERWADER)/WWF Malaysia venture. The posters are being distributed in schools and coastal communities throughout Malaysia to increase awareness of the importance of mangroves. Indonesian, Thai and Filippino Language versions are under preparation.

Posters on migratory waterbirds are being developed by AWB in Malaysia and the Philippines to increase awareness of the need for conservation measures. The Philippines poster has been completed and depicts both the East Asian flyway and the main shorebird species occurring in the Philippines. The Malaysian poster, funded by WWF Malaysia, consists of a map illustrating the East Asian flyway and some typical migratory waterbirds, and can be adapted for any country in the flyway simply by overprinting the text.

SHOREBIRD STUDIES MANUAL.

A shorebird studies manual is under preparation, progress having been delayed by lack of funding. Part of the text has already been written, and it is hoped the manual will be completed in the coming year. Another manual, on rapid assessment techniques for wetland evaluation, is also in preparation.

ASIAN WETLAND BUREAU-PHILIPPINES.

Asian Wetland Bureau (AWB) has established an office in the Philippines as a result of its expansion programme throughout Asia. The creation of such an office known as Asian Wetland Bureau-Philippines (AWB-P) aims to promote protection and sustainable utilization of the wetland resources in the country.

The Bureau's interest in the Philippines began in 1984 when it was involved in organising and running courses on bird banding and wetland surveys in Luzon and Palawan under the name INTERWADER. These activities were co-ordinated by Forest Research Institute (FORI), Natural Resources Management Center (NRMC) and the Haribon Foundation. The training then enabled 3 teams to conduct wader counts and preliminary wetland surveys in 1985-86 in Luzon, Visayas and Mindanao. These resulted in the identification of a number of important wetlands for migratory birds.

In April and May 1987 AWB organised another series of training workshops on Rapid Assessment of Coastal Wetlands in the three regions of the country, this time funded by United National Environment Fund (UNEP). The training was undertaken in order to encourage more people to get involved in the conservation work and to enable them to gain technical know-how so that they could carry on with their activities.

Such enthusiastic response by Filipino conservationists triggered the Asian Wetland Bureau to set up a permanent office in the Philippines.

Although its activities started immediately after the training, AWB-Philippines was officially launched on November 5 1987. Cebu City, being ideally located in the central Philippines was chosen as the base for its Philippine office in order to ease out co-ordination of projects all over the country. The office is now housed at the regional office of the Department of Science and Technology in Region 7 in Banilad, Cebu City.

Initial linkages for the projects lined up for conservation of Philippine Wetlands are already in the process while guidelines for the implementation of the core program were already discussed with some line agencies and NGO's who will be instrumental for the success of the program.

The Philippine Wetland Conservation Program (PWCP) will be fully operational throughout the entire Philippine archipelago by 1988. This project will cover the fields of education and awareness, training, wetland survey and inventory, wetland and waterbird research and production of guidelines for coastal development projects.

Funding for the initial projects conducted this year, 1987, has come from the United Nations Environment Fund, World Conservation International, the Australian National Parks and Wildlife Service, and Wild Bird Society of Japan and a number of private sponsors. World WildLife Fund International (WWF-I) and the International Union for the Conservation of Nature and Natural Resources (IUCN) have endorsed the programme and pledged future support. Likewise, local corporations have also pledged their support for the program. Although international interest and support for the programme will continue in the future, it is hoped that more funding will be located in the Philippines for future projects.

ASIAN WETLAND BUREAU PUBLICATION LIST.

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SOME WADERS OF THE SUNDERBANS MANGROVE FOREST, BANGLADESH.

S.M.A. Rashid, Department of Zoology, University of Dhaka, Dhaka-1000, Bangladesh and Dr. Derek A. Scott, c/- International Waterfowl and Wetlands Research Bureau, Slimbridge, Gloucester GL2 7BX, England.

The mangrove forests of the Sunderbans stretch from the Hoogly River in India in the west to the Meghna River in Bangladesh in the east. The Bangladesh Sunderbans are located at the southern extremity of the Padma and Jamuna delta under the civil districts of Khulna and Patuakhali, within 21°31'N to 22°30'N and 89°E to 90°E. The Bangladesh Sunderbans includes 62% of the total mangrove forest, the remaining 38% is in West Bengal, India (Hendrichs 1975). The total area of Bangladesh Sunderbans is about 5800 km², of which 4100 km² are land and 1700 km² water. The forest area is intersected by many rivers, tributaries, canals and khals of various widths. Most of the Sunderbans is periodically inundated by high tides. For administrative purposes the Sunderbans forests are divided into four ranges, 14 blocks and 55 compartments varying in size from 40 to 160 km².

Gittins (1981) divided the Sunderbans forest into three zones according to the salinity of the surrounding water, but without providing the range of salinity:

1. The fresh water zone - to the north and east of a line drawn from Cobadak forest station (22°15'N, 89° 20'E) in the north to the mouth of Katka Khal (21° 50', 89° 45'E) on the seaward edge, consisting of 1920 km² of *Heritiera fomes* dominated forest.

2. The moderately salt-water zone - west of the above line on the Malancha river (21°40'N, 89°18'E), consisting of 1324 km² of *Excoecaria agallocha* dominated forest.

3. The salt-water zone - west of the Malancha river extending to the international boundary with India, consisting of 781 km² of sparse *E. agallocha* and dense patches of *Phoenix paludosa*.

The coastal and tidal mud flats associated with the mangrove forest provide feeding and resting areas for shorebirds.

During a recent visit to the Sunderbans from February 7-10 1987 in connection with the Asian Wetland Inventory 42 hours were spent in the field and a total of 133 bird species were observed of which only 17 species were waders.
Some recent work was done by Khan (1982) on the birds of Bangladesh and specifically on the Sunderbans by Sarker and Sarker (1986) and on the mangrove ecosystem by Khan (1986). Five of the 17 species of waders observed during our visit. (European Oystercatcher, Asian Golden Plover, Kentish Plover, Mongolian Plover and Ruddy Turnstone) were not mentioned by Sarker and Sarker (1986). Khan (1986) did not mention Beach Thick-knee, Grey Plover and Greater Sandplover as occurring in the mangrove ecosystem, including the Sunderbans. Thus the species not mentioned by Sarker and Sarker (1986) are apparently new records for the Sunderbans.

The number of individuals sighted in various areas of the Sunderbans during the visit are given in Table 1.

Table 1: Shorebird counts in the Sunderbans, 7-10 February, 1987.

Species	1	2	3	4	5	6	7	Total
European Oystercatcher				2				2
Beach Thick-knee				2	2			4
Grey Plover				45	4			49
Asian Golden Plover					1			1
Greater Sandpiper				5	2			7
Little Ringed Plover					2			2
Kentish Plover					30			30
Mongolian Plover			1	100	100			201
Whimbrel	10		70	10	150			240
Eurasian Curlew			3	30	20			53
Common Redshank			30	100	50			180
Common Greenshank				6	6			12
Terek Sandpiper			5	150	100			255
Common Sandpiper	30		100	150	100	30		410
Ruddy Turnstone				5	1			6
Little Stint					1			1
Curlew Sandpiper					12			12
TOTAL	40	0	209	605	581	30	0	1465

Key: 1 - Dhangmari 2 - Suputi 3 - Katka
4 - Dubla Island 5 - Nilkamal
6 - Mangrove Forests
7 - Open waters of Bay between Katka and Dubla

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We are grateful to Mr. Ghulam Habib, Divisional Forest Officer, Sunderbans Forest Division, Khulna for permitting us to enter the forests to make observations. We also thank Mr. A.W. Akando, Senior Research Officer, Wildlife and Administration Section, Forest Department for his help in visiting the forests. We also thank the Forest personnel at the various Forest Stations in the Sunderbans whose help and suggestions were of great use to us.

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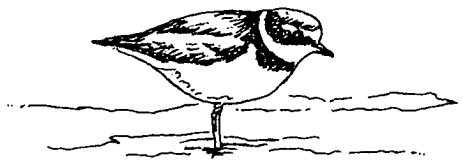

PRELIMINARY REPORT ON THE 1987 NEW ZEALAND WINTER WADER COUNT.

Paul Sagar, Ornithological Society of New Zealand, 38A Yardley Street, Christchurch 4, New Zealand.

The fourth winter national wader count was completed by members of the Ornithological Society of New Zealand (OSNZ) during June/July 1987. Fortunately this year conditions were generally good throughout the period of the count, the main exception being the atrocious conditions encountered by members who covered Farewell Spit. Once again there was consistent effort in most parts of the country and the counts are comparable to those made in previous years. The major exception to this were some major wader sites in the far north of the North Island, where unfortunately no counts were made.

This winter 124195 waders were counted. Once again NZ-breeding species comprised the majority of the birds counted with Pied Oystercatchers and Pied Stilts accounting for about 90% of the total. Double-banded Plovers, overwintering Bar-tailed Godwits and Lesser Knots, Wrybilled Plovers, and Variable Oystercatchers were the next most abundant species (Table 1).
Counts of Pied Oystercatchers and Pied Stilts have varied little over the four years of the project - oystercatcher numbers have ranged from 77705 (1987) to 80307 (1986) and Pied Stilt numbers from 17308 (1984) to 20111 (1987). This year, however, we recorded a record number of Double-banded Plovers (10271). This probably reflects observers greater awareness of the habitats favoured by this species, resulting from the current extensive colour banding programme and associated publicity. Greatest concentrations of Double-banded Plovers occurred at harbours in the northern half of the North Island, although South Island records included 1275 at Farewell Spit and 440 at Lake Ellesmere.

Numbers of Wrybilled Plovers continue to decline. However, this winter some birds at the Firth of Thames, a major wintering ground for Wrybills, may have been missed because a particularly small high tide during the period of the count enabled birds to feed over an extensive area, instead of forcing them to roost.
The numbers of all overwintering migrant species were down on 1986 figures. The total of 6455 Bar-tailed Godwits is the lowest recorded and the 350 Turnstones is also a low number for this species. The 3384 Lesser Knots overwintering appears to be about average. These totals represent 8% (Bar-tailed Godwits), 7.1% (Lesser Knots) and 7.9% (Turnstones) of the numbers of these species recorded during the national wader counts completed during November/December 1986.

There will be another winter wader count during June/July 1988.

Table 1. Numbers of selected wader species recorded during the fourth New Zealand winter wader count, June/July 1987.

SPECIES	NATIONAL TOTAL
Pied Oystercatcher	77705
Pied Stilt	20111
Double-banded Plover	10271
Bar-tailed Godwit	6455
Lesser Knot	3384
Wrybilled Plover	2867
Variable Oystercatcher	1263
New Zealand Dotterel	533
Turnstone	350
Black-fronted Plover	260

No total for any other species exceeded 100 birds.

POSSIBLE UNUSUAL MOVEMENT OF RED-NECKED AVOCETS INTO NORTHERN AUSTRALIA.

Gordon Claridge and Richard Johnson, 9 Armstrong St., Hermit Park, Qld. 4812.

Published information suggests that the Red-necked Avocet *Recurvirostra novaehollandiae* is generally a species of central and southern Australia. The Atlas of Australian Birds (Blakers *et al.* 1984) does not show any records of the Red-necked Avocet in Queensland north of approximately 21°30'S. Other publications (Pizzey 1980, Simpson & Day 1986, Pringle 1987) show distributions which include North-Western Queensland and more or less of the Gulf Plains.

It is generally accepted that this species will occur outside its usual range from time to time, in response to either good breeding seasons or drought in inland Australia (Lane 1987). Lane (1987) describes a seasonal movement out of the inland in summer and back again in winter. He also suggests that the species is unusual in Queenland north of about Townsville.

A number of observations which have come to our attention suggest an unusual movement of Avocets in mid-1987. In late July of that year we counted 950 of this species at a wetland on the coastal plains of the Gulf of Carpentaria (Claridge *et al.* 1988). Britton & Britton (1987) report 260 Avocets at Karumba on the southeastern Gulf in July *pers. comm.*). We observed Avocets in all monthly counts at Blakeys Crossing on the outskirts of Townsville between June and November inclusive, with a peak of 43 in August.

In what may have been a related movement, Coombs (*pers. comm.*) recorded Avocets at Lytton in Brisbane between September 1987 and January 1988 with a maximum of 110 in September. He also recorded the species at that location in January, February, April and May of 1987. However, in 1986 he recorded them in April, July, September and October, suggesting that this may be a regular movement, though the numbers were higher in 1987. Britton *(pers.comm.)* reports that he saw Avocet at Karumba in July 1985, though in much smaller numbers than in 1987.

Do these records indicate an unusual movement of Red-necked Avocets, or was it simply a case of observers being in the right place at the right time to record in annual event?

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AN UNDESCRIBED GULF PLAINS WETLAND IN QUEENSLAND.

Gordon Claridge, Richard Johnson and Christine Dalliston, 9 Armstrong St., Hermit Park, Qld. 4812.

In July 1987, while carrying out field work in the Gulf Plains for the Australian Heritage Commission, we came across a significant but apparently unreported wetland.

At the time we were attempting to locate Buffalo Lake, which appears on most topographic and cadastral maps of the region but which proved to be dry, represented by only a mud pan approximately one kilometre in diameter.

The wetland described below is one of a number of more or less seasonal water bodies (Buffalo Lake, Manrika Lake, Rocky Lake and a number of un-named lakes) which occur within what Perry *et al.* (1964) classified as the Carpentaria Land System. In fact this land system can be subdivided into two distinct units - saline mud flats and mangroves, and beach ridges and low plateaux. The water bodies listed above occur in the latter unit.

This part of Queensland is, as Lane (1987) remarks, "one of the most remote, inaccessible parts of the northern Australian coast". Probably for this reason, Perry *et al.* (1964) make no mention of these wetlands, and neither does Twidale (1964) in his account of the surface hydrology of the region though he does make passing reference in an earlier brief account of the geomorphology of the area (Twidale, 1956). Similarly, Stanton (1975) in his otherwise thorough survey of Queensland wetlands does not mention these water bodies.

The un-named wetland lies some 2.5km southwest of Buffalo Lake, 23km inland from the Gulf coast and 20km north of the Normanton-Burketown road. The area is a remote corner of "Inverleigh" station, and is accessible only by a rough station track, and probably only between May and November.

The wetland appears on some maps as a dotted outline but does not appear on others. This usually suggests a highly ephemeral waterbody. However, when we were there in July of a dry year the lake had a circumference of approximately 15km (giving a diameter of around 4.5km). the lake is an obvious feature on March 1981 Landsat photographs, and is the largest waterbody appearing in the area at that time. This leads us to believe that it would persist well into the dry season in most years.

Some two-thirds of the lake had the appearance of a rice paddy with Brown Beetle-Grass *Diplachne fusca* growing in clumps 80cm tall and 1-1.5m apart. Water depth in the vegetated area was shallow but variable. Seventy metres from the edge it was between 5cm and 20cm and it seemed as if this situation might prevail throughout the vegetated area.

The remaining one-third of the area of the lake appeared, from the lack of vegetation and the behaviour of waterfowl, generally to be considerably deeper, though we did not ascertain its depth.

Because of the size of the lake and the extensive vegetation it was not possible to carry out an accurate census of all species. This was particularly the case for waders using the Beetle-Grass area.

An approximate count gave 120 Greenshanks *Tringa nebularia* per 100mx20m near the edge of the vegetated area, with approximately five times as many Marsh Sandpipers *T. stagnatilis*. It does not seem possible that these densities could extend uniformly over the whole of the vegetated area,

though we have no reason to suspect that the area samples was in any way unusual.

Certainly, short excursions from the shore suggested a fairly homogeneous distribution of these two species. Even if these numbers were present in only one tenth of the grassed area, it would mean that the site had either an early arrival of these species since Lane (1987) reports Marsh Sandpipers arriving in September or a very substantial over-wintering population.

It was possible to count some species which were using the open water areas. Of these the most significant was a total of 950 Red-necked Avocets *Recurvirostra novaehollandiae*. Although no great significance should be attributed to a single count, this number would place the location seventh on Lane's (1987) ranking of the top twenty zones for the species.

A total of 89 species was observed to be using the area during some six hours of observation, Table 1.

From the point of view of important wader habitat, Lane (1987) recognises two types of wetlands in the Gulf Plains - the shore and associated mudflats, mangroves and channels, and the grassy plains. He includes the latter largely because of their importance, when flooded, to northward migrating Sharp-tailed Sandpipers. Further investigation is required to determine whether there is a third type - more or less seasonal lakes which are important to over-wintering or early-migrating waders.

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Table 1. List of waders observed on 27 July 1987.

FAMILY	COMMON NAME	SCIENTIFIC NAME
Charadriidae	Masked Lapwing	Vanellus miles
	Red-capped Plover	Charadrius ruficapillus
Recurvirostridae	Black-winged Stilt	Himantopus himantopus
	Red-necked Avocet	Recurvirostra novaehollandiae
Scolopacidae	Greenshank	Tringa nebularia
	Marsh Sand-piper	Tringa stag-natilis
	Red-necked Stint	Calidris ruficollis
	Curlew Sand-piper	Calidris ferruginea
Glareolidae	Australian Pratincole	Stiltia isabella

WADERS IN THE FAR NORTHERN GREAT BARRIER REEF.

John Cornelius, 88 Hayward Street, Cairns, Queensland 4870. (Other observers: G. Kelly and L. Harris).

As part of my field work as a Marine Park Ranger for the Queensland National Parks and Wildlife Service I participated in a routine vessel patrol of the Far Northern Section of the Great Barrier Reef Marine Park from 19 November to 6 December 1987.

It always interests me that a variety of waders are found up to 20 miles off the coast in reefal situations on bare sand cays as well as continental islands with rocky foreshore. They could certainly be in feeding competition with resident herons - mostly Reef Herons, *Egretta sacra* - and several species of terns which form large breeding colonies foraging close to the shore and at sea.

The larger numbers of waders observed were seen arriving from the northwest after 1700 hours so I presume these locations offer an overnight resting site free from predators and - generally - human disturbance.

Similar species were seen during a southward trip in April 1986, see The Stilt, 10.

Species codes used:
1. Beach Thick-knee
2. Pied Oystercatcher
3. Sooty Oystercatcher
4. Lesser Golden Plover
5. Mongolian Plover
6. Large Sand Plover
7. Ruddy Turnstone
8. Red-capped Plover
9. Eastern Curlew
10. Whimbrel
11. Grey-tailed Tattler
12. Greenshank
13. Bar-tailed Godwit
14. Great Knot
15. Red-necked Stint

PECTORAL SANDPIPERS AND LONG-TOED STINTS IN SOUTH-WESTERN AUSTRALIA: NOTES ON ABUNDANCE AND DISTRIBUTION.

Roger Jaensch, 30/15 Ogilvie Road, Canning Bridge, W.A. 6153.

INTRODUCTION

Questions about the Pectoral Sandpiper *Calidris melanotos* and Long-toed Stint *C. subminuta* were recently asked by Hewish (1987). My purpose is to answer these questions about the distribution and abundance of these species in south-Western Australia. Whereas Hewish mainly used data from the AWSG Summer (February) Counts, I have used all available data from RAOU surveys of 400 wetlands in south-western Australia (Jaensch in prep., unpubl. RAOU data). The RAOU surveys began in July 1981 and the frequency of surveys varied from wetland to wetland (e.g. fortnightly, every two months, or quarterly); many wetlands were not surveyed every year. In addition, I have included records published in Western Australian Bird Notes Nos. 19-42, and unpublished observations of competent observers.

Wetland Conditions.

South-western Australia is subject to wet winters and dry summers. Evaporation therefore causes wetlands to become less deep in summer-autumn, typically by 0.5-1.0m.

Because of poor drainage, numerous small wetlands (< 10 ha in area) and many large or medium-sized

Wader observations in the far northern Great Barrier Reef.

Date	Island Name	Location	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
20/11/87	Stainer Is	(13°57.4'S,143°50.2'E)		15	8	7	200		12		1	25	9		20		
21/11/87	Burkitt Is	(13°56.3'S,143°45.2'E)					50		10								
21/11/87	Pelican Is	(13°55.0'S,143°50.0'E)		8		22	1500					12	8				
21/11/87	Hannah Is	(13°52.0'S,143°43.0'E)					400		18	150		1					200
22/11/87	Wilkie Is	(13°46.5'S,143°38.2'E)					5					2					
22/11/87	Hay Is	(13°40.3'S,143°41.4'E)	1														
22/11/87	Fife Is	(13°39.4'S,143°43.1'E)		1	2	2	45						200				6
23/11/87	Sandbank No.7	(13°26.0'S,143°58.0'E)							20								
23/11/87	Sandbank No.8	(13°22.0'S,143°58.0'E)							65								
25/11/87	Derry Gay	(13°01.0'S,143°51.0'E)							3								
25/11/87	Chapman Is	(12°53.2'S,143°36.2'E)	2						5			2	1				
25/11/87	Rocky Is	(12°53.0'S,143°32.8'E)															
27/11/87	Quion Is	(12°24.0'S,143°29.0'E)							2								
28/11/87	Forbes Is (2)	(12°17.0'S,143°25.0'E)	4										1				
28/11/87	Haggerstone Is	(12°02.0'S,143°18.0'E)															
29/11/87	Sir Charles Hardy Group	(11°54.0'S,143° 2.0'E)															
30/11/87	Magra Islet	(11°51.6'S,143°16.8'E)		1		5			28				19			1	
30/11/87	Cockburn Is (3)	(11°50.4'S,143°18.9'E)										1	1				
30/11/87	Bird Is, Sth	(11° 4.3'S,143°05.4'E)	2	5	2		2					4	1				
30/11/87	Bird Is, Nth	(11°40.2'S,143°05.4'E)	9	1			8		6		1	2	10	1	2	1	12
1/12/87	Bushy Islets	(11°43.0'S,142°59.0'E)	2	7		5											
1/12/87	McArthur Is, Sth	(11°43.0'S,142°59.0'E)	1	2	3		20		50		1		20				
1/12/87	McArthur Is, Nth	(11°43.0'S,142°59.0'E)		5	2		112	80	200		19	60	80			150	
1/12/87	Hannibal Is, W	(11°35.7'S,142°56.5'E)			2		150		4		1		5				
1/12/87	Hannibal Is, E	(11°35.7'S,142°56.0'E)	1	3	1												
2/12/87	Boydong Is (2)	(11°29.4'S,143°01.3'E)		27		1			35		2	5	550	1			
2/12/87	Wallace Islet	(11°27.0'S,143°01.8'E)		17	2	2	18	6	56		1		20		9		
3/12/87	Cholmondeley Is	(11°22.6'S,143°04.0'E)		2													
3/12/87	Jardine Islet	(11°22.8'S,143°07.0'E)		2	1				20								
3/12/87	Harlway Islets	(11°22.9'S,142°57.9'E)		3	1								190				
3/12/87	Bushy Is	(11°14.9'S,142°52.3'E)	2	1	2			25	23				150	2			
3/12/87	Cairncross Is, E	(11°14.5'S,142°56.0'E)	2	1	3		10		10				10				
3/12/87	Cairncross Is, N	(11°14.5'S,142°55.0'E)		1	3		3		25		1		13			20	
4/12/87	Aplin Islet	(11°11.8'S,143°02.3'E)					15		10			1	20				
4/12/87	Milman Islet	(11°10.3'S,143°00.8'E)	2	22	2	3	10	8	40		12	1	25				
4/12/87	Un-named Sandcay	(11°09.7'S,143°04.5'E)		2					15								
4/12/87	Sinclair Islet	(11°06.6'S,143°01.1'E)	1	2		10	50		55		2		100	2	85		
4/12/87	Arnold Islet	(11°00.4'S,142°59.3'E)			2				3			1					
		Total birds	29	128	36	57	2598	119	713	150	41	117	1433	6	116	172	218

lakes (100-200 ha in area) occur on the sandy coastal 'plains'. Many of these rarely exceed 1.0m in depth. These shallow wetlands include fresh-brackish lakes or swamps, saline lakes and tidal estuaries. Most fresh-brackish wetlands include some bare areas not choked with rush or trees.

Consequently there are many areas suitable for use by waders in the region as the fresh-brackish wetlands dry back in summer-autumn. Some may only be suitable for a few months, e.g. December-February if less than 1.0m deep in spring, or February-April if more than 1.0m deep in spring. Many such lakes are suitable at the same times, others at different times.
Tidal estuaries and saline lakes are generally suitable for small waders throughout the period September-April. Few permanent or seasonal fresh-brackish lakes occur more than 25 km inland from the coast.

Pectoral Sandpiper.

Wetlands that I have judged to be important for the Pectoral Sandpiper in terms of regular occurrence (1981-2 to 1986-7), are listed in Table 1. They are all situated within 25km of the lower west coast of south-Western Australia; three are fresh-brackish lakes, two are saline lakes and two are tidal estuaries.

Pectoral Sandpipers have also been recorded once since 1981 at 12 other wetlands in the region, from Kalbarri to Esperance. These wetlands are each within 25km of the coast and comprise ten fresh-brackish lakes, one saline lake and a farm dam.
The highest number of Pectoral Sandpipers counted at any wetland in south-Western Australia (1981-2 to 1986-7) was 12 at Mealup Lake (81 km SSW of Perth) in February 1986. Counts of five or more birds have been made at five other wetlands.
The average number of Pectoral Sandpipers counted each year at the important wetlands (Table 1, 1981-2 to 1986-7) was 14. Numbers actually counted at the 12 other wetlands in each of the six years were 8,5,0,7,19 and 3, giving an annual average of seven birds for those wetlands. Therefore the average annual number of Pectoral Sandpipers counted in south-Western Australia was 21 birds. At least 25 birds were actually present in 1985-6 (allowance made for movements).

Long-toed Stint.

Wetlands that I have judged to be important for the Long-toed Stint in terms of regular occurrence (1980-1 to 1986-7) are listed in Table 2. They are all situated within 25km of the lower west coast of south-Western Australia; six are fresh-brackish lakes, one is a saline lake and one is a tidal estuary.
Long-toed Stints have also been recorded (mainly once) since 1980 at nine other wetlands in the region, from 130 km north of Perth to Esperance. With one exception these wetlands are each within 25 km of the coast and they comprise five fresh-brackish lakes, three saline lakes and a tidal estuary.

The highest number of Long-toed Stints counted at any wetland in south-western Australia (1980-1 to 1986-7) was 80 at Forrestdale Lake in summer 1980-1. Counts of five or more birds have been made at nine other wetlands.
The average number of Long-toed Stints counted each year at the important wetlands (Table 2, 1980-1 to 1986-7) was 138. The annual average counted at the nine other wetlands was about five birds (some sites were not surveyed in earlier years). Therefore the average annual number of Long-toed Stints counted in south-western Australia was 143 birds. At least 125 birds were actually present in 1985-6 (allowance made for movement).

CONCLUSIONS

Whereas a large number of wetlands in the region were surveyed for waterbirds (including waders) from 1981 to 1987, many other wetlands suitable for small waders were not surveyed. In addition no wetland was surveyed every month for six years and many were surveyed in only one or two years. Consequently it is likely that in each year, at least some Pectoral Sandpipers and Long-toed Stints in the region were not detected by the RAOU.

In my calculations for the tables I assumed that there was no movement of birds between the listed wetlands during each summer. Whereas some such movement may have occurred, dates for the highest number counted at each wetland in each year were generally similar (many were during AWSG Summer Counts) such that it is reasonable to assume no movement.

The number of Pectoral Sandpipers occurring each year in south-Western Australia is probably of equal or perhaps greater significance than the number occurring in south-eastern Australia. The average number recorded in annual Summer Counts (over five years) in states other than W.A. (Table 4 Hewish 1987 p.30) was 21 birds: this is identical to the annual average for south-Western Australia (above). The average for south-Western Australia was obtained from a broader set of data, but relates to a smaller area of Australia. Furthermore, the highest number counted at any one wetland was identical in both parts of Australia, i.e. 12 birds.

The greater abundance of the Long-toed Stint (cf. Pectoral Sandpiper) and outstanding importance of south-Western Australia for that species were demonstrated by Hewish (1987); Table 2 confirms those conclusions.

Whereas Hewish found general differences in the patterns of occurrence of the Long-toed Stint and Pectoral Sandpiper, Table 1 and Table 2 indicate that there are few differences in south-Western Australia. Five important wetlands are common to both tables (as are some of the other wetlands), and the two species often occur side-by-side at these wetlands.

Both species occur at two tidal estuaries, 11-13 fresh-brackish lakes and 3-4 saline lakes in south-Western Australia. In saline environments in this region, Pectoral Sandpipers are often seen on exposed mudflats but Long-toed Stints are not; Long-toed Stints are mainly flushed from areas of stunted samphire in or near shallow water. In fresh-water environments, Long-toed Stints are more often seen away from cover but they frequently hide or feed in short rush or grass in or near shallow water.

Conservation.

Five of the important wetlands in Table 1 and six of those in Table 2 are largely within nature reserves, as are some of the other wetlands at which the two species occur. Nevertheless, most are threatened in some way, mainly by groundwater extraction, pollution or recreation. Data collected by the RAOU should assist conservation authorities in wisely managing these wetlands.

ACKNOWLEDGEMENT

The RAOU is indebted to the many volunteer observers who counted waterbirds at wetlands in W.A. in the period 1981-7.

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Table 1. Important Wetlands for the Pectoral Sandpiper in south-Western Australia, 1981-2 to 1986-7.

Name	Location	Type	Surveys A	Surveys B	Number Counted H.	Number Counted Av.
Guraga Lake	125k NNE of Perth	SL	2	2	2	1
Swan Estuary	8k SW of Perth	TE	6	5	2	1
Thomsons Lake	21k S of Perth	FBL	6	4	4	1
Forestdale Lake	23k SE of Perth	FBL	6	4	4	2
Peel Inlet	70k SSW of Perth	TE	4	4	5	3
McLarty Lake	84k SSW of Perth	FBL	4	4	5	3
Vasse-Wonnerup Estuary	190k SW of Perth	SL(*)	2	2	3	3

Notes: 1. WETLAND type: SL = saline lake,
TE = tidal estuary,
FBL = fresh-brackish lake

2. (*) Vasse-Wonnerup Estuary is no longer tidal. It is effectively a lake, fresh in winter and saline in summer.

3. SURVEYS: A = years in the period 1981-2 to 1986-7 in which intensive surveys of waders were made there.

B = years in which Pectoral Sandpiper was recorded there.

4. NUMBER COUNTED: Highest = highest number counted in any RAOU survey 1981-2 to 1986-7.

Annual average = sum of highest number counted in each year, divided by 'A'.

TABLE 2. Important wetlands for the Long-toed Stint in south-Western Australia, 1980-1 to 1986-7.

Name	Location	Type	Surveys A	Surveys B	Number Counted H.	Number Counted Av.
Jandabup Lake	24k N of Perth	FBL	4	4	10	5
Herdsman Lake	5k NW of Perth	FBL	4	4	24	10
Yangebup Lake	18k S of Perth	FBL	3	3	25	10
Thomsons Lake	21k S of Perth	FBL	6	4	11	4
Forrestdale Lake	23k SE of Perth	FBL	7	7	80	23
Peel Inlet	70k SSW of Perth	TE	4	3	8	3
McLarty Lake	84k SSW of Perth	FBL	4	4	60	48
Vasse-Wonnerup Estuary	190k SW of Perth	SL	3	3	49	35

Notes: as per Table 1, for 1980-1 to 1986-7.

LAKE MACLEOD: NEWLY-DISCOVERED WETLAND OF INTERNATIONAL IMPORTANCE FOR WADERS.

Roger Jaensch, 30/15 Ogilvie Road, Canning Bridge, W.A. 6153.

Lake MacLeod in Western Australia is 115 km long and up to 40km wide and is thought to be a former inlet of the ocean. Though occasionally filled by floodwaters of the Gascoyne River, it is usually dry except for a permanent 'inner lake' and associated marshes. This wet area is about 20km long and 2-3 km wide and is maintained by upwelling of seawater from limestone sink-holes in the lake, 15km from the ocean. It consists of pools, channels, marshes and a small lake, all lined with mangroves, and a southward extension of the lake, which is larger in area and more saline. The two lake basins are separated by a raised mudflat which is about 200 ha in area. Shallow water (a few centimetres deep) is pushed back and forth across the mudflat by changes of wind, and by overflow of water to the southward extension as a result of the upwelling.

Though the dry south end of Lake MacLeod may be reached by bitumen road from Carnarvon, the inner lake is not accessible to the public. Scientists had studied the birds (Storr 1985), mangroves and geology of the inner lake for some years but no systematic count of all waterbirds had been conducted there.

From 28 September 1987 to 3 October 1987, 14 RAOU observers funded by the W.A. Government's grant for waterbird studies, used a light aircraft, small boats and trail-bikes to count waterbirds on the inner lake. Some areas were too soft to traverse on foot and work was made difficult by persistent wind and the salty conditions. Nevertheless, observers were encouraged each day by the spectacular sight of dense flocks of waders fising from the mudflat, like swarms of insects.

A total of 115000 waterbirds of 53 species was realised from surveys at Lake MacLeod and 111600 of these birds (27 species) were waders (see Table 1). The most abundant species were the Banded Stilt (53100 birds), Curlew Sandpiper (41600) and Red-necked Stint (8300) and large numbers of the Red Knot and Red-necked Avocet were also counted. Rarer species seen in the survey were the Asian Dowitcher, Broad-billed Sandpiper and Mongolian Plover.

More than 90% of the waders were encountered on the mudflat, i.e. a density of about 500 birds per hectare. At times when wind was gentle or absent, most waders fed vigorously over a wide area of exposed mud, algae and weed. Many of the Curlew Sandpipers however spent long periods resting in dense flocks of many thousands; this was possibly because they had just completed a long journey on southward migration.

When the flats were covered in water, the waders retreated to shallower areas or to fringing marshes. About 4000 migratory waders gathered each evening to roost among roots of stunted mangroves in a shallow marsh beside the lake.

Five other wetlands or wetland zones in Australia are known to support more than 100000 waders (Lane 1987). In many respects, Lake MacLeod is a similar wader habitat to the The Coorong, which supports up to 236000 waders (Lane 1987). Given that Lake Eyre fills infrequently, Lake MacLeod may be considered the fifth most important wader site in Australia.

In terms of highest numbers counted at wetland zones in Australia, Lake MacLeod is the second most important wetland for the Banded Stilt and Curlew Sandpiper (cf Lane 1987).

Lake MacLeod is clearly of international importance for waders. If further work proves that it regularly supports more than 20000 waterbirds, it would satisfy a criterion for nomination as a Wetland of International Importance, Especially as Waterfowl Habitat (RAMSAR Convention).
The inner lake is not protected for conservation of waterbirds. It is entirely within a mining lease held by Dampier Salt (Operations) P/L and permission to enter the lake must be obtained from Dampier Salt and managers of local pastoral stations. There is a small saltfield of limited value for waders at the dry south end of the lake.

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Table 1. Waders counted by the RAOU at Lake Macleod W.A. 28 September 1987-3 October, 1987.

Species	Number
Pied Oystercatcher	19
Grey Plover	34
Lesser Golden Plover	7
Mongolian Plover	1
Large Sand Plover	75
Red-capped Plover	2110
Black-fronted Plover	1
Black-winged Stilt	310
Banded Stilt	53098
Red-necked Avocet	2401
Ruddy Turnstone	18
Little Curlew	1
Common Sandpiper	5
Greenshank	92
Marsh Sandpiper	66
Terek Sandpiper	1
Asian Dowitcher	1
Black-tailed Godwit	25
Bar-tailed Godwit	111
Red Knot	2566
Great Knot	135
Sharp-tailed Sandpiper	602
Red-necked Stint	8312
Long-toed Stint	2
Curlew Sandpiper	41606
Sanderling	1
Broad-billed Sandpiper	1
TOTAL	111601

WADERS AT WATTLE CAMP-ISRAELITE BAY, WESTERN AUSTRALIA.

Brenda Newbey, Box 42, Ongerup, Western Australia 6336.

On 14 December 1986 we drove along the beach in a south-westerly direction from Wattle Camp to Israelite Bay, a distance of 42.5km. The location is approximately 33°30'S, 124°E. The following waders were counted:

Sooty Oystercatcher	30
Pied Oystercatcher	7
Bar-tailed Godwit	37
Sanderling	142
Hooded Plover	113
Red-capped Plover	80
Grey Plover	409
Red-necked Stint	453
Unidentified large waders	52
" small "	67
" medium "	1
" Tattler sp.	1

THE BREEDING OF PIED OYSTERCATCHERS AND HOODED PLOVER ON WIDE OCEAN BEACHES - A NESTING ASSOCIATION?

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

In late October and early November 1987 seventy-six kilometres of ocean beaches were surveyed for waders in east Gippsland and south-eastern New South Wales. A total of 58 Pied Oystercatchers and 48 Hooded Plovers were recorded and 16 nests were located of these two species (Table 1).

Of these nests, 71% of the Pied Oystercatcher and 56% of the Hooded Plover nests were located within 100m of one another. In all cases such nests were situated on broad sections of the beach (greater than 100m wide at low tide) at an inlet entrance or a river mouth (e.g. Tamboon and Mallacoota Inlets and Thurra River mouth) or on points backed by expansive sandy areas (such as on the beach between Mallacoota Inlet entrance and Cape Howe opposite Gabo Island). On sections of the beach (less than 100m wide at low tide) where heavy wave action frequently reached the base of the primary sand dunes nests of both species were located in the dunes and no nests of either species were found within close range (i.e. less than 100m) of each other.

In the open sandy areas the eggs of both species rely on their cryptic colouration for protection from predators when not covered by the incubating bird. In such situations nests are relatively easy to find for visually-searching predators (such as the Australian Raven) due to the convergence of a large number of tracks to each site (except during windy conditions when sand flight covers the tracks). In contrast, nests in the dunes are frequently hidden amongst or even under vegetation and tracks are generally obscured by the loose nature of the sand (even in calm conditions).

Single nests of the Pied Oystercatcher and Hooded Plover located approximately 50m apart at the Thurra River mouth were observed for a six hour period between 0530 and 1130 hrs on 13 November 1987. During the period a number of potential predators ranged within 100m of the nest sites and the reaction of the incubating birds were recorded (Table 2).

The reaction of both species to the White-bellied Sea-Eagle, Australian Raven and Silver Gull were similar. However, the reaction to the fox differed markedly - the pair of oystercatchers actively harassed it while the incubating Hooded Plover left the nest and joined its mate at the water's edge. The Pied Oystercatchers harassed the fox not only out of the immediate vicinity of their own nest site but also because of its proximity away from that of the Hooded Plover's nest site.

AN ORIENTAL PRATINCOLE IN TASMANIA.

John Waugh, 44 Tourmaline Avenue, Pearl Beach N.S.W. 2256.

On 17 April 1987 my wife Pauline and I saw an Oriental Pratincole *Glareola maldivarum* at Marion Bay to the east of Hobart.

Neither Sharland (1981) nor Green (1977) lists it, apparently this is the first sighting of the bird in Tasmania.

The bird was first observed at 1415 hours roosting in short samphire when the brown crown, neck and back were seen. It was later observed flying at ranges from 400m to 20m when the white tail with black tip was seen, and the reddish underwing.

Table 1. Numbers of Pied Oystercatchers (PO) and Hooded Plover (HP) nests and individuals on sections of ocean beaches in East Gippsland and south-eastern New South Wales.

Location	Date 1987	Distance (km)	Numbers Present		Nesting Singly		Close Nesting	
			PO	HP	PO	HP	Number	Distance Apart (m)
Tamboon Inlet–Pt Hicks	13.11	14	8	6	–	1	1	25
Pt Hicks–Mueller R. mouth	12.11	5	9	6	1	1	1	50
Mueller R. mouth–Petrel Pt	23.10	8	2	9	–	–	–	–
Petrel Pt–Rame Head	23.10	4	0	2	–	–	–	–
Wingan Inlet Beach	23.10	2	0	2	–	1	–	–
Mallacoota Inlet–Cape Howe	24-25.10	24	30	15	1	–	3	18, 40, 80
Cape Howe–Nadgee Lake	25.10	3	4	4	–	1	–	–
Wonboyn Lake Beach	9.10	5	2	2	–	–	–	–
Boydtown Beach	10.11	3	1	0	–	–	–	–
Long Beach, Ben Boyd N.P.	9.11	8	2	2	–	–	–	–
TOTAL			58	48	2	4	5	

Table 2. Reaction of an incubating Hooded Plover and Pied Oystercatcher to potential predators coming within 100m of nest sites.

Potential Predator	Reaction to Potential Predators	
	Pied Oystercatcher	Hooded Plover
Fox (occasions = 1)	Both birds circled and swooped the fox, until it was 200m away	Incubating bird left nest and joined other birds on water's edge. No other action taken
White-bellied Sea-Eagle (occasions = 12)	Variable. Mainly the incubating bird sat tight. On several occasions left nest and flew to water's edge	Similar reaction to the Pied Oystercatcher
Australian Raven (occasions = 18)	Sat tight on nest when bird flew close overhead	Sat tight on nest when bird flew close overhead
Silver Gull (occasions = 32)	No obvious reaction	No obvious reaction

Finally it was observed roosting at a range of 40m when the details of the bill and throat were seen. Observation ceased at 1430 and the sighting was reported to Leonard Wall of Hobart and Ruth Brozek, NPWS ranger at Port Arthur.

I am familiar with the bird having made several trips to Darwin in the 'wet', most recently in December, 1986.

ACKNOWLEDGEMENTS

I wish to thank Leonard Wall for comments on our field notes and Walter Boles for allowing us to examine skins at the Australian Museum.

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UNUSUAL BEHAVIOUR OF FOUR SHARP-TAILED SANDPIPERS *Calidris acuminata*.

Jon Wren, P.O. Box 868, Bowen, Queensland, 4805.

INTRODUCTION.

Sharp-tailed Sandpipers are a fairly common visitor to the Bowen area of North Queensland 20°00'S, 148°15'E. On 13 November 1987 Bill Whayman and I visited the Merinda Meatworks to observe birds at a large soak at approximately 5 p.m. We had at our disposal two pairs of binoculars (10x50 and 8x40) plus one scope (15-60x). Weather conditions were excellent although later in the day the setting sun caused a great deal of glare. While scanning the soak we observed four Sharp-tailed Sandpipers acting in a most unusual way. As we had never noted this behaviour in all our years of wader watching we took particular notes of their actions.

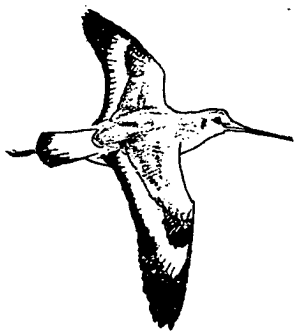
DESCRIPTION OF OBSERVATION

A group of four Sharp-tailed Sandpipers was observed feeding at the edge of the soak. Two displayed the normal eclipse plumage, the others although being of similar size and appearance appeared much paler in colour. These latter two we placed tentatively as first year birds.

Shortly after the initial sighting the group separated. Two birds, one dark and one pale moved off pausing occasionally to feed. It was on these two birds that we concentrated. Suddenly to our surprise the darker bird presumably a male, appeared to go beserk. With stiffened and short tail held erect giving it a Crake-like appearance and with drooping quivering wings held almost to ground level, it gave a frenzied performance. Around, ahead and alongside its companion, it weaved, bobbed and scampered, each display lasting around three to four seconds before resting, the whole performance covering some thirty seconds. Throughout the whole performance the passive partner appeared completely unconcerned. After a short time the darker bird adopted another behavioural position. With wings extended horizontally, drooping slightly downwards at the tips and quivering, tail relaxed and pointing downwards its head held low in a parallel position to the ground (somewhat similar to the head position of a courting Pigeon or Dove), it would once again approach the paler partner. This action still being carried out in a similar manner as described previously drew no response from the paler bird.

CONCLUSION

Neither Bill Whayman nor myself have observed this species at its Northern breeding grounds but over the years have become to know it well during its period here in Australia. Nevertheless we feel convinced that the actions we witnessed were possibly an intense, almost frantic courting display by a Sharp-tailed Sandpiper in eclipse plumage. We would therefore be most interested in some comment from other observers in response to this report.



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 1987 and January 1988. 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:

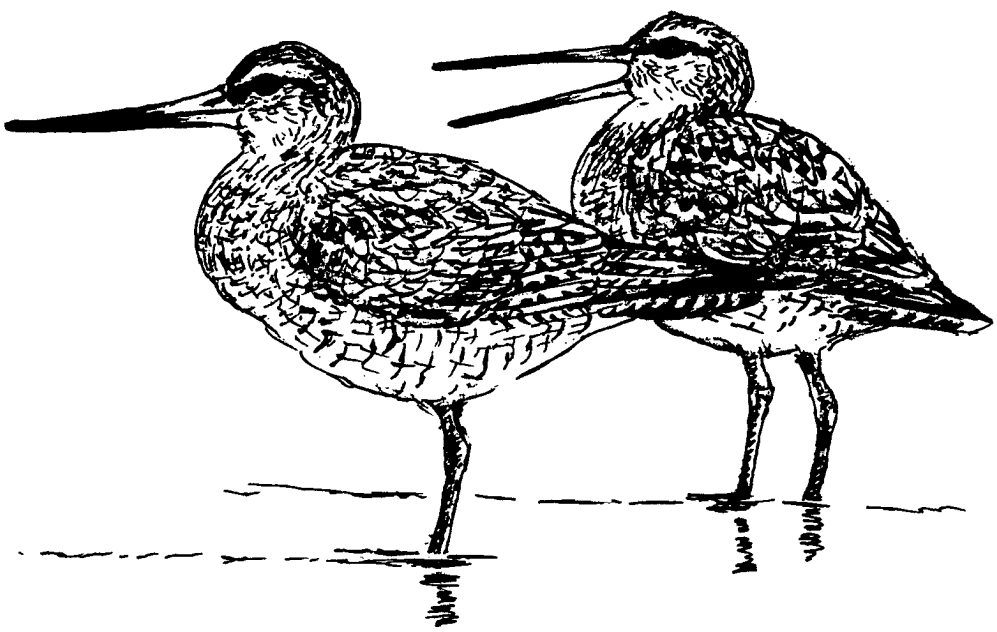
Age code: U = unknown; P = nestling; J = juvenile; 1 = within the first year of life; +1 = within the first year or older; 2 = within the second year; +2 = within the second year or older; etc.

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

Method of encounter: 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; 46 = colour marking sighted in field' bird one of a cohort marked in this manner; 48 = colour marking sighted in field; 54 = beachwashed; 63 = taken for scientific study.

Status after encounter: 01 = status of bird unknown,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.

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.



130 PIED OYSTERCATCHER HAEMATOPUS LONGIROSTRIS

100-84382 RALPHS BAY (SOUTH - WEST) TAS 43d 2mS 147d26mE 02/09/84 1 F SHOREBIRD STUDY GROUP (BOAT)
02 13 RALPHS BAY (WEST) TAS 43d 2mS 147d26mE 22/09/85 2 M SHOREBIRD STUDY GROUP (BOAT)
Distance: 0 km Direction: 0 degs. Time elapsed: 1 yrs 0 mths 20 days

100-84382 RALPHS BAY (SOUTH - WEST) TAS 43d 2mS 147d26mE 02/09/84 1 F SHOREBIRD STUDY GROUP (BOAT)
54 05 TWO BAYS NTH OF GRANVILLE HARBOUR TAS 41d46mS 145d 0mE 10/12/87 U U ROW
Distance: 245 km Direction: 304 degs. Time elapsed: 3 yrs 3 mths 8 days

UNK00008 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 00/00/00 U U VICTORIAN WADER STUDY GROUP
46 26 SANDFLATS NEAR ROSEBUD JETTY VIC 38d21mS 144d56mE 26/07/87 U U ELMER
Distance: 132 km Direction: 286 degs. Time elapsed: 0 yrs 0 mths 0 days

140 DOUBLE-BANDED PLOVER CHARADRIUS BICINCTUS

040-92778 KOORAGANG ISLAND NSW 32d52mS 151d46mE 12/04/80 +1 U LANE
04 13 McCAULEY RIVER NEW ZEALAND 43d43mS 170d34mE 19/11/84 +2 U PIERCE
Distance: 2030 km Direction: 131 degs. Time elapsed: 4 yrs 7 mths 7 days

041-12252 BARRY BEACH CORNER INLET VIC 38d42mS 146d23mE 19/06/82 +1 U VICTORIAN WADER STUDY GROUP
05 13 POINT COOK, ALTONA VIC 37d55mS 144d46mE 03/08/86 U U VICTORIAN WADER STUDY GROUP
Distance: 166 km Direction: 301 degs. Time elapsed: 4 yrs 1 mths 14 days

NB53690 ASHLEY RIVER NEW ZEALAND 43d17mS 172d20mE 12/12/85 +1 F NEW ZEALAND BANDING SCHEME
48 26 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 06/06/87 +2 F VICTORIAN WADER STUDY GROUP
Distance: 2390 km Direction: 274 degs. Time elapsed: 1 yrs 5 mths 25 days

NB53690 ASHLEY RIVER NEW ZEALAND 43d17mS 172d20mE 12/12/85 +1 F NEW ZEALAND BANDING SCHEME
05 13 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 12/07/87 +2 F VICTORIAN WADER STUDY GROUP
Distance: 2390 km Direction: 274 degs. Time elapsed: 1 yrs 7 mths 0 days

NB54203 MATUKITUKI RIVER NEW ZEALAND 44d31mS 168d43mE 22/09/85 +2 M NEW ZEALAND BANDING SCHEME
48 26 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 12/07/86 U U VICTORIAN WADER STUDY GROUP
Distance: 2119 km Direction: 280 degs. Time elapsed: 0 yrs 9 mths 20 days

NB54203 MATUKITUKI RIVER NEW ZEALAND 44d31mS 168d43mE 22/09/85 +2 M NEW ZEALAND BANDING SCHEME
05 13 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 20/07/86 +2 M VICTORIAN WADER STUDY GROUP
Distance: 2119 km Direction: 280 degs. Time elapsed: 0 yrs 9 mths 28 days

NB54203 MATUKITUKI RIVER NEW ZEALAND 44d31mS 168d43mE 22/09/85 +2 M NEW ZEALAND BANDING SCHEME
05 13 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 12/07/87 +2 M VICTORIAN WADER STUDY GROUP
Distance: 2119 km Direction: 280 degs. Time elapsed: 1 yrs 9 mths 20 days

NB54241 ALEXANDRA, NEW ZEALAND 45d15mS 169d23mE 28/10/85 +1 F NEW ZEALAND BANDING SCHEME
48 26 INVERLOCH (ANDERSONS INLET & PT. SMYTHE) VIC 38d37mS 145d45mE 27/07/86 +2 U VICTORIAN WADER STUDY GROUP
Distance: 2085 km Direction: 282 degs. Time elapsed: 0 yrs 8 mths 30 days

NB54241 ALEXANDRA, NEW ZEALAND 45d15mS 169d23mE 28/10/85 +1 F NEW ZEALAND BANDING SCHEME
48 26 INVERLOCH (ANDERSONS INLET & PT. SMYTHE) VIC 38d37mS 145d45mE 17/05/87 +2 U VICTORIAN WADER STUDY GROUP
Distance: 2085 km Direction: 282 degs. Time elapsed: 1 yrs 6 mths 20 days

NB54241 ALEXANDRA, NEW ZEALAND 45d15mS 169d23mE 28/10/85 +1 F NEW ZEALAND BANDING SCHEME
05 13 INVERLOCH (ANDERSONS INLET & PT. SMYTHE) VIC 38d37mS 145d45mE 13/06/87 +2 U VICTORIAN WADER STUDY GROUP
Distance: 2085 km Direction: 282 degs. Time elapsed: 1 yrs 7 mths 16 days

NC35687 ASHLEY RIVER NEW ZEALAND 43d17mS 172d20mE 02/11/86 +1 F NEW ZEALAND BANDING SCHEME
48 26 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 06/06/87 +2 F VICTORIAN WADER STUDY GROUP
Distance: 2390 km Direction: 274 degs. Time elapsed: 0 yrs 7 mths 4 days

NC35687	ASHLEY RIVER NEW ZEALAND		43d17mS	172d20mE	02/11/86	+1	F	NEW ZEALAND BANDING SCHEME
05 13	SWAN ISLAND QUEENSCLIFF	VIC	38d15mS	144d40mE	12/07/87	+2	F	VICTORIAN WADER STUDY GROUP
Distance:	2390 km	Direction: 274 degs.		Time elapsed: 0 yrs 8 mths 10 days				
NC42164	TEKAPO RIVER NEW ZEALAND		44d 7mS	170d19mE	06/11/86	+2	F	NEW ZEALAND BANDING SCHEME
05 13	WERRIBEE SEWERAGE FARM (SPIT, PT WILSON)	VIC	38d 3mS	144d32mE	31/05/87	+2	U	VICTORIAN WADER STUDY GROUP
Distance:	2258 km	Direction: 278 degs.		Time elapsed: 0 yrs 6 mths 25 days				
NC42270	CASS RIVER NEW ZEALAND		43d53mS	170d30mE	29/11/86	J	U	NEW ZEALAND BANDING SCHEME
05 13	SWAN ISLAND QUEENSCLIFF	VIC	38d15mS	144d40mE	16/05/87	1	U	VICTORIAN WADER STUDY GROUP
Distance:	2249 km	Direction: 277 degs.		Time elapsed: 0 yrs 5 mths 17 days				
UNK00010	CAMPBELL ISLAND NEW ZEALAND		52d39mS	169d 8mE	14/11/85	+1	U	NEW ZEALAND BANDING SCHEME
46 26	CLONTARF	QLD	27d15mS	153d 5mE	04/07/87	U	U	COOMBS
Distance:	2397 km	Direction: 314 degs.		Time elapsed: 1 yrs 7 mths 20 days				

161 CURLEW SANDPIPER — CALIDRIS FERRUGINEA

040-93559	WERRIBEE SEWERAGE FARM (SPIT, PT WILSON)	VIC	38d 3mS	144d32mE	17/03/78	+1	U	VICTORIAN WADER STUDY GROUP
02 13	SWAN ISLAND QUEENSCLIFF	VIC	38d15mS	144d40mE	29/12/84	U	U	VICTORIAN WADER STUDY GROUP
Distance:	25 km	Direction: 152 degs.		Time elapsed: 6 yrs 9 mths 12 days				
041-09054	RALPHS BAY (WEST)	TAS	43d 2mS	147d26mE	09/03/86	+1	U	SHOREBIRD STUDY GROUP (BOAT)
05 13	YALLOCK CREEK, NEAR KOOWEERUP	VIC	38d13mS	145d28mE	16/08/86	U	U	VICTORIAN WADER STUDY GROUP
Distance:	560 km	Direction: 342 degs.		Time elapsed: 0 yrs 5 mths 7 days				

162 RED-NECKED STINT — CALIDRIS RUFICOLLIS

032-49361	PELICAN POINT SWAN RIVER	WA	31d59mS	115d49mE	15/12/84	1	U	WA WADER STUDY GROUP
63 01	"SIX MILE ISLAND" ISRAELITE BAY	WA	33d38mS	123d57mE	23/02/86	U	F	JOHNSTONE
Distance:	784 km	Direction: 105 degs.		Time elapsed: 1 yrs 2 mths 8 days				
032-54546	BARRY BEACH CORNER INLET	VIC	38d42mS	146d23mE	04/08/85	2	U	VICTORIAN WADER STUDY GROUP
03 14	AGANO RIVER NIIGATA CITY JAPAN		37d58mN	139d 7mE	26/07/87	+2	U	CHIBA
Distance:	8522 km	Direction: 354 degs.		Time elapsed: 1 yrs 11 mths 22 days				
032-61999	SALTWORKS, PORT HEDLAND	WA	20d15mS	118d55mE	19/04/84	1	U	AUSTRALASIAN WADER STUDY GROUP
05 13	BEACHES CRAB CK RD ROEBUCK BAY	BROOME WA	18d 0mS	122d22mE	19/04/85	+2	U	AUSTRALASIAN WADER STUDY GROUP
Distance:	440 km	Direction: 56 degs.		Time elapsed: 1 yrs 0 mths 0 days				

BANDING TOTALS FOR JANUARY - JUNE 1987.

	Banders					
	A	B	C	D	E	F
Pied Oystercatcher						13
Sooty Oystercatcher						5
Masked Lapwing	7			8		1
Grey Plover						14
Lesser Golden Plover	6			1		
Mongolian Plover	2					1
Double-banded Plover						309
Red-capped Plover	6		10			37
Black-fronted Plover	21			17		
Black-winged Stilt			1			
Red-necked Avocet	2					
Ruddy Turnstone						49
Eastern Curlew	1					
Grey-tailed Tattler	2					
Common Sandpiper		2				
Terek Sandpiper	1					1
Latham's Snipe	3			8		
Bar-tailed Godwit	2					24
Red Knot						49
Great Knot						1
Sharp-tailed Sandpiper	31			19		111
Red-necked Stint	2		224			1611
Curlew Sandpiper	3					909
Comb-crested Jacana	2					
Beach Thick-knee				1		
Total	91	2	235	54	0	3135

A. Mid/north NSW Coast : S.G. Lane, B. Tynan, D. Secomb and G.P. Clancy.
B. Motopure Island PNG : I Burrows.
C. WAWSG.
D. Grafton NSW : D.J.Geering.
E. SSG (BOAT).
F. VWSG.

AUSTRALASIAN WADER STUDIES GROUP

OFFICE BEARERS

Chairperson	Mr. Mark Barter, 21 Chivalry Ave., Glen Waverly, Victoria,3150.	Admin Secretary	Mrs. Brenda Murlis 34 Centre Ave., Vermont, Victoria, 3133.
Treasurer	Mr.David Henderson, P.O.Box 29, Legana, Tasmania, 7277.	Editor 'The Stilt'	Mr. Eric Woehler, 37 Parliament St., Sandy Bay,Tas. 7005. (002) 234666 (AH)
Co-ordinator	Mr. Brett Lane, 11/272 Berkly St., North Fitzroy, Victoria. 3068	Liaison Officer	Mr. Peter Haward, 4/13 Phillip St., Bentleigh, Victoria. 3204
	Conservation Officer	Mr. Jeff Campbell, 8/5 Wattle Ave., Glenhuntly, Victoria. 3163.	

STATE & REGIONAL REPRESENTATIVES

TASMANIA

Cathy Bulman,
100 Nelson Road,
MT NELSON, 7007.

NEW SOUTH WALES

Alan Morris,
33 Cliff Street,
WATSON'S BAY, 2030.

Jim Perry and
Wilma Barden(Newcastle),
Hunter Bird Observers
C/- 8 Denby Street,
GARDEN SUBURB, 2288.

QUEENSLAND

Dennis Watson
6 Nainana Street
MANLY WEST, 4179.

Lindsay Bone (Mackay)
2 Cooney Street,
ANDERGROVE. 4740.

WESTERN AUSTRALIA

Mike Bamford
79 Kalgoorlie St.
MOUNT HAWTHORN, 6016.

Peter Curry,
29 Canningmills Road,
KELMSCOTT, 6111,

NORTHERN TERRITORY

Niven McCrie,
4 Wilfred Court,
PALMERSTON, 5787.

SOUTH AUSTRALIA

Jamie Matthew,
11 Russell Street,
MAGILL, 5072.

INTERWADER

Duncan Parish,
P.O. Box 10769,
Kuala Lumpur
Malaysia.

NEW ZEALAND

Stephen Davies (Nth Island)
Dept. Philosophy.
University of Auckland,
Pte Bag AUCKLAND.

Paul Sager,(Sth Island)
Ornithological Soc. of
New Zealand
38a Yardley Street,
CHRISTCHURCH 4.

PAPUA - NEW GUINEA

Ian Burrows
Biology Dept.,
P.O. Box 320,
University of Papua-
New Guinea,

THE STILT

BULLETIN OF THE AUSTRALASIAN WADER STUDIES GROUP

OF THE

ROYAL AUSTRALASIAN ORNITHOLOGISTS UNION

NUMBER TWELVE APRIL 1988

A.W.S.G. ITEMS

INTERWADER

NEW ZEALAND

OPEN NOTEBOOK

BANDING ROUND-UP

S T O P P R E S S

THE 1988 N.W. AUSTRALIA WADER EXPEDITION

The latest wader study expedition to N.W. Australia has been a fantastic success!

A total of 6638 waders (and terns) was caught in 14 cannon net and 4 mist net catches over the three week period from 19 March to 10 April. A catch was made on every occasion the nets were set. The strength of the team - 25 experienced wader banders from throughout Australia (15) and overseas (10) - enabled much more ancillary data to be collected than on previous expenditions, with the age/weight/~~month~~/moult/% breeding plumage being recorded on all birds as well as full biometric data on many.

Top species totals caught were:

Terek Sandpiper	1005
Bartailed Godwit	955
Great Knot	856
Curlew Sandpiper	802
Red Knot	722
Greytailed Tatler	579
Large Sand Plover	570
Rednecked Stint	391
Broadbilled Sandpiper	336
Turnstone	140

Highlights were two cannon net catches at Broome each with over 250 Terek Sandpipers and a mist netting catch at Port Hedland saltworks which included 236 Broadbilled Sandpipers in a four hour period.

There were also three exciting 'controls'. A Bartailed Godwit which had been banded as a juvenile in Hong Kong in September last year was recaptured on the beach beside the new Broome Bird Observatory. In the same catch was a Terek Sandpiper carrying a Japanese band! The expedition also recaptured a Curlew Sandpiper (carrying a leg flag) banded near Melbourne during the summer.

The expedition encountered monsoon conditions at Anna Plains, 80 Mile Beach, on 29th March when 185mm of rain fell in 24 hours. Even the Great Sandy Desert was flooded and the De Grey river rose 40 ft. washing away part of the Princes Highway between Port Hedland and Broome. Conditions were unsuitable for migratory departures for a week resulting in huge weight build ups in birds. A massive emigration took pace as the weather finally cleared on 1st April with some 25% of the wader population departing in one night.

Radar observations using the meteorology station facilities at Broome airport were commenced by an advance party on 7th March and have been continued since the expedition ended by the new wardens at Broome Wader Observatory (Brice Wells and Gail Hooper). Weather conditions throughout March were generally less favourable for wader migration than in previous observation periods and some birds were eventually forced to depart in less than perfect conditions. More regular departures were observed in April (especially on the 7th when the weather systems were ideal for a clear flight to China with a tail wind). The

.../2.

Broome Observatory appears to be ideally sited to observe these late afternoon migratory departures with individual flocks of up to 1000 birds being seen setting off on their northwesterly heading.

Thanks to everyone in the team for the enormous effort which enabled so much to be accomplished.

CLIVE MINTON & DOUG WATKINS,
JOINT LEADERS OF THE EXPEDITION.

P.P.S.: Wang Tianhou recaptured 2 Bartailed Godwits and 2 Great Knots from N.W. Australia near Shanghai, China, in early April.