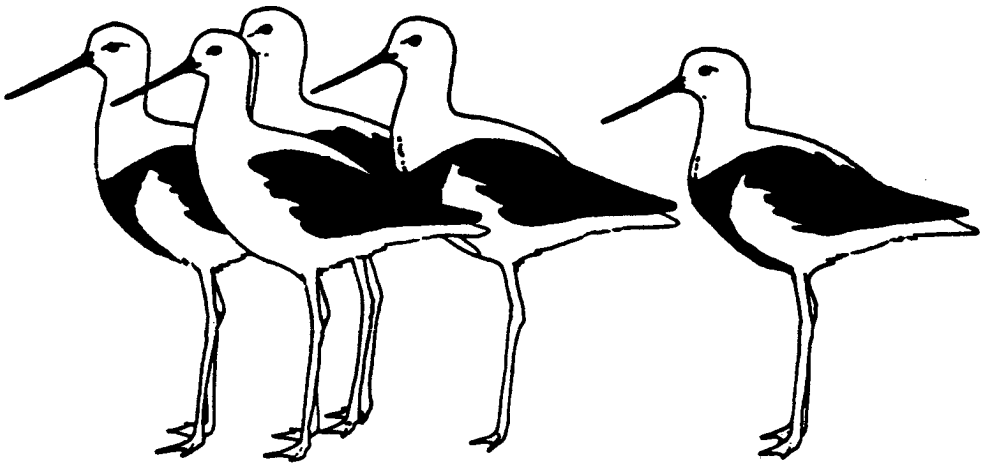
The Stilt



ISSN 0726-1888

BULLETIN OF THE AUSTRALASIAN WADER STUDIES GROUP

OF THE

ROYAL AUSTRALASIAN ORNITHOLOGISTS UNION

Number 15 **October 1989**

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

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

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

3. To encourage and assist with the publication of results.

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

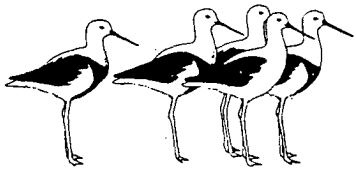
5. To formulate and promote policies for the conservation and management of waders and their habitat.

VIEWS AND OPINIONS EXPRESSED IN "THE STILT" ARE THOSE OF THE AUTHOR(S) AND NOT NECESSARILY THOSE OF THE AWSG.

Subscriptions for 1989:

Australasia	AUS $15
Overseas	AUS $20
Libraries	AUS $25

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



EDITORIAL

Due to the unfortunate illness of David Thomas it has been necessary for Mark Barter and myself to act as editors for this number of *The Stilt*. We trust that the road to recovery is not too long a one for David. It is not until one takes on such a task as the editorship that one realises just how much is involved in the production of the journal and our thanks must go to David for the excellent work he did in producing *Stilt* 14, which at 71 pages was the largest edition so far published.

We have made only minor alterations to this edition, with a slight change in layout and the addition of a new column; The Broome Bird Observatory Report. On the subject of Broome it is pleasing to report that due to the generosity of Woodside Petroleum Ltd and BHP Petroleum Ltd, the observatory will soon have an accommodation unit with 20 single bedrooms. This will make it much easier for the observatory to cater for visitors at peak periods and should enable it to become financially self supporting.

Another recent news item of interest to wader enthusiasts is the announcement that planning is underway for a joint United States and Soviet Union National Park and Wilderness Reserve, dubbed the "Glasnost and Glaciers Park", for the land on both sides of the Bering Strait. This area is of major importance as a palearctic wader breeding ground.

Subscription forms for the AWSG, Asian Wetland Bureau and Wader Study Group are enclosed in this issue. Prompt payment of your renewal(s) or new subscription(s) would be appreciated. Please note that if renewing or subscribing for the first time to more than one group one cheque only, payable to AWSG, is necessary.

Jeff Campbell

CONSERVATION NEWS

The most important event on the conservation front is that the AWSG application for a grant from the World Wildlife Fund to carry out a research project on the conservation of wader habitat in Australia has been approved. This grant will allow us to employ a researcher for six months to formulate a management plan for the conservation of waders and their habitat in Australia. Important wader sites will be compared with the current reserve system and areas in need of conservation action will be identified. A researcher should be appointed soon and it is hoped that work will begin late this year.

Amongst other issues dealt with since the last report submissions have been made on a draft plan for protection and development of Port Phillip and Corio Bays (Vic); to the Senate Standing Committee on Environment, Recreation and the Arts Australian Tourist Industry Inquiry on the environmental impact of tourist developments in coastal regions and to a similar New South Wales Legislative Council Committee Inquiry into coastal development.

Comments on a Draft Zoning Plan for a proposed Marine Park in Hervey Bay (Qld) have also been made. Unfortunately, this is a Marine Park in name only as virtually no commercial activity would be prohibited in the area. The proposed boundaries also totally ignore the ecological evidence presented in the background report and omit the most important areas. It would appear that this proposal is an attempt to convince the public that the bay is to be protected when in fact it is not. With the recent moves by politicians to gain the so called "green vote" this is a trend to be wary of.

Jeff Campbell

CORRECTIONS

One of the two papers reproduced from the Wader Study Group Bulletin in the last issue of *Stilt* was incorrectly titled. The title referred to the Bar-tailed Godwit **instead** of the Black-tailed Godwit. The correct citation is:

Danielsen, F. and Skov, F. 1988. The importance of south-east Sumatra as a summering area for non-breeding waders, especially the Black-tailed Godwit *Limosa limosa*. Reprinted from: Wader Study Group Bulletin 53:8-10

Also in "Recent Interesting Wader Records in Western Australia" on page 67, the Banded Stilts were **not** breeding!

RECENT LITERATURE

The following is a selection of publications dealing with waders from periodicals published in 1988 and 1989.

Aust. Bird Watcher 13(1) 1989. A Little Ringed Plover *Charadrius dubius* at Lake Connewarre, Victoria (F.T.H. Smith), 30-31.

Aust. Bird Watcher 13(2) 1989. The Story Behind the Naming of Cox's Sandpiper (J.B. Cox), 50-57.

British Birds 81(6) 1988. The world's first known juvenile Cox's Sandpiper (P.A. Buckley), 253-257.

British Birds 81(10) 1988. Report of adult Cox's Sandpiper in Hong Kong (P. Kennerley), 532-533.

Notornis 35(2) 1988. Brooding of a Banded Dotterel fledgling (M. Barlow), 158-159.

S. Aust. Ornithologist 30(7) 1989. Notes on the Affinities of Cooper's and Cox's Sandpipers (J.B. Cox), 50-57.

Sunbird 18(4) 1988. Wader Numbers at Raby Bay, Moreton Bay: Changes over three decades (P.L. Woodall and D.J. Watson). 83-92.

ELECTION OF OFFICE BEARERS

The term of Office of the present Committee expires on May 31, 1990.

In accordance with Rule 7 of the Rules of the Australasian Wader Studies Group of the Royal Australasian Ornithologists Union, written nominations for committee positions, seconded by a member of the Group, shall be sent to the Chairperson by January 31 in the year of an election. The new committee shall take office on June 1, 1990 and shall have a term of two years.

The positions and names of current office bearers are listed below:

Chairperson	Mark Barter
Research Co-ordinator	Brett Lane
Administrative Secretary	Brenda Murlis
Editor	David Thomas
Treasurer	David Henderson
Liaison Officer	Peter Haward
	(Co-opted to replace Jon Starks)
Conservation Officer	Jeff Campbell (Co-opted)
Committee Members	Clive Minton
	Mick Murlis (Co-opted)

All committee members, elected and co-opted, are willing to stand for another term. Should an election be necessary, ballot papers will be included in the April 1990 edition of the *Stilt*

BACK ISSUES OF *THE STILT*

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

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

Limited quanitites only of Nos 5 and 6 are available

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

COLOUR-BANDED PIED AND SOOTY OYSTERCATCHERS

The Victorian Wader Study Group has been intensively catching and colour banding oystercatchers. In many cases the birds have unique colour combinations, including the metal band, on both legs.

The basic intention of the study is to try to find out where flocking oystercatchers move to during the breeding season. So far there have been interesting movements around the Melbourne area and also from Melbourne to Corner Inlet and Western Victoria.

Could members keep a close watch out for colour banded birds and advise Clive Minton of any sightings at:

165 Dalgetty Road
Beaumaris Vic 3193
Telephone (03) 589 4901

BROOME BIRD OBSERVATORY REPORT

During a few of the AWSG expeditions to Roebuck Bay, attempts have been made to record visual departures, mostly from Cable Beach. This has not produced many results. In recent times radar tracking has proved to be more productive.

Since we arrived (mid-March '88), we have been fortunate enough to record a good number of departures. Some of these may be outside the norm. The siting of the observatory, at least from this particular aspect, has proved to be fortunate since Crab Creek and Fall Point appear to be regular departure points. We hear the birds preparing to leave before they actually do so.

Most departures, in our experience, take place just around sunset, but the chain of events preceding this begins much earlier. Generally, a handful of birds will begin spiralling up and down above the major flocks, calling continuously. As more birds join them the sounds increase and seem to become more excited and insistent. As dusk approaches the swirling birds begin to gain height. Suddenly, without our being aware of it happening, they form a ragged vee and head off in a north-westerly direction. All calling ceases, except for odd stragglers and a few birds that leave the vee (presumably youngsters) and head back to the beach. Once the vee is formed the die is cast - we have never seen a flock turn back. The whole process is a haunting, melancholy experience.

Flocks vary is size from about 50 upwards to around 300. We have had a few smaller and three during April '88 that topped a thousand. The vee they formed extended from above the observatory almost to the horizon. We have speculated that adverse winds which delayed departures earlier caused these big groups to form. We saw none approaching that size this year. The biggest flock we saw was about 300. As previously stated most birds moved around dusk, but we saw one flock leave at 1130 hours, and several others in the early and mid-afternoon during 1988. This did not happen in 1989 although we did become aware of later flights, ranging in time from 1830 to 2130 hours. Flocks coming from the Wood Point area generally passed us out to sea, flying directly over Broome township and Cable Beach.

We have so far failed to see Oriental Plovers leave. Our last sightings were in March both years, and both were a single sighting of a small group. It is probable that they leave in February or even earlier. The Eastern Curlews also leave early. We saw two groups of 150 each, leaving on 14 and 15 March this year. For a time that seemed to be it, but we now have a flock that exceeds 100 over-wintering here. Whether they were always around and we failed to locate them, or whether they came from further south we are not sure. The latter seems more likely. The same thing happened with the Black-tailed Godwits. We saw none, and suddenly there were good numbers (up to 500) at Crab Creek.

Coming back from Perth on 20 February we came across vast numbers of Oriental Pratincoles on the edges and spread right across Roebuck Plain. They were busy feeding, hawking on a front of about 1 kilometre wide and 15 kilometres long. We estimated their numbers in excess of 50,000. As we have scarcely seen one since that spectacular evening, we assume they were gathering just prior to departure.

At present we have something in the vicinity of 15-25,000 over-wintering waders in Roebuck Bay. Bar-tailed Godwits and Great Knots predominate, with the Knots being most numerous but there are also large numbers of Red Knot and Large Sand Plover as well. The smaller waders are also represented. Redshanks are hard to see (11 only this year), but we saw 9 Asian Dowitchers last week (July) - two of them in full breeding plumage. The number of partially or totally coloured birds is quite high (up to 50% of the Knots). We haven't seen the albino Godwit this year - which must be the first time for nine years that it hasn't been seen.

We tell people that the waders have left, but there are still enough left to provide a feast for a gourmet.

Gail Hooper and Brice Wells
Wardens

EAST CHINA WADER STUDY GROUP

The Group has recently published their first Newsletter which describes the results of a counting and banding training course last April and May in the Yangtze River/ Hangzhou Bay area, near Shanghai.

The major aims of the course were to train ECWSG members and National Bird Banding Centre of China staff in banding techniques and biometric data collection, to stimulate internal co-operation between China and other flyway countries and to lay the foundation for wader survey work along the East China coastline.

Doug Watkins and Shapelle McNee, both AWSG members, took part in the course as trainers. Wang Tian Hou (1986 north-west Australia Expedition) also took part.

Count data for 32 species provides some interesting passage information and shows that Great Knot pass through in early to mid-April, whilst Red-necked Stint stage relatively later towards the end of April. Sharp-tailed Sandpipers move through in late April/early May - yet they leave south-east Australia in February, the earliest of all departing waders. Where do they stop on the way to China?

A total of 283 waders of 14 species were caught including three Australian-banded birds, with a further four being obtained later from hunters. Very interesting arrival weight data was collected and this confirmed that, for a number of species, non-stop migration occurs between Australia and China.

Mark Barter.

NEW PUBLICATIONS

Shorebirds in the Yangtze River Estuary and Hangzhou Bay. Wang Tianhou and Qian Gouzhen, East China Normal University Press. 1988.

This Monograph contains a detailed analysis of data obtained by Wang and Qian from 1982-6. The basic text is in Chinese, but each chapter has an English summary and all graphs and tables have English sub-titles. Thus, it is possible to glean a surprising amount of useful and fascinating information from the publication.

There are six chapters. The first describes the geomorphology, flora and fauna of the region. The second chapter provides a shorebird checklist for the area. A total of 40 shorebirds were studied, of which 26 are dealt with in detail. A further four shorebirds were seen infrequently and these, with an additional eight from historical records, make a grand total of 52 species known for the region. The chapter also covers biometrics, ageing, feeding behaviour, diet, distribution range, passage periods and potential departure points for shorebirds migrating through the area.

Chapter 3 is the most fascinating from the Australian point of view as it covers fluctuations in wader numbers during the peak passage period. These provide very useful data on the migration strategies of a number of species when taken in conjunction with departure dates from Australian sites. For example, arrival times for Great and Red Knot provide support for the view that these species fly non-stop between Australia and China. Data for other species assists in developing hypotheses on the number of staging sites between the two countries.

The final three chapters cover habitat requirements, niche analysis, and foraging strategies and energy budgets.

The Monograph provides invaluable information on a major staging site which is of particular importance to waders migrating between Australia and the northern hemisphere breeding grounds. It is obvious from the text that the area is under serious threat from agricultural and industrial development and, hopefully, the recently signed China-Australia Migratory Birds Agreement can be used, in some way, to further wader studies in the region and work towards the development of a management plan for conservation of waders and their habitat.

A Survey of Coastal Wetlands, and Shorebirds in South Korea, Spring 1988. Long, A.J., Poole, C.M., Eldridge, M.I., Won, P.O. and Lee, K.S. Asian Wetland Bureau, Kuala Lumpur, 1988.

This report covers the first comprehensive survey of wetlands in South Korea and has highlighted the importance of the north-west coast as a staging area for migratory waders. Unfortunately, most of the shorebird habitat is under serious threat from reclamation, as the South Korean Government plans to reclaim 67% of the coastal wetlands of the south and west by the year 2001.

The 173 page report is very comprehensive and covers coastal topography, vegetation and climate, legislation and administration of wetlands, usage, and reclamation, past, present and future. The major portion of the report provides a detailed description of the wetlands visited, with individual conclusions, evaluations and recommendations. This section is well illustrated with maps and tables. Distribution maps are included for most of the wader species encountered.

During the survey a total of approximately 150,000 shorebirds of 35 species was recorded at 30 wetland sites along the south and west coasts. Of particular interest were c.1500 Eastern Curlew and c.28,000 Great Knot (Both >10% of the estimated world population), c.1000 Chinese Egrets (>50% !!) and c.120 Nordmann's Greenshanks (largest number ever recorded of what is probably the world's rarest wader). Other wader species found in large numbers were Dunlin (70,000), Black-tailed Godwit (17,000), Bar-tailed Godwit (14,000) and Grey Plover (4,000).

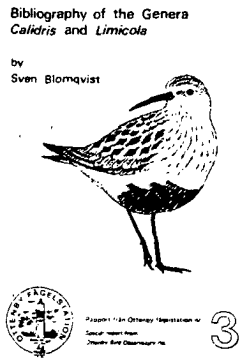
Additionally, four wetland areas of international importance, as defined by the RAMSAR Convention, were identified on the north-west coast and the largest ever breeding colony of Chinese Egrets (429 nests) was found in the same region.

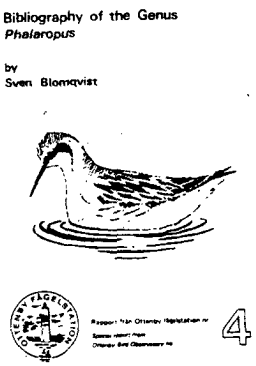
The overall recommendations of the authors are that full protection status should be given to the four potential RAMSAR sites and to the Chinese Egret breeding colony, that effective pollution control legislation be introduced and enforced, and that a wader-banding programme be commenced.

The Report is available for US$18, postage paid, from: The Asian Wetland Bureau, Institute of Advanced Studies, University of Malaya, Lembah Pantai, 59100 Kuala Lumpur, Malaysia.

And when you write ask for their Publications List - the Asian Wetland Bureau publishes many reports of interest to wader buffs and wetland ecologists.

Mark Barter.





Two Wader Bibliographies: Available from Ottenby Bird Observatory, in Sweden. Volume 3 of our special report series contains 1364 listed references to the genera *Calidris* and *Limicola*, (price: US$7.00). Volume 4 contains 394 listed references to the genus *Phalaropus*, (price: US$4.00). Both prices include surface mail postage. For air mail postage, add US$1.00. Please, make your specified order payable by international bank cheque or money order to:

Ottenby Bird Observatory
Pl. 1500
S-380 65 Degerhamn
Sweden

1990 NORTH-WEST AUSTRALIA WADER EXPEDITION

A further expedition to study waders in North-West Australia will take place from Friday, 23 March to Sunday 15 April, 1990.

The principal objectives of this visit are to:

(a) catch further samples of waders prior to their departure on northward migration, and in particular to collect additional information on departure weights/timing.

(b) to continue the studies of wader emigration using the radar at the Broome Meteorological Station.

(c) to try and catch samples of particular rarely caught species which can occur in that area in good numbers at that time of the year, such as Little Curlew, Oriental Pratincole and White-winged Tern.

As in previous years the expedition will spend periods at three different locations -

Broome (staying at the new RAOU Broome Bird Observatory),
80 Mile Beach, and
Port Hedland Saltworks.

AWSG members who are interested in participating should contact:

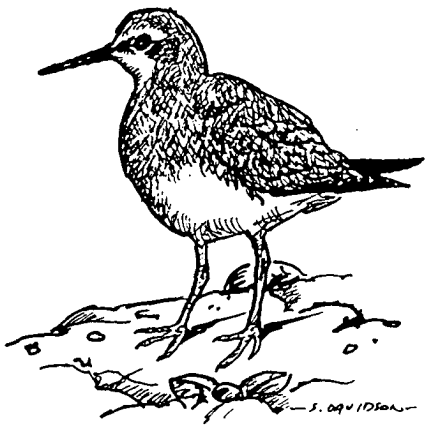
Clive Minton
165 Dalgetty Road
BEAUMARIS VIC 3193
Telephone: (03) 589 4901

It is envisaged that, as in 1988, the team will comprise around 25 people. Participants should ideally have had previous wader banding experience and should be physically able to operate under the conditions encountered in North-West Australia at that time of the year, which include temperatures in the 35-41 $^{\circ}$ C range in the middle of the day.

Costs to participants will principally be the travel costs of getting themselves to/from Port Hedland (where the expedition begins/ends) and food costs (budgeted at $13 per day). It is hoped that financial assistance will be gained for the other costs, principally four-wheel drive transport for the team and equipment and getting the equipment up to North-West Australia from Melbourne and Perth.

Those who are not familiar with the results of North-West Australia wader expeditions should note that in a similar period in 1981, 6,500 waders of 23 different species were caught. Over 30 species of waders were seen together with a large number of other interesting bird species.

Clive Minton



1989 RAOU SCIENTIFIC DAY ABSTRACTS

The 1989 RAOU Scientific Day, organised by the AWSG, was held in Melbourne on 27 May, prior to the AWSG Workshops (see p.16) and was attended by more than 130 people. The following abstracts have been provided by the presenter of each paper. Audio cassettes of all presentations are held in the RAOU library.

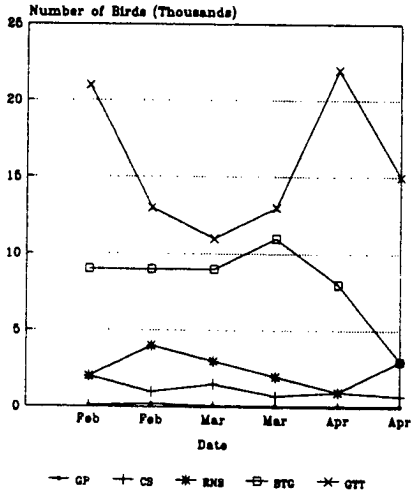
Preliminary Results Of Investigations Into Habitat Selection And Timing of Migration By Waders In Moreton Bay, Queensland.

Jeremy Thompson, Zoology Department, University of Queensland, St. Lucia, Qld. 4067.

In light of increasing Bayside development, the Queensland National Parks and Wildlife Service has provided funding for research into wading bird ecology in Moreton Bay. Work has begun along the shores of Moreton and North Stradbroke Islands which form part of an area under investigation as a marine park by the State Government.

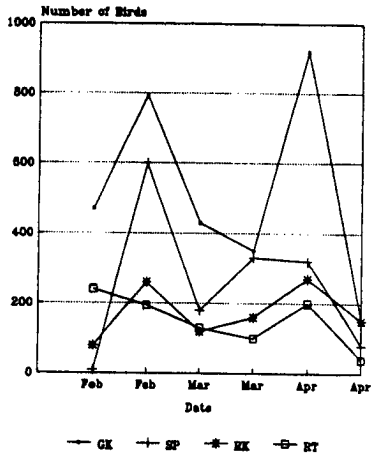
Regular roost counts and species proportion counts on feeding grounds during the southward migration revealed a peak of migration during the first two weeks of October for most species. Counts also showed that on the feeding grounds around the islands, some species are absent although they commonly occur on mainland shores. Preliminary fieldwork on the mainland and census data from annual RAOU/AWSG wader counts shows a clear separation of sites, according to relative species representation, into island and mainland locations. Site classification and examination of aerial photographs has allowed the discrimination of three habitats which differ according to substrate characteristics along a mud/sand ecocline. For the adequate conservation of waders in Moreton Bay, elements from all habitats should be preserved.

Figure 1. Notional Population Estimates



GP - Grey Plover
CS - Curlew Sandpiper
RNS - Red-necked Stint
BTG - Bar-tailed Godwit
GTT - Grey-tailed Tattler

Figure 2. Notional Population Estimates



GK - Great Knot
SP - Mongolian Sandplover
RK - Red Knot
RT - Ruddy Turnstone

Counts Of Waders In Westernport, Victoria, From 1973-89

Richard Loyn, Peter Dann, Pat Bingham and Val Curtis. Presented by Richard Loyn, Fisheries and Wildlife Service, 123 Brown Street, Heidelberg, Vic, 3084.

Waterbirds have been counted in Westernport since 1973, as a project of the Bird Observers Club of Australia. The survey was begun to provide data for the Westernport Bay Environmental Study. Simultaneous counts were made at 18 major high tide roosts and other areas at monthly intervals to 1975, and then five times a year. Data have been analysed for the first ten years.

Distribution of waders varied seasonally and annually, but the main patterns were consistent over time. For example, Greenshank still favour mangrove-lined shores backed by saltmarsh, and Bar-tailed Godwit favour the seaward south part of the bay.

Numbers of waders varied seasonally and annually. Total numbers declined over the ten-year period, though some species increased in number (Pied Oystercatcher, Lesser Golden Plover and Masked Lapwing), and others remained stable (Bar-tailed Godwit) or fluctuated erratically (eg. Sharp-tailed Sandapiper, probably in response to conditions inland, and Red Knot).

A major dieback of seagrass occurred during the period, with 85% loss of biomass. Only Grey-tailed Tattlers declined in number to the same extent.

Twenty Five Years Of Wader Research In South-east Tasmania

R M Patterson, 89 Summerleas Road, Fern Tree, Tasmania 7054.

Hobart area wader resorts have been the subject of 25 years of systematic wader research. Thomas (1968 & 1970) carried out regular monthly surveys over a 4 year period from 1965 to 1968. The Bird Observers' Association of Tasmania has conducted annual summer and winter wader counts since 1972. The Tasmanian Shorebird Study Group commenced a 5 year programme of regular monthly counts in 1980 complemented by a comprehensive wader banding programme. The data from these sources form the basis for the analysis which follow.

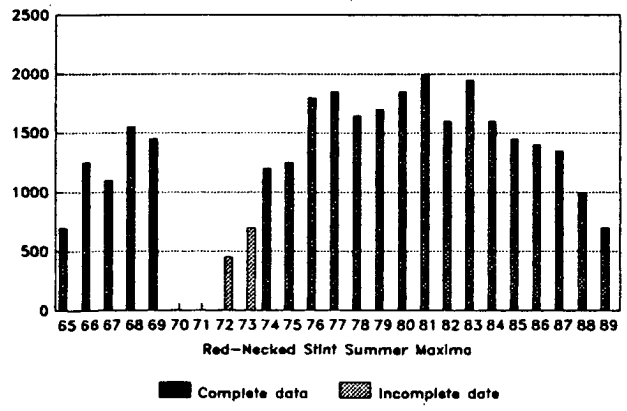
Hobart area wader resorts are grouped into two major complexes of Pitt Water and South Arm. These are essentially discrete although a small leakage of birds between the two does occur. Being at the end of the migration route eliminates the complication of passage birds and allows positive statements to be made about the fluctuations and long-term trends of a relatively stable wader population.

The populations of three species are examined: Red-necked Stint *Calidris ruficollis* and Curlew Sandpiper *C. ferruginea* as the two most numerous migrant waders and Eastern Curlew *Numenius madagascariensis.*

Red-necked Stint-peak summer population (Fig. 1).

A steady increase is apparent from 1965 to 1969. Data from 1970 to 1973 are lacking or incomplete. Numbers again increase after 1974 through to a maximum population of 4000 birds in 1981. A steady decline has occurred between 1983 and 1989 to a present population of only 1320.

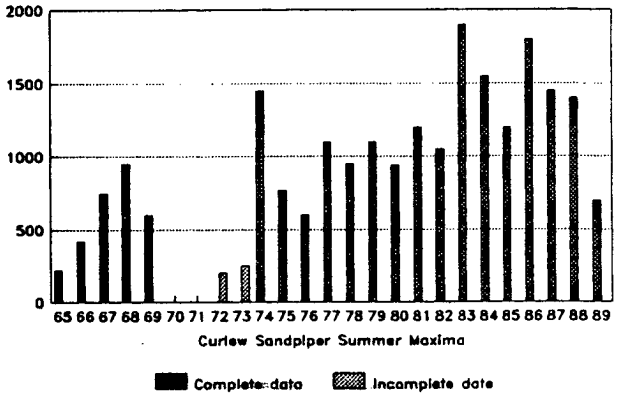
Figure 1. **RED-NECKED STINT Peak Summer Population**



Curlew Sandpiper - peak summer populations (Fig. 2).

Numerically less abundant, the Curlew Sandpiper population none the less shows essentially the same long-term trends if with greater annual variations.

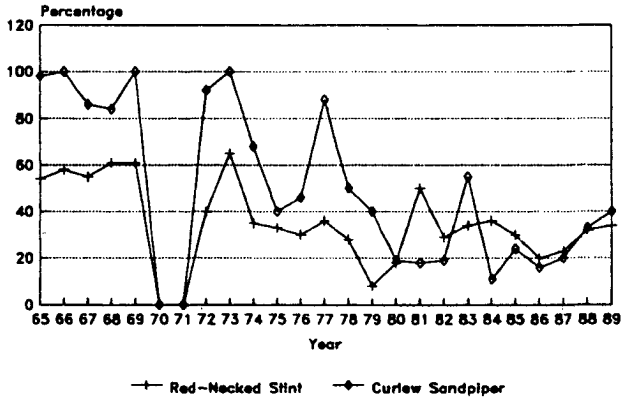
Figure 2. **CURLEW SANDPIPER Peak Summer Population**



Pitt Water Summer Distribution (Fig. 3).

The distribution of Stint and Curlew Sandpiper populations between Pitt Water and South Arm has been plotted by calculating the percentage of the total population present at each complex as illustrated by the Pitt Water results. A steady movement of both species away from Pitt Water in favour of South Arm over a long-term is shown characterised by a series of peaks and troughs. It may be that peaks coincide with high juvenile recruitment into the area initially favouring Pitt Water.

Figure 3 **PITT WATER SUMMER DISTRIBUTION**



Curlew Sandpiper - monthly counts at Pitt Water and South Arm 1980 to 1985 (Fig. 4a and b).

The Curlew Sandpiper tends to be a more opportunistic and hence more mobile species in its choice of feeding grounds. A comparison of monthly counts for the two areas shows an early season build-up of numbers at Pitt Water to a peak by October/November, followed by a gradual decline through to the onset of northward migration. In contrast, South Arm shows a late season peak in February/March followed by a sharp fall in numbers as migration takes place. A mid to late season movement from Pitt Water to South Arm is suggestive, perhaps coinciding with the exposure of additional food resources as areas such as Calverts Lagoon dry out.

Figure 4a **CURLEW SANDPIPER**
Monthly Counts

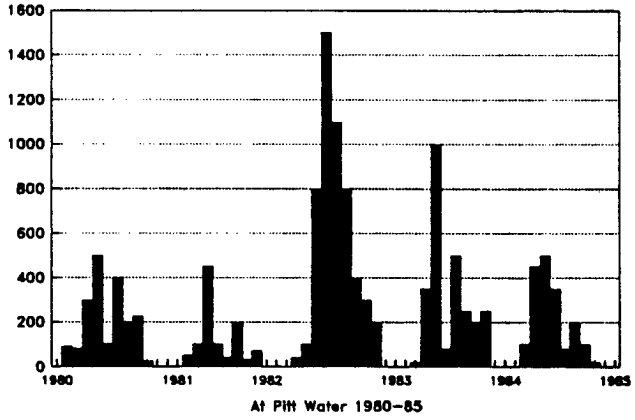
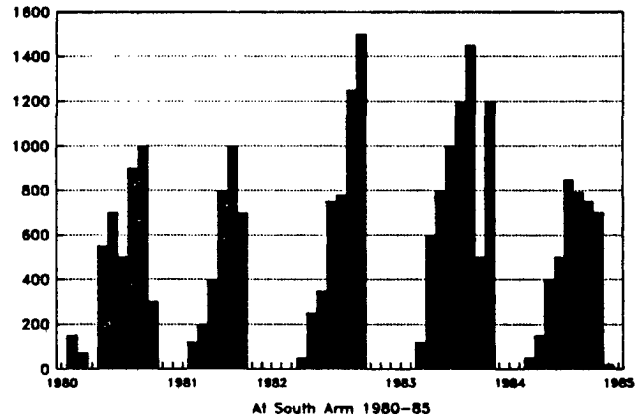


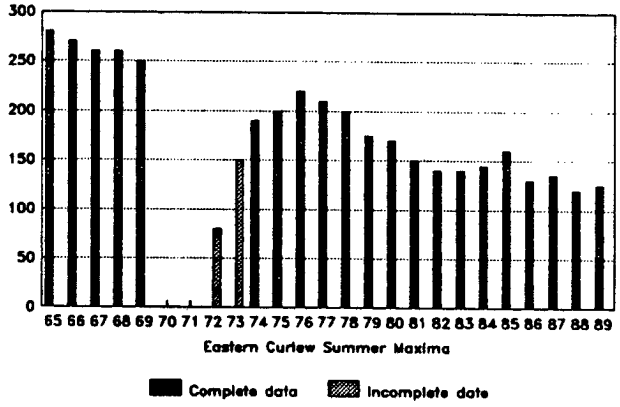
Figure 4b **CURLEW SANDPIPER**
Monthly Counts



Eastern Curlew Summer Population (Fig. 5).

Close and Newman have remarked upon the decline of the Eastern Curlew in South East Australia. Wall estimated its population in the Hobart area as between 500-600 birds in 1948-51. Over the period of these surveys a steady annual decline has occurred. By the year 2005 it may be a comparatively rare species here unless this trend can be arrested. The causes have not been identified but may relate to factors operating away from the area on breeding grounds or at flyway staging posts.

Figure 5. **EASTERN CURLEW**
Peak Summer Population



Summary

These analyses show the value and necessity for long-term monitoring programmes to identify wader population trends and changes in favoured wintering grounds. The causes must also be identified. Waders must have alternatives in terms of feeding grounds and secure roosts. Environmental decisions based on short-term studies do not define the conservation needs of waders.

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Oystercatcher Affairs

Mike Newman, 98 Nowra Road, Lauderdale, Tas. 7021

A study of Pied Oystercatchers in south-east Tasmania has been in progress for twelve years. The study has shown that the Tasmanian population has some unusual features.

The Oystercatchers are extremely sedentary, birds establishing breeding territories on average a mere five kilometres from their place of birth. Most birds first breed at six years of age, compared with four years in other populations. Consequently, there are large numbers of non-breeding birds. Breeding territories are at a premium. The probability of a juvenile Oystercatcher surviving to breed is approximately 15 percent.

Adult Oystercatchers are usually faithful to their pair bond.

Satellite Monitoring Of Wader Habitat

M.R. Fleming, Conservation Commission of N.T., Box 1046, Alice Springs, N.T., 0871.

The availability of wetland habitat suitable for waders in northern and inland Australia varies greatly both spatially and temporally. The vagaries of the summer monsoon mean that not all ephemeral wetlands are productive at the end of the wet season. While this is not an apparent problem for the birds, successful protection and management of wader habitat requires methods for monitoring the shifting location of these wetlands.

Digital images from the NOAA meteorological satellites provide a broad-scale coverage at low resolution (pixel size is $1km^2$) but have the advantage of a high frequency of passes and low cost per image. Daytime passes occur in the morning and mid-afternoon with each pass having an effective swath width of about 1500 km. Images are readily processed using the MicroBRIAN software on a desktop computer.

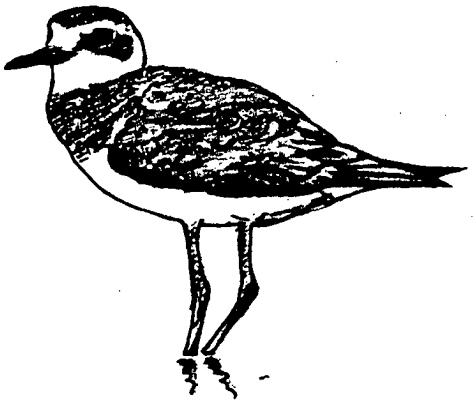
Using the visible and infra-red channels, night-time images and "greenness indexes" allows wetland habitat to be readily defined and monitored. Up to date information can be acquired rapidly with the entire process from satellite pass to processed image taking only three days. The methodology provides a cheap and efficient way of planning wader surveys in remote areas of Australia. Further refinement of the image analysis process will allow NOAA images to define wader habitats on a broad-scale.

The Southern Coorong: an Over-rated Habitat For Waders

David C Paton, 47 Gilbert Street, Gilberton, S.A. 5082.

The Coorong is regarded as a Wetland of International Significance based largely on the numbers of waterbirds that use the shallow lagoons. Migratory and non-migratory waders are prominent. A detailed survey of the distributions and abundances of these birds and their foods in the South Lagoon was conducted during 1984 and 1985. This lagoon is approximately 55 km long and 1.5 km wide. Water levels are highest in winter and spring and lowest in summer and autumn.

High salinities restrict the variety of aquatic foods that are available for birds. Only four items are important: seeds and turions of *Ruppia tuberosa*, chironomid larvae *Tanytarsus barbitarsis* and the small hardyhead fish *Atherinosoma microstoma*. These foods occur in vast quantities but are often time-consuming to collect and as a result few species of waterbirds can breed in the Coorong. During summer over 160,000 waterbirds, including 60,000 waders, were counted in the South Lagoon, and these seasonal peaks in abundance coincided with similar peaks in the abundance of food. However, food supply does not determine the number of birds that use the southern Coorong.



Five Years Of National Wader Counts In New Zealand

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

Members of the Ornithological Society of New Zealand began a series of national wader counts in November 1983 and by July 1988 had completed five counts each in summer (November/December) and winter (June/July). During these counts all major habitats were covered and the results provide information on the distribution and abundance of waders in New Zealand.

Summer counts provided the most reliable estimates of the numbers of migratory waders which reach New Zealand from the northern hemisphere. Bar-tailed Godwits *Limosa lapponica* were the most numerous of these and numbers ranged from 72,639 to 87,432. Next in order of abundance were Red Knots *Calidris canutus* (47,040 to 57,868), Ruddy Turnstone *Arenaria interpres* (4,420 to 5,922), Lesser Golden Plover *Pluvialis fulva* (303 to 1,120), and Red-necked Stints *Calidris ruficollis* (157 to 231)

Winter counts provided information on the population sizes of some of our breeding species and the numbers of arctic migratory waders which overwintered. The Pied Oystercatcher *Haematopus ostralegus* was the most numerous of the NZ-breeding species with counts ranging from 77,705 to 85,147. This was followed by Pied Stilts *Himantopus himantopus* (15,152 to 21,339), Double-banded Plovers *Charadrius bicinctus* (6,849 to 10,271), and Wrybilled Plovers *Anarhynchus frontalis* (2,867 to 4,418). Other NZ-breeding species tend not to flock at coastal sites in winter, so counts of these are not indicative of population size. Arctic migrants which do not migrate north to breed are assumed to be 1-year-old birds. Therefore, for each species the proportion of birds which remains for the subsequent winter indicated relative breeding success the previous year. These counts indicate that above average breeding success was achieved by Bar-tailed Godwits in 1987, Red Knots and Ruddy Turnstones in 1985, and Red-necked Stints in 1984 and 1987.

The harbours of the northern half of the North Island, plus Farewell Spit and the estuaries of the Nelson and Southland regions are the most important habitats for waders in New Zealand

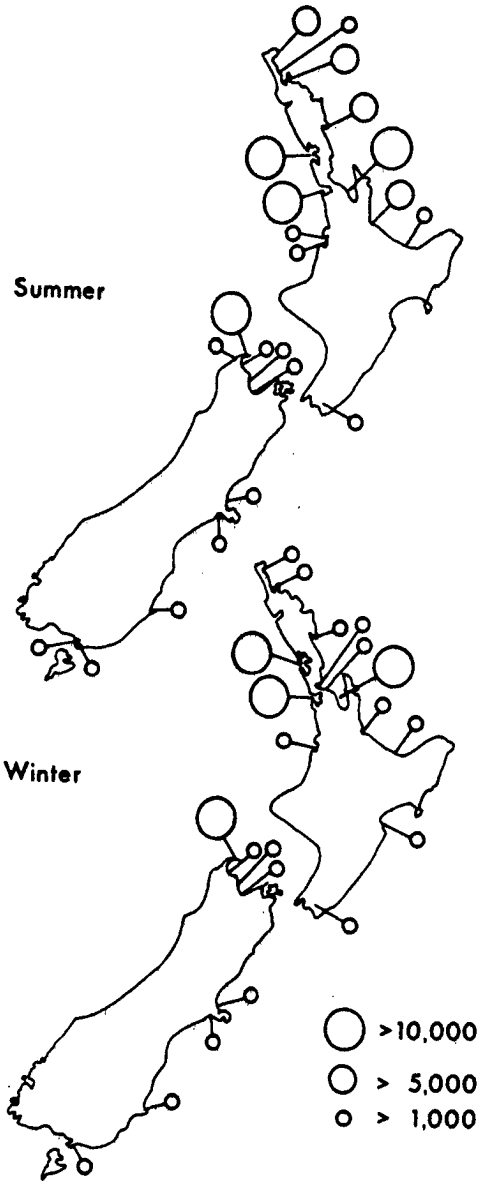


Figure 1. Sites in New Zealand which averaged >1000 waders during the OSNZ national wader counts, 1983-1988.

Wader Studies In South-east Asia

Duncan Parish, Asian Wetland Bureau, Institute of Advanced Studies, University of Malaya, Lembah Pantai, 59100, Kuala Lumpur, Malaysia.

Since 1983, INTERWADER (now the Waterbird Study Programme of the Asian Wetland Bureau) has been conducting wader studies in S.E. Asia. In the last six years, over

10,000 km of coastline have been surveyed and 29 key wader sites have been located and documented. Co-ordinated counts have been undertaken in fifteen Asian countries with 3,500 count forms received from 236 sites. New information has been collected on rare or little-known species especially Asian Dowitcher *Limnodromus semipalmatus*, Spoon-billed Sandpiper *Eurynorhynchus pygmaeus*, Nordmann's Greenshank *Tringa guttifer* and Eastern Curlew *Numenius madagascariensis*. As a result of surveys, the documented population of Asian Dowitcher has been increased from less than 1,000 to 15-20,000. In addition to surveys, considerable achievements have been made with banding, ecological studies, training, awareness and conservation of key sites.

The N.W. Australia Wader Expeditions 1981 - 1988

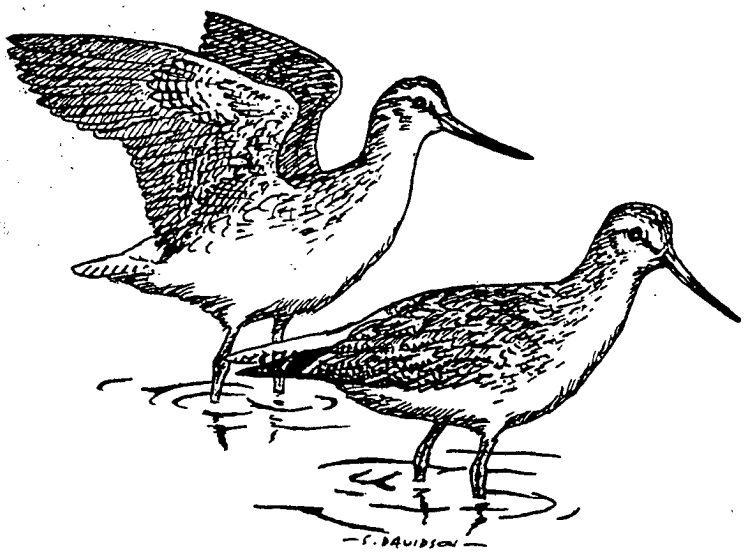
Clive Minton, 165 Dalgetty Road, Beaumaris, Vic., 3193.

The results of 11 special RAOU visits - ranging from major month long banding expeditions to small one week counting trips - to N.W. Australia between 1981 and 1988 are analysed.

The areas of Roebuck Bay at Broome, 80 Mile Beach and Port Hedland Saltworks were found to hold over half a million waders - nearly a third of the total peak population in Australia. Many species were found to be present in numbers far greater than previously known - particularly Great Knot. Aerial and ground counts were supplemented by radar studies. These revealed that birds were departing in a north-westerly direction in late March and April, under particular meteorological conditions (S.E. wind and clear skies).

20,248 waders of 33 species were captured during banding operations and these have produced a good crop of overseas recoveries - particularly in China. Ancillary biometric and moult data has aided the understanding of each species. Weights assumed by species before departure in March/April are sufficient to enable most to reach the Shanghai area in China in a single 3-day flight. On southward migration many small waders use N.W. Australia as a stopping off point before crossing the continent to S.E. Australia.

Recommendations are made for future wader studies in N.W. Australia.



Where Do Australia's Migratory Waders Breed?

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

For many years recoveries of bands from birds have provided essential information on their migratory movements and breeding ranges. In the case of waders, though, the extent and remoteness of the breeding sites means that few bands are returned from these areas, although recoveries from migration staging sites and some non-breeding areas can be numerous, especially in Europe.

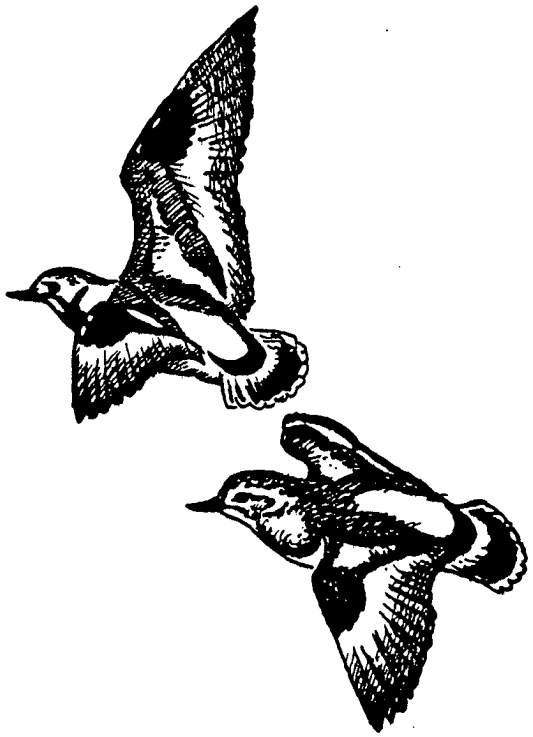
Fortunately, biometric information obtained from waders as they are being banded can do much to fill in the gaps in our knowledge of breeding sites, especially if measurements are available from the different sub-specific breeding populations.

Data obtained from the Australian populations of Red Knot *Calidris canutus rogersi*, Bar-tailed Godwit *Limosa lapponica* and Lesser Golden Plover *Pluvialis dominica fulva* will be used as examples of how successful this ornithological detective work can be. Often the results are unexpected!

Comparison of Australian wing and bill-length measurements for Red Knot with those recently published by Tomkovich for four Siberian breeding populations, shows that the sub-species which spends the non-breeding season in Australia breeds on the Chukotski Peninsular, in far eastern Siberia. Most references give Wrangel Island as the breeding site for rogersi, but both bills and wings of Wrangel Island birds are too long to be the Australian race.

Lesser Golden Plover *Pluvialis dominica fulva* breed from central Siberia eastwards to Alaska. Alaskan birds have longer wings than those from Siberia and are similar in length to measurements taken from Australian plovers. The origin of birds spending the non-breeding season in Australia is confirmed by the movement of an Alaskan-banded plover to New South Wales.

There are two recognised sub-species of the Bar-tailed Godwit *Limosa lapponica*, ie. *baueri* and *lapponica*. The former breeds in Alaska and eastern Siberia, the latter west from the Taimyr Peninsular. It is generally accepted that the sub-species occurring in Australia is *baueri*. Analysis of the Australian data shows that birds from north-western Australia have significantly longer bills and shorter wings than those from the south-east. The bill and wing-lengths of north-west Godwit match well the published data for *menzbieri* (Portenko), a sub-species which is not widely recognised and which breeds in central Siberia. Three band recoveries of Western Australian birds from these breeding grounds confirm the origin of this non-breeding population. The data for south-east Australian Godwit do not fit the published measurements for *baueri* particularly well. The lack of interchange between north-western and south-eastern Godwit and the proportionally fewer overseas recoveries of south-eastern birds (none in the breeding areas) indicates that this population breeds further to the east in Siberia and Alaska. The recovery of an Alaskan-banded bird in New Zealand supports this hypothesis.



– S. DAVIDSON –

THE WINTER 1988 POPULATION MONITORING COUNT

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

The winter 1988 wader count was held on the weekends of 25-26 June and 2-3 July. Wader species and numbers at the 23 monitored sites are given in Table 1. A total of 106 count sheets was returned, listing 35 species and 34,009 individuals. The count included 17,259 migratory waders from the northern hemisphere, 12,028 resident waders, 4,432 Double-banded Plovers and 290 unidentified waders.

This count was very similar to that obtained in winter 1987 (36,674 birds), the only large-scale differences being decreases for Black-winged Stilts (2,295 in 1987, 374 in 1988) and Red-necked Avocets (4,089 in 1987, 264 in 1988).

Perhaps the most interesting result from this count was the winter occurrence of 40 Lesser Golden Plovers in Victoria; immediately after I had written a count report explaining that the species leaves southern Australia for the winter (Hewish 1988). To my great surprise, I observed 3 birds myself while counting at Lake Connewarre on the Bellarine Peninsula, the first in my experience of winter counts; another 5 were on Mud Island in Port Phillip Bay, and 30 (!) at Stockyard Point, Westernport.

This increase in winter numbers was very localised to Victoria, and unusual numbers were not found elsewhere in southern Australia, in Tas., SA, or WA. However, in northern NSW and Qld, where the species normally overwinters, counts were slightly elevated. The count of 14 birds at the Clarence/Richmond estuaries (n.NSW) was higher than average, although not unprecedented in our count series. The total count for the three monitored sites in Qld was 45; high in comparison with previous totals of 27 (1982), 15 (1983), 20 (1984), 24 (1985) and 20 (1987), but still lower than the record count of 63 (1986). The record count in 1986 followed a year of excellent breeding success as determined by wader catch results, but even then numbers remained low in Victoria.

Why should winter 1988 be different? It is possible that the numbers of birds recorded in winter at Australian sites reflect not only breeding success in the previous year, but also environmental factors which determine movements within the non-breeding range. Some factor, as yet unknown, has inhibited or made unnecessary the normal northward movement of first-year birds, particularly in Victoria. Any ideas?

Another of my count reports (Hewish 1989) has been overtaken by a recent exciting discovery; nesting Banded Stilts at Lake Torrens in central SA. When I suggested that mass departure of Banded Stilts from the coast of south-eastern Australia heralded breeding somewhere in the remote salt lakes of the Lake Eyre basin, I was unaware of Ian May's long search for these unknown breeding sites. I and all other wader enthusiasts are delighted at his success. And, yes, the Banded Stilts left Moolap Saltworks just after the inland rain, and so the departure from the coast has at last been definitely linked to inland breeding in the eastern half of Australia.

The RAOU Scientific Day and the AWSG Workshop on wader research took place in May. After the excitement of those two days, I am left with the conviction that an incredible amount has been achieved in the last 9 years, mostly through the efforts of volunteer wader counters, banders and organisers. The Population Monitoring Project was generally seen as one of the most valuable of the AWSG's projects, especially for government agencies wishing to make informed decisions on conservation. But if we look at what has been achieved by long-term monitoring elsewhere in Australia and overseas, our project is still in its infancy, and I was pleased that there was agreement that it should continue past 1990. The AWSG's Scientific Sub-committee will now be investigating ways of continuing and expanding this project in the future. Although I will not continue as national co-ordinator after 1990, I am glad that, for many years to come, I will not have to contemplate a February or June without a wader count weekend.

Acknowledgements

I would like to thank the wader counters and regional organisers; Niven McCrie, Mike Bamford, Jamie Matthew, Brett Lane, Peter Menkhorst, Margaret Cameron, Jeff Campbell, Mike Carter, Val Curtis, Clive Minton, Peter Dann, Martin Schulz, Cathy Bulman, Alan Morris, Glenn Holmes, Greg Clancy, Jim Perry, Lindsay Bone, Dawn Magarry and Denis Watson.

My particular thanks to Stephen Davidson and Peter Haward for their hard work in collating the data sheets from the RAOU wader counts.

The Department of Conservation, Forest and Lands, Vic., supplies a boat and personnel for the counts of Corner Inlet and Mud Island. The RAOU supports this project through the Research Fund, and provides a computer for data analysis.

References

Hewish, M. 1988. The winter 1987 Population Monitoring Count: Lesser Golden Plovers over-wintering in Australia. *Stilt* 12: 41-46.

Hewish, M. 1989. The summer 1988 Population Monitoring Count: Banded Stilts at monitored sites in South-eastern Australia. *Stilt* 14: 14-20.

Table 1.

Result of the Winter 1988 Wader Count at 23 selected sites

	N.S.W.					VIC.						QLD.		
	Clarence/Richmond	Hunter Estuary	Parramatta River	Botany Bay	Shoalhaven Estuary	Corner/Shallow Inlet	Westernport	East Port Phillip Bay	Altona	Werribee/Avalon	Bellarine Pen./Mud Is.	Cairns Area	Mackay Area	Moreton Bay
Bush Thick-knee														
Beech Thick-knee													1	
Painted Snipe														
Pied Oystercatcher	8			18	11	796	251		18	52	80		224	8
Sooty Oystercatcher	3			2	6	236					1			
Masked Lapwing	9	6	6		46	40	145	15	17	142	299	14	17	21
Banded Lapwing														
Grey Plover						54				1	20		1	
Lesser Golden Plover	14			3		2	30				8	27		18
Red- kneed Dotterel														
Hooded Plover						63	1				8			
Mongolian Plover				5		2	44					20	88	
Double-banded Plover	60			154	136	1281	159		403	955	430			220
Large Sand Plover						2						3		
Oriental Plover														
Red-capped Plover	24	55		19	141	107	73		54	137	394		25	332
Black-fronted Plover			7					21		58	10			1
Black-winged Stilt		7		6				9	63	3	90	30	15	
Banded Stilt														
Red-necked Avocet		1												
Ruddy Turnstone				6		31	9			13	34			3
Eastern Curlew	18	140			5	184	131				5	22	69	71
Whimbrel	7	10					1					7	13	30
Little Curlew														
Wood Sandpiper														
Grey-tailed Tattler	28	4		14		10	2				8	73	6	
Wandering Tattler	1													
Tattler sp.													30	162
Common Sandpiper														
Greenshank	1	9				15	10		2	15	104		1	
Marsh Sandpiper									1		20			
Terek Sandpiper												4	2	
Latham's Snipe														
Snipe sp.														
Black-tailed Godwit	8	10				4								
Bar-tailed Godwit	197	620	39	419	510	1330	53				165	71	175	421
Red Knot		1		3		1700					73	1		
Great Knot	30					100					13	29	207	
Sharp-tailed Sandpiper											15			
Pectoral Sandpiper														
Red-necked Stint	11			62	30	1452	429		35	862	1544	58	163	21
Long-toed Stint														
Curlew Sandpiper	1	1	2			177				341	272	3		520
Sanderling	5					12								
Ruff or Reeve														
Broad-billed Sandpiper														
Oriental Pratincole														
Australian Pratincole														
Unidentified small														
Unidentified medium														
Unidentified large														
TOTAL	425	864	54	711	885	7598	1338	45	593	2579	3593	362	1037	1828

Table 1 Cont.

Result of the Winter 1988 Wader Count at 23 selected sites

	S.A.			W.A.		TAS.			N.T.	
	Western Eyre Pen.	South East Coast	Gulf St. Vincent	Albany Area	Swan Coastal Plain	East Derwent/Pittwater	Marion Bay	Cape Portland	Darwin Area	TOTAL
Bush Thick-knee										
Beech Thick-knee										1
Painted Snipe										
Pied Oystercatcher		17	4	29		464	112	22		2114
Sooty Oystercatcher		6		4		16	7	19		300
Masked Lapwing		76	23			493	2	37	94	1502
Banded Lapwing										
Grey Plover			26	4	1					107
Lesser Golden Plover			1			1			1	105
Red- kneed Dotterel			59							59
Hooded Plover	Not Counted	11					21	43		147
Mongolian Plover										159
Double-banded Plover		67	49			367	57	94		4432
Large Sand Plover									3	8
Oriental Plover										
Red-capped Plover		78	368	1	1	113	84	96	34	2136
Black-fronted Plover						2		2		101
Black-winged Stilt			42		5				104	374
Banded Stilt			5030							5030
Red-necked Avocet			263							264
Ruddy Turnstone		9	20					21		146
Eastern Curlew			1			9				655
Whimbrel						1			3	72
Little Curlew										
Wood Sandpiper			2							2
Grey-tailed Tattler		6						2	9	162
Wandering Tattler										1
Tattler sp.				8						200
Common Sandpiper									1	1
Greenshank			86			1				244
Marsh Sandpiper			16							37
Terek Sandpiper									6	12
Latham's Snipe										
Snipe sp.										
Black-tailed Godwit										22
Bar-tailed Godwit			29	18		38	7			4092
Red Knot						2			20	1800
Great Knot				60					50	489
Sharp-tailed Sandpiper										15
Pectoral Sandpiper										
Red-necked Stint		39	1895	20		151	2	25	150	6949
Long-toed Stint										
Curlew Sandpiper			633			6		3	5	1964
Sanderling										17
Ruff or Reeve										
Broad-billed Sandpiper										
Oriental Pratincole										
Australian Pratincole										
Unidentified small										
Unidentified medium			40						250	290
Unidentified large										
TOTAL		309	8587	144	7	1664	292	364	730	34009

WADER RESEARCH IN THE 1990'S - PRELIMINARY REPORT ON THE AWSG WORKSHOP, 29 MAY, 1989

On Monday, 29 May 1989, 38 people gathered at the University of Melbourne to review the last decade of wader research and to establish research objectives for the coming decade. The workshop was attended by AWSG project co-ordinators, active members, representatives of all state and territory governments (except New South Wales) and from non-government organisations in Australia, New Zealand and South-east Asia. The objectives of the workshop were outlined in the last issue of *Stilt*. (No. 14, p4).

In the morning, there were presentations by Marilyn Hewish and Clive Minton on the Population Monitoring Project, Richard Alcorn on the Regular Wader Counts Project, Paul Sagar and Brett Lane on resident wader studies, Kim Lowe (ANPWS) on data needs for conservation and Duncan Parish (Asian Wetland Bureau) on wader research and conservation priorities in East Asia. The afternoon session was devoted to four workshop sessions on the following topics: international co-operative studies; resident waders; feeding ecology; and current AWSG projects. A full report, including the morning papers and summaries of discussions and outcomes of the workshop sessions, will be published early next year. The reports below, prepared by the workshop chairmen, give an indication of the range of discussions and the directions for future projects which emerged.

The results of this workshop will be used as a basis for developing the AWSG research programme in the 1990's. This is expected to involve membership-based projects as well as the encouragement and support of more specific research by both amateurs and professionals. The need to generate information relevant to developing conservation guidelines will be an important consideration. The Scientific Sub-Committee of the AWSG will meet towards the end of this year to develop a programme for the 1990's based on the outcomes of the workshop. Before they do, members, especially those already participating in projects, are encouraged to contribute their thoughts on the ASWG research programme, and wader research generally, in writing to the research co-ordinator, so that these can be considered by the Sub-Committee.

Please send your comments to Brett Lane, Department of Zoology, University of Melbourne, Parkville, Vic. 3052.

INTERNATIONAL CO-OPERATIVE STUDIES WORKSHOP

Chairman, Clive Minton
Summar, Kim Lowe

A number of topics and actions were discussed in this session. These fell under three broad headings: important sites, information exchange and a conservation plan.

It was considered that important sites could be paired in a sister-site arrangement to act as a focus for conservation and for training of Asian wader researchers.

Information exchange was considered to be critical to the future development of wader studies in the region. Australia and New Zealand clearly held the greatest expertise and it was essential that this reached other countries in the region. Avenues for this were discussed and the *Stilt* was considered to be important. Because of currency problems, free copies of *Stilt* should be sent to appropriate people in the flyway (Asian Wetland Bureau could supply list of names and addresses). The possibility of setting up a flyway bibliography was flagged. A substantial list of references exist at the Asian Wetland Bureau but resources are required to formalise it and make it available.

The Asian Wetland Bureau requested more support for its activities from Australian wader enthusiasts. To this end, a series of expeditions could be arranged to key sites by small groups of Australian and local wader researchers. These would not only conduct worthwhile research but enable the local workers to be trained in a range of field techniques. The improvement in banding returns in the region since the establishment of a number of banding projects following training of locals attests to the success of training.

Conservation actions required in the flyway were discussed briefly. Things which could be done in the immediate future included the AWSG Management Plan for Australia Waders, now funded by World Wildlife Fund Australia. Management Plans for other parts of the flyway could be developed in the near future by the Asian Wetland Bureau.

Successful conservation depends on appropriate and comprehensive information on an area. This requires not just data collection, but analysis and presentation in a form suitable for management agencies as well. This should be borne in mind in all project plans.

STUDIES OF RESIDENT WADERS WORKSHOP

Chairman: Mike Clarke
Summar: Jeff Campbell

The AWSG Resident Wader Study has only recently begun and because of the illness of the project co-ordinator is not yet fully up and running. It was considered that studies of resident waders should have a conservation objective rather than a biological emphasis. To this end a document outlining the current knowledge on resident wader distribution, status, habitat requirements and breeding biology

should be prepared. This could be done along the lines of the Kangaroo Management Plan.

The paper should also list what are seen as the critical issues for each species, priorities for future effort and the critical gaps and questions on present knowledge. The document would be used to direct researchers in government, universities and AWSG and to advise fauna authorities of resident wader requirements. A review of the direction of emphasis for volunteers involved in the Resident Wader Study should be made on completion of the paper.

The current emphasis of the Resident Wader Study on the five species; Pied Oystercatcher, Masked Lapwing, Hooded Plover, Black-fronted Plover and Black-winged Stilt, should continue.

FEEDING STUDIES AND COMMUNITY ORGANISATION WORKSHOP

Chairman & Summar: Peter Dann

The session commenced with a review by the chairperson of past and present research on the feeding ecology of waders in Australia. The principal conclusion of this introduction was that our knowledge of the feeding ecology of most species of waders was inadequate for management purposes. The group considered what sort of information would be required for the future management of wader populations and how these requirements might be achieved. Most of the research topics suggested were related to either conservation/management issues or to the answering of biological questions with relevance to current theories.

Generally the management issues concentrated on threatened species, areas or processes. Studies of the feeding ecology of threatened species may identify the causes of population decline and priorities can be determined simply on the basis of degree of the perceived decline. Priorities for the Australasian species were similar to those established during the resident wader workshop earlier in the day. The Bush and Beach Thick-knees, Painted Snipe, Inland Dotterel and Hooded Plover were considered of high priority. For Palearctic species, the priorities require further consideration, although some species such as the Eastern Curlew require immediate attention.

Habitat reduction or modification for industrial or recreational purposes may result in reductions in the amount of feeding area available to waders, their access to it or the productivity of the feeding areas. Predicting the impact of such alterations requires a sophisticated understanding of the feeding ecology of the wader species and the availability and ecology of the food species. Priorities for this kind of study need to be decided on a regional basis in relation to the importance of the areas and the likelihood of habitat alteration.

Changes in land-use practices, recreational activity or pollution may interfere with the processes of feeding by reducing the productivity of feeding areas, by increasing the energetic costs of feeding or by causing the waders to accumulate pollutants. Priorities in this field may come from concerns about particular populations or areas but also may arise when distribution and behaviour or, more significantly, survival and breeding success are effected.

Apart from management issues, the other direction of feeding studies considered during the workshop was the investigation of biological questions with relevance to current theories. Although optimal foraging theory has been around for over 20 years, theoretical models of foraging continue to outweigh those based on field observations of birds feeding. Waders can be suitable subjects for testing the predictions of these models. The sexual dimorphism in beak sizes of waders is another aspect of their biology which presents many opportunities for comparatiave studies of energetics, predator-prey relationships and, perhaps, sexual selection.

Studies of the foraging of waders usually require considerable experience and expertise which make them difficult for large-scale co-operative projects. Some possibilities for wader study groups which were raised during the workshop included the movements of waders between feeding areas and roosting sites and the non-destructive sampling of stomach contents of birds caught during cannon-netting operations ie. emetics.

The most productive groups of people studying wader feeding overseas usually centre around a university or research station where some continuity of expertise exists. It was considered during the workshop that the establishment of a centre of interest in a university or observatory would be the most effective means of developing the experience and skills necessary to promote feeding studies. Broome Observatory appears ideally placed for such a centre, being adjacent to feeding grounds of international significance.

Other catalysts were mentioned that may encourage more research on wader feeding and these included the preparation of a manual on the methods of recording feeding behaviour and sampling available foods, and the development of projects suitable for tertiary students.

REGULAR COUNTS AND POPULATION MONITORING WORKSHOP

Chairman & Summar: Mark Barter

These projects have been running since 1986, although both can draw on data collected during the RAOU Wader Studies Programme which ran from 1981 to 1985. The projects have an initial duration of five years and the purpose

of the workshop was to review progress to date and determine whether either should continue and, if so, in what form. Specific questions addressed were:

- Is the project likely to meet its objectives? If not, where?
- What are the problems, if any?
- Do the objectives need revising?
- What is the time frame for completion? - For analysis?
- What resources are required?

The Population Monitoring Project is monitoring year-to-year changes at 23 sites. Population changes can be explained in terms of reproductive success, drought, flooding of ephemeral wetlands and local habitat alterations.

It was felt that the project was providing very useful data on wader species that occur in reasonable numbers in the coastal regions of southern Queensland, New South Wales, Victoria, Tasmania, South Australia and south-western Australia. However, the project is not achieving its monitoring objectives with respect to:

- waders that are only abundant in north-western Australia, eg. Great Knot, Large Sand Plover, Terek Sandpiper.
- inland waders, such as Oriental Pratincole, Little Curlew, and
- dispersed waders, eg. Red-kneed Dotterel, Inland Dotterel, Red-capped Plover.

The workshop view was that priority should be given to north-west waders, followed by inland species. The Asian Wetland Bureau suggested that emphasis should be placed primarily on:

- the Oriental Pratincole (under heavy hunting pressure in Indonesia),
- the Asian Dowitcher (a rare bird for which the Australian population has not been estimated),
- Great Knot and Black-tailed Godwit (little information available on either of these species).

The AWB also suggested that the AWSG should review its estimates of the abundance of wader species in Australia, as this information is essential for estimating the importance of Asian sites, particularly with respect to potential Ramsar nominations.

The major problem involved in obtaining the missing data is that of logistics due to the remoteness of much of the habitat, eg. north-western Australia and the Gulf of Carpentaria, and the nomadic nature of some of the species, eg. Little Curlew and Oriental Pratincole.

It was agreed that the original objectives of the Population Monitoring Project are still valid but that there is a need to enlarge the project to cover the wader groups currently being missed.

The strong view of those present was that the project should continue indefinitely, as the monitoring of populations is a long term and on-going requirement. However, it was felt that the initial detailed analysis should commence in 1991, after the project had been running for five years. For many sites this would mean that ten years of data would be available.

The Project Co-ordinator believes that the amount of work involved in running the project and writing interim analyses is greater than one person can reasonably cope with, especially in their spare time, and recommended that an assistant be appointed. She also felt that a person should be employed to carry out the detailed analysis in 1991 and estimated that this would take about three months. It was suggested that this would be a good project for a tertiary student.

The Regular Count Project involves at least monthly counts at 43 sites with the objective of determining:

- the timing of arrival, departure and migration of long-distance migrants,
- the timing of flocking and movements of Australian-breeding species,
- the responses to drought and flood by inland species.

The majority of sites occur in the eastern coastal, south-eastern inland and south-western coastal regions.

It was generally agreed that the departure and arrival times of long-distance migrants had been adequately defined. This was even the case with waders in north-western Australia as a number of expeditions have been made there during arrival and departure periods.

However, only sketchy information is being obtained for Australian-breeding and inland-occurring species, especially non-wetland waders. Particular species with data shortage are Banded and Black-winged Stilts, Red-necked Avocet, Red-kneed Dotterel, Red-capped Plover and Sharp-tailed Sandpiper.

It was suggested that the data collection on long-distance migrants stop at the end of 1990 and that it be analyzed in early 1991, possibly in conjunction with the Population Monitoring Project data.

A general recommendation was made that the AWSG develop a project aimed at collecting data on inland-occurring waders. This may need to be a mix of regular counts and expeditions. It may be possible to use satellite data to detect ephemeral wetland areas for study. This technique is already being used by Northern Territory Conservation Commission.

ASIAN WETLAND BUREAU

AWB NEWS

The first half of 1989 saw the continuation of AWB's training and survey activities, with progress made towards gazettement of some sites of outstanding importance for migratory waterbirds, in the Philippines and Indonesia.

In March a three week training course at Xuan Thuy, Vietnam's Red River delta Ramsar site, included practical sessions on wetland assessment, waterbird identification and drawing up a management plan for the reserve. Xuan Thuy is an important non-breeding site for endangered species such as Black-faced Spoonbill *Platalea minor* and Saunders' Gull *Larus saundersii*, as well as for large numbers of shorebirds. A similar course was undertaken, also in March, at Kukut, in Peninsular Thailand, principally for Forestry Dept officials and students of the Prince of Songkla University. The Non-Hunting Area at Kukut includes a large freshwater lake, surrounded by rice fields, which is used by large numbers of migrant and resident waterfowl.

The Australian National Parks and Wildlife Service (ANWPS) (via ICBP-Australia) funded a two week banding course in Shanghai, organized in conjunction with the Chinese National Bird Banding Centre (NBBC) and the East China Waterbird Ecology Study Group (ECWESG). The course was run by Wang Tian Hou (ECWESG) and Doug Watkins. Five Australian banded birds were recovered during the course. Adding to the 20 recovered from this site in recent years, this makes the Shanghai area the most productive for international recoveries of Australian banded shorebirds. A Spoon-billed Sandpiper *Eurynorhynchus pygmeus* was among the 283 birds banded. A full report of the course is included in the first issue of the ECWESG Newsletter, which is available from Wang Tian Hou, Biology Dept, East China Normal University, 3663 Zhongshan North Road, 200062 Shanghai, China.

AWB survey work has included a multidisciplinary project looking at Malaysian peat swamp forest, a brief survey of the proposed reserve on Pulau Bruit, Sarawak, a coastal survey of parts of Bangladesh (see last issue) and a comprehensive study of the threatened wetlands of Northeast Thailand. Drainage and reclamation, including some massive projects on the Mekong River, threaten the few wetland areas that remain in Thailand. Five internationally important sites were identified in the study area, being of particular importance to migratory wildfowl, herons and egrets.

Following completion of the Directory of Asian Wetlands, a companion volume - "A Status Overview for Asian Wetlands" has been prepared at AWB-HQ. A joint AWB/World Wide Fund for Nature (WWF) project, it summarizes the main points arising from the directory, and identifies priorities for conservation action, based on an evaluation of the importance of, and degree of threat to individual wetlands. This will be available from AWB shortly.

In the Philippines, AWB became "official" in March, under the name Asian Wetland Bureau Philippine Foundation Inc. (AWB-PFI). Surveys of major wetlands in Negros and Mindanao were completed, while projects covering Panay and Palawan are planned. The information gathered in these surveys will be included in the Philippine Wetland Inventory, now in its final stages.

Effective lobbying of local and international support for the protection of Olango Island in the Visayan region, by AWB-PFI, has resulted in a detailed study by a Composite Working Committee of interested parties. Reserve boundaries have now been delineated and papers for the formal declaration of Olango as a protected area are now being finalized. Visitors this spring (including Mark Barter of RAOU) have been treated to some good waterbird numbers on this beautiful island. Recent observations of up to 92 Chinese Egrets *Egretta oeulophotes* in March (with c 70 still present in late April) suggest that the island is an important non-breeding area for this endangered species (whose world population is estimated at c 2,000 birds). Funds are now being sought to assist in the protection and management of the reserve following its gazettement.

AWB-Indonesia, in co-operation with the Directorate General of Forest Protection and Nature Conservation (PHPA) of the Indonesian Government, has been active in several surveys of important wetlands. A comprehensive survey of Bintuni Bay, Irian Jaya, will hopefully provide the field data necessary for gazettement of this outstanding area of mangroves as a nature reserve. This will hopefully provide protection against the insatiable demands of the mangrove chip paper industry which has recently set up operations there. Six previously undescribed species of fish were discovered in the survey.

In South-east Sumatra, a meeting of developers and government officials is planned in July, to discuss the fate of the Banyuasin-Sembilang mangrove and swamp forests. The undisturbed forest and adjoining mudflats, covering

some 200,000 ha. is the best example of a pristine swamp forest ecosystem remaining in the Indo-Malayan region, and has an exceptional species diversity. Recent discoveries there include the world's largest breeding colony of Milky Storks *Mycteria cinerea*, an estimated 1,000 nests; the second nest ever discovered of the even rarer Storm's Stork *Cinconia stormi;* and a non-breeding population of 13,000 Asian Dowitchers *Limnodromus semipalmatus*. Half a million waders are estimated to use the area annually.

Other AWB-Indonesia projects include the production of a film on mangrove ecology, translation of the Indonesian Wetland Inventory (to Indonesian), and a training programme for 20 Indonesian Conservation officers.

Finally, strengthening AWB's Antipodean connections, Roger Jaensch, formerly an RAOU Field Officer, joined AWB as Projects Manager in July. He replaced Crawford Prentice, who after spending over 3 years at AWB, has returned to UK to further his studies. Crawford's tireless and highly effective work and cheerful presence will be a hard act to follow, but Roger's track record leaves him well equipped to take up the challenge!

David Bakewell
Publications and Information Officer

SHOREBIRDS OF THE SALT PONDS AT THE GREAT VEDARANYAM SALT SWAMP - TAMIL NADU, INDIA

K. Sampath and K. Krishnamurthy, Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai, 608 502 Tamil Nadu, India

Although a great deal of work has been done on the distribution and ecology of shorebirds, it appears that scant information in available on the shorebirds frequenting salt ponds. Salt ponds are highly productive of macrobenthos, fishes and other animals which form the staple diet of shorebirds and other aquatic birds. Thus, salt ponds serve as an ideal habitat for birds, as has been reported by Anderson (1970) and Davis (1978). Besides salt ponds, high salinity natural salt lakes serve also as an important feeding ground for many kinds of birds (Jehl, 1986 and Mahoney and Jehl, 1985).

The aim of this study, which was carried out between November 1984 and March 1987, was to find out the suitability of salt ponds for shorebirds at the Great Vedaranyam Salt Swamp (for brevity it will be referred hereafter as the Vedaranyam Swamp).

The Study areas:

The Vedaranyam swamp area is located on the Bay of Bengal seaboard of Thanjavur district of Tamil Nadu (10 deg. 18'N; 79 deg. 51'E) India. The swamp, extending over an area of 2,400 ha, is interspersed in the waterlogged areas with numerous small islets. The entire swamp is bounded to the south by the Palk Strait (Fig. 1). The swamp is bordered on the north by man-made dykes of mudwall beyond which lie villages and arable lands. Enclosed inside the swamp are vast, muddy intertidal flats.

Large scale exploitation of Industrial Grade Salt and Table Salt is carried out from the swamp area. The salt industry has formed 20 salt ponds for the purpose of salt extraction. Only 7 ponds are now functional, the remaining 13 ponds having been abandoned. The area of each salt pond is a little over 1 sq. km.

These salt ponds can be classified, based on the presence of sea water in them, into perennial salt ponds and seasonal salt ponds. The 7 salt ponds are all seasonal.

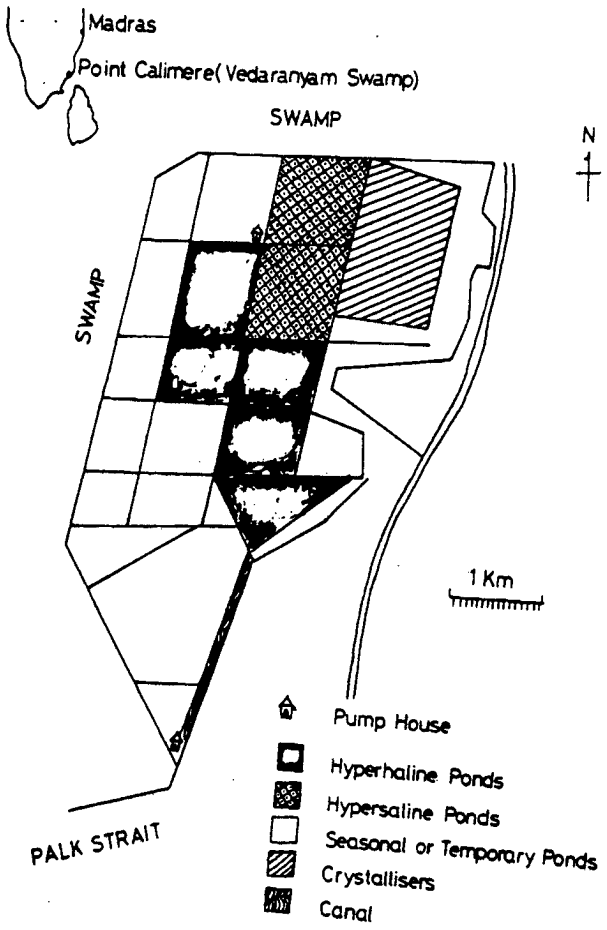


Figure 1.

The perennial salt ponds can be classified into hyperhaline ponds (the salinity of water ranges from 40 to 80 ppt) and hypersaline ponds (above 80 ppt) adopting the classification made by Por (1972). There are 5 hyperhaline ponds and 2 hypersaline ponds. Except during the monsoon, when they receive rain water, these ponds are filled with water pumped from the adjacent sea through a Pump House located on the shore (Fig 1).

The Seasonal Salt Ponds receive water from the adjacent sea through neretic inlets during the southwest monsoon especially during May. High winds at this season blowing from the sea to land facilitate the flow of sea water into the salt ponds. Also these ponds receive rain water during the northeast monsoon in October to December.

The salt pans (crystallisers) are situated at the extreme end of the hypersaline ponds (Fig. 1). Many salt pans have been constructed in a vast area for the purpose of extracting salt from the highly saturated waters of the hypersaline ponds.

Macrobenthos

The macrobenthos was studied in all three categories of salt ponds. In the perennial hyperhaline and seasonal salt ponds, polychaetes, chironomid larvae and amphipods were common and occurred in higher density. In the perennial hypersaline ponds pupae and larvae of ephydrid flies were commonest (Table 1). The mean density of benthos (all the components of benthos) was the highest at the perennial hyperhaline ponds, where it was 21,180 organisms/sq.meter, followed by seasonal salt ponds (14,300 organisms/sq.meter) and hypersaline ponds (12,770 organisms/sq.meter). In all these ponds the density of macrobenthos reached its peak value during the monsoon (especially November) and henceforth started declining.

In the hypersaline ponds the production of the brine shrimp, *Artemia* sp. reached its peak during September and its density was found to decline thereafter and it disappeared completely during the end of December. At the time of formation of *Artemia* in the salt ponds, the salinity of the water was high, running up to 175 ppt. When the monsoon set in during October, the salinity started decreasing to 50 ppt during December, such that decline in *Artemia* could have been due to decreasing salinity. However in the salt pans, the salinity of sea water reaches up to 650 ppt during summer (May); but during monsoon season, the salinity drops drastically due to monsoonal rains. During that season the salt pans began production of chironomid larvae.

Shorebird Population

In the Vedaranyam Swamp, 47 species of both migratory and non-migratory shorebirds have been recorded (Sugathan, 1982). However, only 39 species were observed during the course of the present study. The most common species were the Little Stint *Calidris minuta*, the Marsh Sandpiper *Tringa stagnatilis* the Curlew Sandpiper *Calidris ferruginea* and the Mongolian Plover *Charadrius mongolus*. The population of *Calidris minuta* during the peak season (November to January) reached about 25,000 in the study area. The maximum population of the other three species was around 15,000 each. The non-migratory species of the swamp are the Red-wattled Lapwing *Vanellus indicus*, the Yellow-wattled Lapwing *Vanellus malabaricus*, the Little Ringed Plover *Charadrius dubius* and the Kentish Plover *Charadrius alexandrinus*.

Arrival of birds and the availability of food items

Migratory shorebirds occur in the swamp from September to March every year. The population reaches its peak between November and January. When birds start arriving in September, all the seasonal ponds are dry, but the perennial hyperhaline ponds remain functional, with a water depth of up to 60 cm. Fortunately, at this juncture, the hypersaline ponds commence the production of *Artemia* sp. This forms the basic source of food for the birds in this area, residents as well as migratory (Anderson, 1970; Cramp and Simmons, 1983; Mahoney and Jehl 1985 and Jehl, 1986). Also the *Artemia* sp. are driven ashore by the prevailing wind current where they are preyed upon by *Calidris minuta*.

The monsoon sets in during October and continues until the end of December, irrigating the seasonal ponds. These are then colonized by various components of macrobenthos. Meanwhile, in the perennial hyperhaline and hypersaline ponds, the salinity decreases with the addition of rain water.

Table 1. Mean density (organisms/m sq) of different components of common macrobenthos in three habitats at the Vedaranyam Swamp.

Macrobenthos		Perennial salt ponds		Seasonal salt ponds
		Hyperhaline	Hypersaline	
1.	Polychaetes	4210	970	3460
2.	Chironomid larvae	1000	2550	4260
3.	Ephydrid pupae	1450	5500	350
4.	Ephydrid larvae	310	4750	2250
5.	Ostracods	850	180	900
6.	Amphipods	10470	225	2270

With the decreasing salinity in the hypersaline ponds, the *Artemia* sp. production decreases. But to offset the production loss, other components of macrobenthos start colonizing these ponds. So the hypersaline ponds maintain their attraction to shorebirds during the periods of both high and low salinity. During the monsoon many species of shorebirds are found distributed all over the swamp area.

Despite the fact that the perennial hyperhaline ponds had a higher production in terms of macrobenthos than the seasonal salt ponds, the highest densities of shorebirds could be seen in the seasonal salt ponds. This was perhaps because of the very shallow water in the seasonal ponds (up to 15 cm). A decline in the density of benthos after November may be due to predation by shorebirds (Baird et al., 1985; Piersma, 1987) and also by fishes (Peterson and Peterson, 1980).

Food habits of Shorebirds.

To confirm the food habits of some of the four common species of shorebirds, gut contents were analysed for a period of four months from December 1986 to March 1987. The single most preferred food of *Calidris minuta* and *Charadrius mongolus* was chironomid larvae, whereas for *Calidris ferruginea* it was polychaete *Ceratonereis costae*, and for *Tringa stagnatilis* it was amphipods *Grandidierella sp.* These food items did not form the bulk of the food when compared to the other food items in total. Variation in the preference of different food items could be seen in all the four species and in all the months. So it could be inferred that all the four species are opportunists in their food preference. Recher (1966) in his study on various species of shorebirds concluded that the birds studied were opportunists. Apart from the single most preferred food items the other food items were *Apseudes, Artemia,* bivalves gastropods, pupae and larvae of ephydrid flies, ostracods, copepods, foraminiferans and other unidentified materials. Among the many studies on the food habits of shorebirds, those of Reeder (1951), Bengston and Svensson (1968), Davidson (1971), Puttick (1978), McLachlan *et al.*, (1980), Zwarts and Drent (1981) and Hockey (1983) are in support of the present findings. The *Apseundes* was preyed upon only by *Charadrius mongolus* but in very small quantities. *Tringa stagnatilis* was not found to feed at all on polychaetes.

Despite the fact that many species of shorebirds were seen in appreciable numbers in the perennial hypersaline ponds, during the time of *Artemia* sp. production the percentage composition in their gut was very low in all the four species studied (Table 2). This was because gut contents were only analysed from December, when the availability of *Artemia* sp. had decreased considerably. *Artemia* sp. has already been reported as a prey item of *C. minuta* by Cramp and Simmons (1983), but there appears to be no literature recording the use of *Artemia* sp. as food by *C. ferruginea, T. stagnatilis* and *C. mongolus.*

Conclusion

The functioning of the salt industry with the formation and use of salt ponds favours shorebirds and other aquatic birds in many ways. Since the period of peak bird season (November to January) becomes off-season for salt production, salt ponds are fully utilized by the birds. The bunded salt ponds retain water which helps to reduce the salinity after the onset of the monsoon. This lowering salinity initiates the colonization of many components of macrobenthos which are utilized by considerable numbers of shorebirds.

Table 2. Percentage frequency of different food items in the gut of four species of shorebirds during the study period.

	Food items	*C. minuta*	*C. ferruginea*	*T. stagnatilis*	*Ch. mongolus*
1.	Chironomid larvae	38.87	13.84	22.1	39.13
2.	Amphipods	0.77	11.01	37.8	6.68
3.	Apseudes	-	-	-	2.87
4.	Artemia	1.62	0.33	1.5	0.63
5.	Polychaetes	1.46	33.13	-	14.11
6.	Molluscs	4.85	15.69	6.2	14.99
7.	Ephydrid pupae & larvae	15.78	10.84	12.3	6.22
8.	Beetles	0.62	0.87	2.0	2.45
9.	Ostracods	6.46	2.51	4.5	2.66
10.	Copepods	20.09	5.23	6.0	2.25
11.	Foraminiferans	8.24	5.56	5.8	6.58
12.	Unidentified forms	1.23	0.98	1.8	1.41

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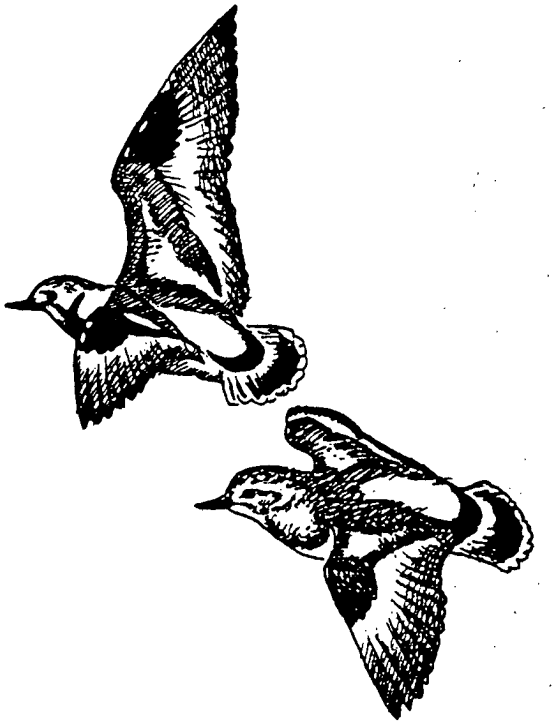

-S. DAVIDSON-

HOODED PLOVERS, PIED OYSTERCATCHERS AND A WINDY WEEKEND AT DISCOVERY BAY, VICTORIA

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

On 14 October, 1988, my husband and I set out on a 3-day walk along Discovery Bay, between Nelson and Cape Bridgewater on the far west coast of Victoria, to survey the beach for the AWSG's Victorian Hooded Plover and Pied Oystercatcher Survey (Murlis 1989). Summaries of the survey results for the three states involved have been published in *Stilt* (Morris 1989; Murlis 1989; Stewart 1989), but here I present a more detailed account of our experiences and observations on this beautiful stretch of coastline.

Our itinerary was: 14 Oct., Nelson to White Sands, 7 km; 15 Oct., White Sands to Swan Lake, 26 km; 16 Oct., Swan Lake to the first cliffs of Cape Bridgewater, 18 km: total distance, 51 km (calculated from distances marked on National Parks signs).

The walk was memorable mainly for the appalling weather; gale-force westerly winds, black squalls of heavy rain and hail blowing horizontally, and flying sheets of stinging sand and spray; the wind whistling through our pack frames; the flapping of the tent; the roar of the ocean; the hiss of the waves rushing up the sand; the long stretches of soft sand; and the eternal struggle to keep notebooks, binoculars and feet dry.

Our reward was a count of 55 Hooded Plovers and 47 Pied Oystercatchers. Because of limited time and the dreadful weather, we did not check the sand dunes behind the beach, although birds may have been sheltering there from the wind. We did however walk close beside all areas of beach-washed seaweed, to flush sheltering birds, but avoided walking over the seaweed itself so that we would not trample nests and attract ravens. We did not have time to make careful searches for nests, and consequently found none.

Tables 1 and 2 show the counts and densities of Hooded Plovers and Pied Oystercatchers in Discovery Bay. For habitat description, the walk was divided into 4 sections, on the basis of the location of convenient distance markers. Along broad, flat beaches, beach-washed seaweed occurred patchily in wide strips along the high-tide line. Most such strips were small, but ranged up to 100s of metres in length. Seaweed was scattered in many small low hummocks, built up on the windward side with sand, and separated by bare sand.

Wherever seaweed had been cast up, there was also an impressive collection of beach-washed debris, including light bulbs, plastic bags, bottles, fishing and cray-pot floats, planks, nerve gas testing kits and an ominous-looking metal canister with faded military markings and warning labels! High dunes backed the beach, except where they were interrupted by inlet entrances, rocky promontories or headlands with steep cliffs. Most frontal dunes were grassy with bare areas, but often those beyond were bare or covered with low coastal scrub. We saw only 4 other people on the beach and a 4-wheel drive on the dunes, all near roads coming down to the shore.

The Hooded Plovers were in 20 groups; 2 single birds, 11 pairs, 2 groups of 3, 2 groups of 4, 2 groups of 5 and one group of 7. All were in adult plumage. Most birds (46/55) were in patches of seaweed; so consistent was the association that we soon approached each seaweed patch with the expectation of seeing a group of Plovers. The birds were crouching or standing behind seaweed hummocks or debris built up with sand, as shelter from the fierce wind. Only 9 were away from seaweed clumps; 2 at the water's edge on Nelson Spit (a very exposed position), 2 on a sheltered beach enclosed by cliffs, and 5 on the sandy shore of an inlet entrance. Birds ran ahead when flushed, eventually going down to the water's edge and flying low over the sea to land behind us. One of the single birds was with a group of 3 Red-capped Plovers, running and flying with them when disturbed. Otherwise, Hooded Plovers did not seem to associate closely with other birds, although Red-capped Plovers and Red-necked Stints also sheltered among seaweed clumps. Ravens were common on the beach along the high-tide line, especially where there was abundant debris. One Hooded Plover acted aggressively, flying low and fast over our heads and calling loudly when disturbed, but a brief nest search was unsuccessful.

Density (birds/km) was very variable between the 4 areas (Table 1). In high-density stretches, the Hooded Plover groups were on average both larger and closer together. The highest density (1.9 birds/km) occurred on wide flat beaches with seaweed (Cape Montesquieu - Swan Lake); the lowest (0.3 birds/km) on narrow, steep beaches with little seaweed and waves washing up to the base of the dunes (Swan Lake-Cape Bridgewater). Where there were long stretches of headlands, with only a few small beaches at the cliff bases (White Sands - Cape Montesquieu), densities were lower.

The Pied Oystercatchers were in 23 groups; 10 single birds, 10 pairs, 2 groups of 4, and 1 group of 9. Groups were encountered in a variety of situations, many among seaweed, but also on bare sand from the water's edge to the base of the dunes, on lower slopes of frontal dunes, and (1 bird) perched on a cliff-top overlooking the sea. Many were in exposed situations as, even among seaweed, the hummocks were generally too small to offer shelter for Pied Oystercatchers. On being disturbed, birds ran ahead for a short distance, and then flew ahead or behind, over the sea, beach or sand-dunes. One of the single birds accompanied a Sooty Oystercatcher, and they ran and flew together when disturbed. Pied Oystercatchers did not associate closely with other bird species, even where several species were present together among seaweed. They were found in good numbers on the steep

beach between Swan Lake and Cape Bridgewater, where very few other birds occurred.

Pied Oystercatcher densities (birds/km) were not as variable between areas as for Hooded Plovers. The higher density from Cape Montesquieu - Swan Lake arose mainly from an increased average group size; there was one group of nine birds in this area. Density, group size, and distance between groups was not lower for Swan Lake - Cape Bridgewater than for other sections, indicating that Pied Oystercatchers use both wide, flat beaches and narrow, steep beaches, and do not require areas of seaweed.

These results confirm the Hooded Plover's preference for wide flat beaches with abundant seaweed. It is thought that seaweed areas are favoured because they provide good nesting and feeding habitat but, under conditions such as we experienced, the need for shelter could also be important. The beach on Discovery Bay is very exposed, and there are often strong westerly winds (National Parks staff, pers. comm.). Larger birds must either tolerate exposed conditions (eg. Pied Oystercatchers) or shelter in the dunes (eg. Whimbrels, see bird list below).

The count of Hooded Plovers on Discovery Bay in 1988 was comparable with the highest obtained in previous surveys; 60 in 1982, 56 in 1984. The count for 1986 was only 20, and it was thought that birds sheltering from strong winds and rain in the dunes were missed. Our comparatively high count in 1988 indicates that few birds were missed, although the weather appeared to be equally unfavourable this year (I took part in both counts).

The density of Hooded Plovers along Discovery Bay (1.1 birds/km) was above average, in comparison with densities obtained for all beaches surveyed in Vic., SA and NSW (0.7, 0.4 and 0.2 birds/km respectively)(Morris 1989; Murlis 1989; Stewart 1989). In Vic., only 8 stretches of beach supported a higher density than the most favoured section, Cape Montesquieu - Swan Lake, and only 2 did so over a comparable distance (Murlis 1989). Discovery Bay is clearly important for Hooded Plovers as it provides one of the longest, uninterrupted stretches of suitable feeding and nesting habitat in the state, and because, at the moment, it suffers relatively little human disturbance.

Despite the weather, I found many things to enjoy during the survey, especially the close encounter with so many Hooded Plovers and the experience of that long, wild stretch of sea and shore. There was even a perverse satisfaction in surviving in the open against the worst the elements could throw at us, but I will never again believe the regional organizer when she assures me that Hooded Plover Surveys are held in fine, sunny weather.

We did little bird-watching, because of the weather and our pre-occupation with survival, but birds recorded on the beach on dunes or over the sea are listed below:

Wader Species

Sooty Oystercatcher: 1 with Pied Oystercatcher, on beach beside rocky headland.

Masked Lapwing: 1 by swampy inlet behind dunes, White Sands; 1 on beach at Swan Lake entrance.

Red-capped Plover: about 30 birds in groups of 2-3; among seaweed hummocks, on gently-sloping dune faces, shores of inlet entrances.

Red-necked Stint: about 20 birds, groups of up to 5. Among seaweed hummocks.

Sanderling: 1 bird, at water's edge on bare sandy shore.

Ruddy Turnstone: 3 birds. 2 on shore of inlet entrance, 1 among seaweed hummocks and debris.

Whimbrel: 3 birds perched under bush in coastal scrub, high in second line of dunes.

Other species

Short-tailed Shearwater (100s); Little Penguin (1); Australasian Gannet (1); Black-faced Shag (6); Great Cormorant (3); Little Pied Cormorant (1); Marsh Harrier (1); Australian Kestrel (1); Silver Gull (about 30); Common Tern (2); Crested Tern (30-40); Horsfield's Bronze-Cuckoo (1); Skylark (about 10); Welcome Swallow (about 10); Eastern Yellow Robin (1); White-browed Scrubwren (5); Brown Thornbill (1); Silvereye (15); Raven (sp. unknown)(30-40);

Acknowledgements

I would like to thank my husband for his companionship, camp maintenance and cooking, National Parks staff at Nelson for providing car parking and a lift to the start of the walk, and Mrs Hewish and Mrs Rogers for transport at the finish. This survey was part of the programme of two-yearly Hooded Plover Surveys initiated by the RAOU, and continued by the AWSG since 1986.

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TABLE 1. COUNTS OF HOODED PLOVERS ALONG THE BEACH OF DISCOVERY BAY, VIC., 14-16 OCTOBER 1988

Location	Description	Dist. (km)	Count	Birds/ km	Groups/ km	Av .gp. size
Nelson to White Sands	Beach wide and flat, with areas of cast- up seaweed. A few rock promontories.	7	6	0.9	0.4	2.0
White Sands to Cape Montesquieu	Beach wide and flat, with areas of cast-up seaweed. Several headlands, with steep cliffs.	13	18	1.4	0.4	3.6
Cape Montesquieu to Swan Lake	Beach wide and flat, with areas of cast-up seaweed. No rocky areas	13	25	1.9	0.6	3.1
Swan Lake to Cape Bridgewater	Narrow, steep beach with soft sand. Very little seaweed. Waves wash up to base of dunes.	18	6	0.3	0.2	1.5
	TOTAL	**51**	**55**	**1.1**	**0.4**	**2.8**

TABLE 2. COUNTS OF PIED OYSTERCATCHERS ALONG THE BEACH OF DISCOVERY BAY, VIC., 14-16 OCT. 1988.

Location	Description	Dist. (km)	Count	Birds/ km	Groups/ km	Av.gp. size
Nelson to White Sands	See Table 1	7	3	0.4	0.4	1.0
White Sands to Cape Montesquieu	See Table 1	13	8	0.6	0.4	1.6
Cape Montesquieu to Swan Lake	See Table 1	13	22	1.7	0.6	3.1
Swan Lake to Cape Bridgewater	See Table 1	18	14	0.8	0.4	1.8
	Total	**51**	**47**	**0.9**	**0.5**	**2.0**

NOTES ON THE BUSH THICK-KNEE ON THE CAPRICORNIA INSTITUTE CAMPUS

Gary Wilson, Residential College, Capricornia Institute, Rockhampton, Queensland 4700.

Introduction

The Capricornia Institute is located on the northern outskirts of Rockhampton (23° 19'S 150° 31'E) The campus has an area of 150 hectares including a 35 ha Flora & Fauna Reserve, academic and residential precincts and sports fields. The student body numbers 4200 of whom 270 live in residence on campus. A population of Bush Thick-knee *Burhinus magnirostris* resident on the campus was the subject of a study during the period December 1985 through February 1989. Data from the study are presented in this paper.

Population details:

The Bush Thick-knee is a breeding resident on the campus. Three pairs of birds are known to be resident. Observations of one pair at the Residential College over a four year period revealed a territory size of 20ha. The other two pairs occupied a remaining 50-60ha of suitable habitat. These data suggest an average territory size of 20-25ha. This figure corresponds with that in Blakers et al. (1984) The campus population appears sedentary but territorial boundaries become less rigidly defined during the Dry Season.

Birds could be heard calling on most nights with vociferous calling when two or more birds came together at the edge of adjoining territories and during the Dry Season. Calling usually commenced at or slightly before last light and continued through until first light. Calling during late afternoon was heard on several occasions during the 1988/9 Wet Season but was markedly less frequent and continuous than by birds on the campus of the James Cook University of Townsville during the same period. (pers. obs.) Birds were frequently seen at night about the grounds of the Institute and Residential College, feeding on insects attracted to security lights on the path system.

Breeding:

A pair of birds, presumed to be the same birds due to their nest site fidelity, bred at the same location during the 1985, 6, 7 & 8 wet seasons. Breeding successes were 2, 2, 1 & 2 respectively. In December 1987 the nest site was slashed and the clutch (number unknown) lost. A second clutch of two was laid within a 14-day period and one bird fledged in March 1988. The eggs were laid on the ground with only the slightest suggestion of a scrape. Eggshell fragments were disposed of by the parent birds once hatching had occurred. The site was in a copse of *Eucalyptus alba* with a sparse grass understorey 20m from the Residential College carpark. Breeding commenced with the start of exams in mid-November when student activity was at a minimum. Prior to that time the site was not often visited by students but was irregularly disturbed by cross-country runners and by slashing by grounds staff. In January 1989 breeding by a second pair of birds on campus was confirmed when a road-killed juvenile bird was found on an internal road in the academic precinct. The bird appeared to be of similar age to two juvenile birds banded at the Residential College nest site during the same week as the road-kill was found.

Behaviour:

In the 1987/88 season the single young remained with the adults, sharing a day-time roost at the nest site for a period of 93 days. After the departure of the juvenile bird the adult birds continued to use the roost for a further four weeks after which they abandoned it. The time at which the use of the roost ceased corresponded to that of maximum disturbance by cross-country runners. On 2 May, 50 days after leaving the roost, all three birds were back at the site. The use of the roost site totally ceased on 20 May and did not appear related to any disturbance of the site. It did correspond with regular dry season flocking activity by the species. Use of the site as a day time roost by the adult birds re-commenced on 1 September, after a period of 103 days and continued, in the latter part in company with the two young of the 1988/9 season, until 20 January 1989.

In 1988 once inspection through binoculars revealed that the young was mobile I visited the nest. When I approached to a distance of 10m the adult birds exhibited signs of alarm and ran several metres before adopting a "freeze" posture. The young bird reacted less quickly and allowed me to approach to 3m before sinking to the ground and attempting to use its cryptic colouration to escape detection. When I continued my approach the adult birds flew, without calling, to similar habitat 30m distant and within sight of the young bird. As I knelt beside the young bird it rose and ran to the adult birds. I followed and the adults flushed, once again without calling, when I was 15m away. The young bird again went to ground and remained there motionless for a period exceeding five minutes whilst I took a series of photographs. Only when I touched the bird did it start up and run away to join its parents who had been watching the proceedings from a point some 20m away. At no time did the adult birds call or make any attempt to protect the young.

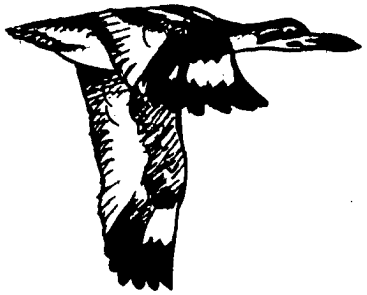
On 2 May, 1988 I observed all three birds at the nest site roost and approached them observing through binoculars as I did so. At a distance of 40m one adult bird went to ground and the second and the immature adopted a "freeze" posture. The adults flushed and the immature ran to join them when I advanced to within 20m and all three ran another 30m when I continued to approach. Thereafter my continued attention even from that distance caused them to be restless and within a minute they moved further away into thicker cover. The adult birds displayed a heightened awareness of my identify from that date forward and reacted with caution whenever I was in sight of them. Their reaction to me was noticeable in

so far as the approach of other staff and students invoked no response unless the distance was less than 10m.

Discussion:

Observations made at the Capricornia Institute complement those made by Garnett (1985) at James Cook University in Townsville. They emphasise the similarities between this and the European species *B. oedicnemus*. The high fledging rate, 87.5% of hatched eggs, and the rapid replacement of a lost clutch parallel the data given for this species (Nethersole-Thompson and Nethersole-Thompson 1986).

Observations on the Institute campus and in the Rockhampton district suggest that the species is common but declining with accelerating habitat loss and modification as likely causes for the change. Rapid expansion of the Institute is expected to result in the loss of two of the three resident pairs. Monitoring of the status of the species on the campus will continue.



-S. DAVIDSON-

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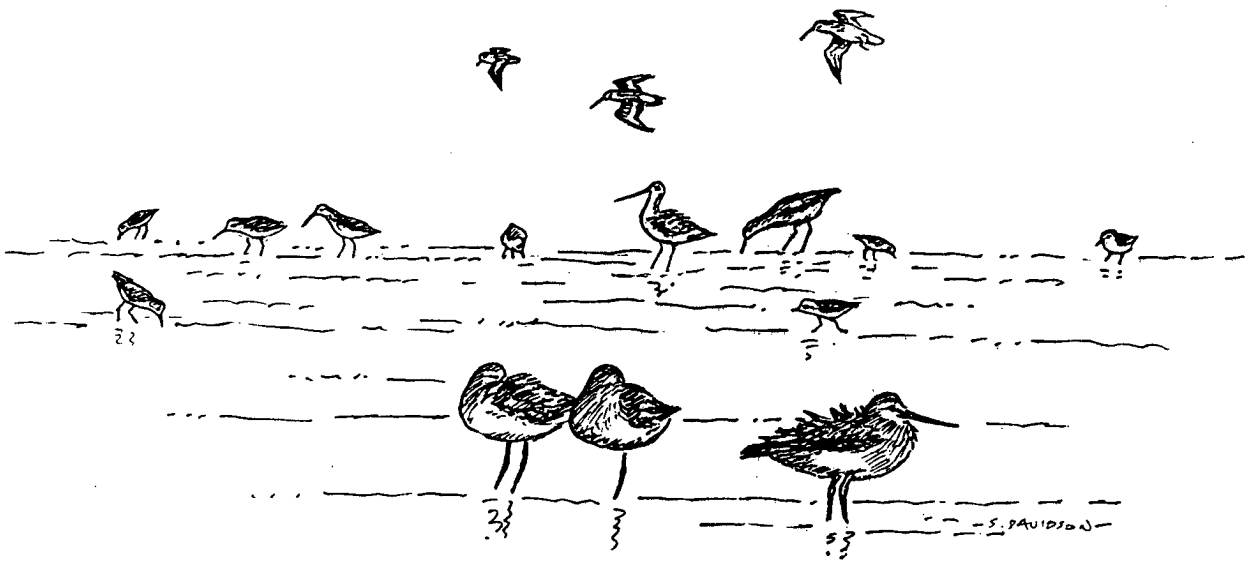

BIOMETRICS, MOULT AND MIGRATION OF BROAD-BILLED SANDPIPERS *Limicola falcinellus* SPENDING THE NON-BREEDING SEASON IN NORTH WEST AUSTRALIA

Graham Fry, 46 Whitfield Parade, Hurstville Grove. NSW 2220

Summary

A preliminary analysis is presented of data obtained from 632 Broad-billed Sandpipers caught in North-West Australia from 1982 to 1988.

Broad-billed Sandpipers arrive in North-West Australia during September/October and depart in mid April.

Broad-billed Sandpipers undergo active moult during the non-breeding season. There are indications that moult of flight feathers may start before or during migration from the breeding grounds.

The mean wing length of adult Broad-billed Sandpipers in North-West Australia was 111.70 mm and of first year birds was 108.81 mm.

The mean total head length of adult Broad-billed Sandpipers varied from 53.1 mm in August/September to 52.2 mm in March/April. Bill length showed a similar decrease from 31.8 mm in October/November to 30.8 mm in March/April.

The mean non-breeding season weight of Broad-billed Sandpipers was 37 grams which increases to 55 grams in April prior to migration.

Introduction

This paper presents the results of a preliminary analysis of data obtained from Broad-billed Sandpipers caught by the Australasian Wader Studies Group between 1982 and 1988. During this period five major catching expeditions to North-West Australia were undertaken. The numbers caught on each expedition were:

April	1982	69
August	1982	17
October/November	1983	195
August/September	1986	16
March/April	1988	335
Total		632

The various expeditions covered three stages in the birds' sojourn in Australia: arrival, mid season and departure. The total of 632 birds caught includes 22 retraps.

There are two sub-species of the Broad-billed Sandpiper. Sub-species *falcinellus* breeds in Scandinavia and NE Russia and during the non-breeding season migrates south to Africa via the Middle East and Europe. Its non-breeding sites are virtually unknown but its breeding areas are well known. Sub-species *sibirica* is thought to breed in Siberia but the location is unknown; during the non-breeding season it occurs in SE Asia, Indonesia and Australia.

Data from Cramp and Simmons (1983) on the wing and bill lengths of *sibirica* are given in Tables 1 & 2.

Methods

Nearly all the birds were caught at Port Hedland Saltworks using mist nets, a small number was caught at Broome and 80 Mile Beach using cannon nets. Biometric data were obtained using standard methods. On the majority of birds caught, measurements of total head length, bill length, wing length and weight were taken, as well as the degree of wing moult. Additionally, on some of the birds, the percentage of breeding plumage was also recorded.

Birds were aged by plumage and primary feather wear with the following codes used:

3+	in third year and older
2+	in second year and older
2	in second year of life
1	in first year of life.

Second year birds become indistinguishable from 3+ birds when primary moult is complete and at that stage all 2 and 3+ birds became 2+. Birds aged 2+ and 3+ are referred to as adults in this paper. In accordance with accepted convention ages change on August 1.

Results

Wing Length

Wing length for the three age groups is given in Table 3. Field measurements were taken to the nearest millimetre (mm).

The wing lengths for the birds caught in October/November and March/April are significantly different from each other ($p<0.001$) with the October/November birds having a mean wing length of 110.5 mm and the March/April birds having a mean length of 112.2 mm. The small numbers caught in August/September make comparisons with the other periods unreliable. The change in wing length is attributable to most of the adult birds undergoing active moult in the October/November period with the outer primaries not yet renewed and severely abraded compared with March/April when wing moult was completed and feathers were in good condition. The mean wing length of all adult birds caught, 111.7 mm, was significantly greater ($p<0.001$) than first year birds, 108.8 mm.

Total Head Length

Mean total head length data are given in Table 4. Field measurements were taken to the nearest 0.1 mm.

The overall mean total head length of each of the age groups are not significantly different from each other. However, there is a definite decrease in total head length for adults between arrival in and departure from Australia with the mean total head length decreasing from 53.1 mm in August/September through 52.9 mm in October/November to 52.2 mm in March/April. The October/November mean length is significantly different from the March/April mean length ($p<0.005$).

Bill Length

Bill lengths for the three age groups are given in Table 5. Field measurements were taken to the nearest 0.1 mm.

The mean bill lengths for each of the age groups are not significantly different ($p> 0.1$) from each other. As with the total head length measurements, there is also a decrease in bill length between arrival in and departure from Australia. In adult birds the mean bill length in October/November was 31.8 mm which is significantly different ($p<0.001$) from the March/April length of 30.8 mm. The decrease was parallelled in first year birds also, decreasing from 30.7 mm in August/September to 29.4 mm in March/April; however these differences are not significant ($p >0.05$).

Weight

A summary of the weights for each of the age groups in the different catching periods is given in Table 6. Field measurements were generally taken to the nearest gram.

Adult birds had a mean weight in the non-breeding period of 37 g. The adult weight increases to a mean of 55 g in early April. First and second year birds had very similar weights to adults during the non-breeding period. In April first year birds showed a slight weight increase to a mean of 40 g. Seven birds banded in November 1983 and subsequently retrapped in April 1988 had weight increases of between 14g and 23 g with a mean increase of 18.3 g; this agrees well with the overall mean weight increase of 18 g for all the birds caught.

The heaviest birds in early April were approaching 68 g. It is considered that, as there was no significant decrease in mean weight of adults for each of the catches in April, departure for the breeding grounds had not commenced.

The final mean take-off weight is unknown as the weight of the birds was still increasing when the last catch occurred on 9 April. However, Lane (1987) states that Broad-billed Sandpipers depart Australia in the 2nd or 3rd week of April and therefore it would seem that the birds caught on the last catch were about to depart. A bird weighing 55 g of which 19 g is fat is carrying over 52% fat which falls within the range of fat content for birds undertaking migration from Australia (Starks and Lane, 1987). The average weight increase between 19 March 1988 and 9 April 1988 was almost 5 g. Six individual birds were caught on the 19/20 March and again on 8/9 April and showed weight changes of between -5 g and +11 g. Two birds originally banded in September 1986 were recaptured in April 1988 and had weight increases of 29 g and 21 g. These large weight changes suggest that the birds when caught in September were recently arrived migrants and were essentially fat free.

Use of the flight distance equation developed by Summers and Waltner (1979) indicates that birds weighting 55 g or more can fly 3500 km non-stop. This would allow birds departing NW Australia to reach the Gulf of Thailand and the Malaysian Peninsular without stopping. The calculation assumes that the average fat free weight is 37 g and that still air conditions apply. This formula is conservative and does not take into account tail winds which may allow the range to be extended to 4000 km.

Primary Feather Moult

Moult score for each age group and catching period are given in Table 7.

The small sample of adult birds caught in August/September were in active moult with a mean primary score (MPS) of 20. In October/November all birds were actively moulting with a MPS for adult birds of 28. By March/April all adult birds had completed wing moult. At this stage first year birds were moulting their four outer primaries. The MPS of 20 in August/September indicates that birds may start moult of the wing feathers at the breeding grounds or at stopovers during the migration. By October/November moulting of wing feathers was well advanced and as expected wing moult was completed prior to departure from Australia in April.

Breeding Plumage

Breeding plumage data is given in Table 8.

The majority of birds exhibited varying degrees of breeding plumage prior to departure for the breeding areas in April. Due to the subjective nature of gauging the percentage of breeding plumage (BP%), the variation in mean BP% between March and April is not considered to be significant.

Migration

It is assumed that Broad-billed Sandpipers arrive in Australia in September/October. The small number of adults caught in August and early September indicates that very few migrating birds had arrived at this time. However, by late October the catch data shows that both adults and first year birds had now arrived. As discussed earlier, Broad-Billed Sandpipers depart Australia about the middle of April.

Discussion

Broad-billed Sandpipers are sexually dimorphic with females being larger than males. Using measurements of museum skins, Cramp and Simmons (1983) showed that females have longer wings and bills. However, the criteria for sexing contains a large overlap which does not allow for reliable sexing of live birds. Further statistical analysis of these data is now underway which may lead to the development of more useful sexing measurements.

The change in bill length and total head length between arrival in August/September and departure from Australia in April is interesting. The difference is significant and whilst a change in sex ratios could possibly be the reason it is not entirely convincing.

Studies on passerines have shown seasonal bill length changes. Davis (1954 & 1961) concluded that these changes could be attributed to changes in food availability ie. changing from granivory to insectivory but also complicated by changes in protein intake. However, Morten and Morten (1987) showed that a decrease in bill length corresponded to post nuptial moult. It was surmised that this could be caused by protein re-allocation as growth of new feathers requires a considerable deposition of protein.

Broad-billed Sandpipers do undergo a complete wing moult during their stay in Australia which corresponds to the period of bill shortening and therefore supports this theory. Another possible reason for the decrease could be changes in foraging patterns or substrate composition leading to an increase in bill wear. It has also been suggested that feather moult around the head may have led to inaccurate measurements of the bill. However, it is unlikely that moult would have affected the total head length measurement which also showed this decrease in length.

The significance of these bill length changes is that any sexing criteria developed from bill length measurements is likely to be unreliable at certain periods of the year. It is recommended that future expeditions to North-West Australia take particular care when taking total head and bill measurements. In addition careful examination of bill tips could reveal patterns of wear.

Other measurements were similar to earlier published figures although they are slightly larger than those quoted in Cramp and Simmons which were based on museum skins which undergo shrinkage with preservation.

Whilst there is no evidence to suggest that any birds had departed before 9 April, the mean fat content of birds caught at this time agrees with other species of calidrid about to depart on migration (Starks and Lane 1987).

Acknowledgements

I wish to thank the Australasian Wader Studies Group for allowing me to analyse their data and also the many participants of the various expeditions for collecting biometric information often in quite difficult conditions. The bands placed on the birds were supplied by the Australian Bird and Bat Banding Schemes.

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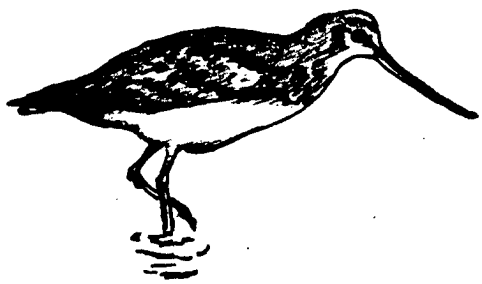


Table 1 - Wing Length of Broad-billed Sandpipers *Limicola falcinellus sibirica* from Cramp and Simmons (1983)

	Adult				Juvenile				
Sex	**n**	**Mean**	**S.d.**	**Range**	**Sex**	**n**	**Mean**	**S.d.**	**Range**
Female	21	111	2.32	108-115	Female	27	109	2.14	105-114
Male	21	106	2.96	100-111	Male	28	106	2.40	101-110
All Birds	42	108.5	2.63	100-115	All Birds	55	107.5	2.25	101-114

Table 2 - Bill Length of Broad-billed Sandpipers *Limicola falcinellus sibirico* from Cramp and Simmons (1983)

	Adult			
Sex	**n**	**Mean**	**S.d.**	**Range**
Female	33	32.6	1.45	30-36
Male	41	29.9	1.61	27-32
All Birds	74	31.1	1.52	27.36

Table 3 - Wing Length of Broad-billed Sandpipers Caught in North West Australia Between 1982 and 1988

Age	**2+/3+**				**2**				**1**			
Date	**n**	**Mean**	**S.d.**	**Range**	**n**	**Mean**	**S.d.**	**Range**	**n**	**Mean**	**S.d.**	**Range**
Aug/Sep	21	112.2	3.45	104.119					13	109.9	3.45	103.117
Oct/Nov	165	110.5	3.41	100-118	25	109.4	3.20	102-117	1	113		
Mar/Apr	370	112.2	3.33	103-122					7	106.1	4.14	100-111
Total	556	111.7	3.43	100-122	25	109.4	3.70	102-117	21	108.8	4.06	100-117

Table 4 - Total Head Length of Broad-billed Sandpipers Caught in North West Australia Between 1982 and 1988

Age	**2+/3+**				**2**				**1**			
Date	**n**	**Mean**	**S.d.**	**Range**	**n**	**Mean**	**S.d.**	**Range**	**n**	**Mean**	**S.d.**	**Range**
Aug/Sep	20	53.1	1.72	49.6-56.0					13	51.8	1.76	49.0-55.0
Oct/Nov	116	52.9	2.26	46.6-59.0	17	52.4	2.91	48.4-57.5	1	55.5		
Mar/Apr	328	52.2	2.09	47.4-57.2					6	51.1	1.81	49.4-54.5
Total	464	52.4	2.14	46.6-59.0	17	52.4	2.91	48.4-57.5	20	51.8	1.92	49.0-55.5

Table 5 - Bill Length of Broad-billed Sandpipers Caught in North West Australia between 1982 and 1988

Age	2+/3+				2				1			
Date	n	Mean	S.d.	Range	n	Mean	S.d.	Range	n	Mean	S.d.	Range
Aug/Sep	21	32.0	1.80	28.3-35.0					13	30.7	1.60	28.7-33.9
Oct/Nov	116	31.8	2.00	26.8-37.0	18	31.1	2.70	27.0-36.0	1	37.0		
Mar/Apr	368	30.8	2.09	24.9-37.3					10	29.4	1.42	27.9-32.9
Total	505	31.1	2.10	24.9-36.0	18	31.1	2.70	27.0-36.0	24	30.4	2.12	27.9-37.0

Table 6 - Weight of Broad-billed Sandpipers Caught in North West Australia between 1982 and 1988

Age	2+/3+				2				1			
Date	n	Mean	S.d.	Range	n	Mean	S.d.	Range	n	Mean	S.d.	Range
Aug/Sep	21	36.8	4.52	28.0-46.0					13	42.2	3.35	37.0-48.3
Oct/Nov	69	37.1	3.37	29.0-52.0	26	35.4	2.66	30.0-40.0	1	37.0		
Mar/Apr	392	54.5	6.03	33.0-74.0					11	39.6	9.41	34.0-61.0

Table 7 - Moult Score of Broad-billed Sandpipers Caught in North West Australia between 1982 and 1988.

Age	2+/3+				2			
Date	n	Mean	S.d	Range	n	Mean	S.d.	Range
Aug/Sep	4	20.0	4.08	15-25				
Oct/Nov	164	27.6	5.90	3-39	26	26.2	5.40	15-37
Mar/Apr	280	50						

Table 8 - Percentage of Breeding Plumage of Adult Broad-billed Sandpipers Caught in North West Australia in 1988

Date	n	Mean % BP	Range
19.3.1988	25	68+/- 20	25 - 90
20.3.1988	21	65+/- 33	5 - 100
8.4.1988	233	81+/- 25	5 - 100
9.4.1988	47	75+/- 26	20 -100

SURVIVAL RATE OF DOUBLE-BANDED PLOVERS *Charadrius bicinctus bicinctus* SPENDING THE NON-BREEDING SEASON IN VICTORIA

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

Summary

Survival rates have been calculated for Double-banded Plovers spending the non-breeding season at Queenscliff, Victoria, using the Fisher-Ford, Jolly and Manly-Parr capture-recapture models. The Jolly method appears to be the most applicable and gives estimates of annual survival rates which vary from 0.68 and 0.92, with an average rate, over 4 years, of 0.79. The Fisher-Ford estimate confirms this result with a value of 0.80 for the average annual survival rate over a period of ten years. Annual population estimates vary from 317 to 625 and are considerably higher than those obtained from physical counts in the Queenscliff-Swan Bay area, ie. 200 to 351, indicating either undercounting or that the Queenscliff population is part of a larger geographical group. This latter suggestion is supported by the sighting of Queenscliff colour-banded birds over a relatively wide region outside the count area.

Introduction

Double-banded Plovers breed in New Zealand. Part of the population remains there during the non-breeding season but a significant proportion migrates across the Tasman Sea to spend the austral winter in South-eastern Australia. Birds arrive during February to April and depart in late July and August. Colour banding and dyeing studies have shown that Double-banded Plovers reaching Australia come from the more mountainous regions of central South Island (C.D.T. Minton and R.J. Pierce pers. comm.).

The biometrics, moult and migration of Double-banded Plovers in Victoria have been covered in a previous paper (Barter and Minton 1986).

The Victorian Wader Study Group has been banding the species since 1979 and a good series of catches, over the 1980 and 1989 period, has been made at one of the study sites, Queenscliff. The capture-recapture data is of a sufficient quality to allow the estimation of year-to-year survival rates and annual populations for this particular site.

The New Zealanders have been studying the breeding biology of the species and survival rates estimates from the non-breeding areas, in conjunction with their natality and fledging data, will give a valuable insight to the population dynamics of Double-banded Plovers.

Estimated survival rates of waders range from 0.5 to 0.8 (Miller and Reid 1987). Boyd quotes survival rates of around 0.6 for Ringed Plover *Charadrius hiaticula*, Little Ringed Plover *C. dubius* and Kentish Plover *C. alexandrinus*, these being species which are reasonably similar in size and migratory habits to the Double-banded Plover.

A number of models are available for estimation of survival rates and population sizes and these range from the basic Peterson estimate to more sophisticated models, such as those developed by Fisher and Ford (1947), Jolly (1965) and Manly and Parr (1968). Fewer assumptions are required as the models become progressively more sophisticated. However, the quantity and quality of date needed for the more complex models are greater than for the simpler ones.

General assumptions (Begon 1979) required for most models are that:

- bands are permanent
- catching, handling and banding one or more times has no effect on an individual's chances of (i) recapture and (ii) dying or emigrating,
- all individuals, whether marked or not, have an equal chance of (i) being caught and (ii) dying or emigrating, and
- sampling periods are short in relation to total time.

In this analysis only the Fisher-Ford, Jolly and Manly-Parr models have been used. All require multiple releases and recaptures.

The Fisher-Ford model assumes that the survival rate is both constant with time and independent of age and gives population size and the gain and loss for each period. The model is most useful when recapture data is limited, as samples are combined and, thus, sampling errors are reduced. However, if differences in survival rate occur, they will be hidden.

Jolly's model assumes only that survival is age-independent and provides all the estimates that the Fisher-Ford model gives with the addition of survival rates between catches. Importantly, the Jolly survival rate is probabilistic, whereas that of Fisher-Ford is deterministic. It is important to note that Jolly's method is actually largely unaffected by differences in age-dependent survival rates, as long as survival is independent of band status and the capture-probability is independent of age. The exception is when survival is strongly age-dependent.

According to Bishop and Shephard (1973), the Fisher-Ford technique is more accurate than Jolly when the proportion of the population sampled is small (ie. < 12%), survival rate is low (c.50%) and/or population sizes are small (<1000 birds).

The Manly-Parr estimate is the only one that does not assume the survival rate is age-independent. However, data quality requirements are quite severe, e.g. the sampling in-

tensity should be at least 40% and, for each catch, 10 or more birds should be caught at least once before and once afterwards.

Methods

Double-banded Plovers were trapped at Queenscliff using cannon-nets and the numbers caught (new and retraps) are given in Table 1. Data have been amalgamated on an annual basis, with birds being caught more than once in a season being treated as one event.

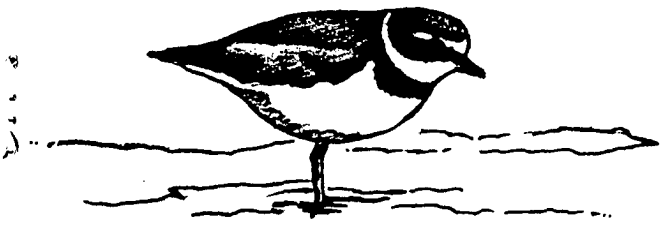
Table 1. Annual number of Double-banded Plovers caught at Queenscliff.

Year	New	Retrap
1980	108	-
1984	55	8
1985	18	5
1986	202	39
1987	97	74
1988	74	53
1989	59	117

NB. Only small numbers caught in 1981-3.

All birds were marked with uniquely numbered metal bands supplied by the Australian Bird and Bat Banding Schemes.

Data for adult and first-year birds have been combined. Whereas the data on first-years alone is too scanty for meaningful analysis, the addition of this data to that of the adults greatly improves the total quality. It is suggested that the survival rate of juvenile birds, having already survived their first seven or eight months of life and a trans-Tasman flight of 2000-2500 km, is probably little different to that of adults. Competition between adults and first-years for suitable feeding habitat in south-eastern Australia would not appear to be sufficiently serious to affect the survival chances of first-year birds, in comparison to adults, during the non-breeding season.



Results and Discussion

Estimated survival rates, using the chosen methods, are given in Table 2.

Table 2. Survival rate for Double-banded Plovers between years. Standard errors are given for the Jolly estimates.

Period/ Method	Fisher-Ford	Jolly	Manly-Parr
1984/5	-	0.75 +- 0.16	-
1985/6	-	0.79 +- 0.15	0.67
1986/7	-	0.68 +- 0.07	0.58
1987/8	-	0.92 +- 0.13	0.94
Average	0.80	0.79	0.73

Bishop and Shephard's (1973) requirements (viz. sampling intensity, survival rate and population size) indicate that the Jolly method should give better results than Fisher-Ford, and the Manly-Parr requirement that the sampling intensity be >40% is not met (for estimated population sizes see Table 3 below).

According to the Jolly method, estimates of the survival rate vary on a year-to-year basis from 0.68 to 0.92. The variation could be due to a natural effect, such as migration loss, but is possibly caused by non-adherence to the model assumptions, particularly that of random sampling. The similarity between the Fisher-Ford and Jolly estimates indicates that the average annual survival rate is probably close to 0.80. This estimate is considerably higher than the values of 0.6 for similar sized plover species in Europe.

The life expectancy of birds with an average survival rate of 0.8 is 4.5 years (Life expectancy = -1/Ln S, where S= survival rate). That is, a live plover in Australia can be expected to live for an additional 4.5 years.

Estimated annual population sizes are given in Table 3.

Table 3. Estimated population sizes. Standard errors are given for the Jolly estimates.

Year	Fisher-Ford	Jolly	Manly-Parr	Actual count
1984	371	361 +-127	-	-
1985	316	317 +-136	-	200
1986	495	465 +- 65	412	293
1987	488	436 +- 47	399	351
1988	622	625 +- 97	706	330
1989	384	-	-	???

There is good agreement between the Fisher-Ford and Jolly estimates, and the Manly Parr estimates follow a similar trend.

All are considerably higher than the actual counts (M. Cameron pers.comm), indicating either that the Queenscliff-Swan Bay population is under-counted or that birds at Queenscliff are part of a larger population drawn from a greater area than that covered by the count. This latter suggestion is supported by the fact that Queenscliff colour-banded birds have been regularly observed westwards to Barwon Heads, at Mud Islands and occasionally at the western end of the Mornington Peninsular.

Conclusions

The average annual survival rate of Double-banded Plovers at Queenscliff is about 0.8.

Estimates of the annual survival rates vary from year to year, ranging from 0.68 to 0.92. This variation may be due to a natural effect or it could be caused by non-compliance with assumptions, particularly that of random sampling.

Annual population estimates of 317 to 625 are considerably higher than physical counts of 200 to 351, indicating either that the Queenscliff/Swan Bay area is under-counted or that the Queenscliff birds come from a more widely spread population. Regular sighting of Queenscliff colour-banded plovers outside the immediate count area provide support for the latter suggestion.

Recommendations

It is recommended that continuing attempts be made to obtain large annual catches, ie. >50 birds, at Queenscliff in order that survival rates can continue to be monitored. It would be useful to continue catching Double-banded Plovers at another site in order to obtain confirmatory survival rate data. Yallock Creek has the most comprehensive existing data set after Queenscliff.

Acknowledgements

My thanks are due to the Victorian Wader Study Group for allowing me to analyse their data which is so often very hard-won at Queenscliff. I am also grateful to Clive Minton for his very useful comments on the first draft.

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AN APPARENT NEW ZEALAND STILT IN TASMANIA

A.W.J. & M. Fletcher, 115 Clarence Street, Bellerive, 7018. R.M. Patterson, 89 Summerleas Road, Fern Tree, 7054.

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In New Zealand, the hybridization of the Black Stilt *Himantopus novaezealandiae* with the Black-winged Stilt *H.himantopus* is a phenomenon causing serious concern for the future of the Black Stilt as a viable species (Pierce 1984).

A once-common endemic, the Black Stilt is endangered with about 10 pairs remaining in the Mackenzie Basin. There they suffer heavily from the predation of eggs, young and adults (Pierce 1985a). The juveniles of both species cannot reliably be distinguished. Young Black Stilts can be separated from adult hybrids on plumage characteristics once they begin moulting into first winter plumage. Adult hybrid stilts exhibit a range of plumages between the typical adult plumages for both species.

During the morning of 4 December 1988 while observing waders on the spit at the northern end of Orielton Lagoon, AWJF and MF noticed what appeared to be an adult Black-winged Stilt in shallow water at the edge of the spit. The bird was eventually flushed across Orielton Rivulet to a large shallow pool, where it was located by RMP that afternoon. Stilts are vagrant in Tasmania and so the bird was closely observed.

All observers noted the typical adult plumage of a Black-winged Stilt. It was particularly noticeable that the black marking on the hind-neck extended to encircle the neck in a broad black band across the breast. Additionally an area of black feathering in the region of the lower belly gave the impression of separating the belly from the white undertail coverts. The bird most closely resembles a Node E bird (Pierce 1984, 1985a) although we did not notice if the black of the hindneck extended to a mantle.

During the afternoon the bird was observed feeding steadily by drawing its bill sideways through the water in a vigorous scything action. Scything is a common feeding style of NZ stilts but is rare amongst Australian stilts (Pierce 1985b) and at night (Robert and McNeil 1989).

The Black-winged Stilt remained in the area for a short time only, last being seen at Orielton Lagoon on 29 December 1988. This apparent movement across the Tasman Sea is interesting in the context of the postulated double invasion of New Zealand to explain the differences and present interaction of the two species. We are not aware of other hybrids having been found in Australia.

Acknowledgement:

The authors gratefully acknowledge the constructive comments of Dr Ray Pierce on an earlier draft of this manuscript.

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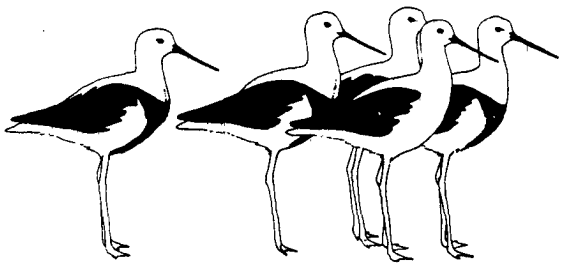


BANDING ROUND-UP

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 February and August 1989. Permission must be sought from the banders and clearance given by ABBBS before using these data in publications.

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

Symbols used:

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

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

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

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

130 PIED OYSTERCATCHER HAEMATOPUS LONGIROSTRIS

100-82301 EAST BAY SOUTH ARM NECK TAS 43d 1mS 147d28mE 10/01/81 +1 U NEWMAN
31 05 ON ROAD RALPHS BAY NECK TAS 43d 2mS 147d27mE 12/12/88 U U ALDERTON
Distance: 2 km Direction: 216 degs. Time elapsed: 7 yrs 11 mths 2 days

A middle-aged oik. Longest time elapsed is over 11 years.

148 RED-NECKED AVOCET RECURVIROSTRA NOVAEHOLLANDIAE

082-43562 WERRIBEE SEWERAGE FARM (SPIT, PT WILSON) VIC 38d 3mS 144d32mE 28/11/81 +2 U VICTORIAN WADER STUDY GROUP
68 05 CULLENS LAKE NEAR KERANG VIC 35d38mS 143d46mE 19/03/89 U U LOYN
Distance: 277 km Direction: 345 degs. Time elapsed: 7 yrs 3 mths 21 days

The longest time elapsed for the ABBBS for this species.

160 TEREK SANDPIPER TRINGA TEREK

051-25308 KOORAGANG ISLAND HUNTER RIVER NSW 32d52mS 151d46mE 27/03/88 +2 U TYNAN
03 14 TAICHUNG TADU RIV MOUTH CENTRAL W TAIWAN 24d12mN 120d28mE 07/04/89 U U CHEN-DE
Distance: 7136 km Direction: 328 degs. Time elapsed: 1 yrs 0 mths 11 days

The first control to Taiwan, the other control was to China. Three Japanese controls were to Kooragang Island, Brisbane and Broome.

161 CURLEW SANDPIPER CALIDRIS FERRUGINEA

040-96206 WERRIBEE SEWERAGE FARM (SPIT, PT WILSON) VIC 38d 3mS 144d32mE 30/11/79 +2 U VICTORIAN WADER STUDY GROUP
05 13 SALTWORKS, PORT HEDLAND WA 20d11mS 118d54mE 27/08/82 U U WA WADER STUDY GROUP
Distance: 3166 km Direction: 301 degs. Time elapsed: 2 yrs 8 mths 27 days

040-96914 YALLOCK CREEK, NEAR KOOWEERUP VIC 38d13mS 145d28mE 22/12/79 +2 U VICTORIAN WADER STUDY GROUP
05 13 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 26/01/85 +2 U VICTORIAN WADER STUDY GROUP
Distance: 70 km Direction: 266 degs. Time elapsed: 5 yrs 1 mths 4 days

040-98966 EAST SIDE PIPE CLAY LAGOON TAS 42d58mS 147d32mE 23/11/79 +1 U HARRIS
03 04 TAICHUNG TADU RIV MOUTH CENTRAL W TAIWAN 24d12mN 120d28mE 07/04/89 U U ZE-DE
Distance: 7938 km Direction: 333 degs. Time elapsed: 9 yrs 4 mths 14 days

Two interesting movements between sites within the continent. The first control to Taiwan, others were throughout East and South-east Asia.

162 RED-NECKED STINT CALIDRIS RUFICOLLIS

032-22790		PIPECLAY LAGOON	TAS	42d59mS	147d32mE	22/11/79	2 U	SHOREBIRD STUDY GROUP (BOAT)
05	13	SHORES OF THE 80 MILE BEACH	WA	19d15mS	121d20mE	07/09/82	U U	AUSTRALASIAN WADER STUDY GROUP
Distance:	3599 km	Direction: 308 degs.			Time elapsed: 2 yrs 9 mths 15 days			
032-22790		PIPECLAY LAGOON	TAS	42d59mS	147d32mE	22/11/79	2 U	SHOREBIRD STUDY GROUP (BOAT)
05	13	PIPECLAY LAGOON	TAS	42d59mS	147d32mE	10/10/82	U U	SHOREBIRD STUDY GROUP (BOAT)
Distance:	0 km	Direction: 0 degs.			Time elapsed: 2 yrs 10 mths 18 days			
032-49048		COMO FORSHORE SWAN RIVER	WA	31d59mS	115d51mE	06/10/83	+3 U	WA WADER STUDY GROUP
54	05	BEACH NEAR PENGUIN IS. FERRY DOCK	WA	32d18mS	115d42mE	02/04/89	U U	TODD
Distance:	38 km	Direction: 201 degs.			Time elapsed: 5 yrs 5 mths 27 days			
032-75856		POINT COOK, ALTONA	VIC	37d55mS	144d46mE	25/10/86	2 U	VICTORIAN WADER STUDY GROUP
99	05	AT A SALT PAN HANGU CHINA		39d15mN	117d47mE	17/05/87	U U	YAN-GONG
Distance:	8979 km	Direction: 339 degs.			Time elapsed: 0 yrs 6 mths 23 days			
033-42671		SALINE SWAMP SE SIDE OF PORT AUGUSTA	SA	32d31mS	137d47mE	17/02/89	+1 U	KLAU
03	13	TA-TU-HSI TAIWAN		24d12mN	120d28mE	06/05/89	U U	LIANG
Distance:	6541 km	Direction: 341 degs.			Time elapsed: 0 yrs 2 mths 17 days			

An interesting sequence of retraps for 032-22790 indicating movement between Broome and Hobart areas in about four weeks. The control to China was recently reported (our eleventh to there). The second control to Taiwan and a direct result of recent work there.

164 RED KNOT CALIDRIS CANUTUS

051-08452		SWAN ISLAND QUEENSCLIFF	VIC	38d15mS	144d40mE	22/03/80	+2 U	VICTORIAN WADER STUDY GROUP
67	05	ZANGHAI SHANGHAI PROVINCE CHINA		30d48mN	121d27mE	30/04/89	U U	EAST CHINA WATERBIRD GROUP
Distance:	8015 km	Direction: 339 degs.			Time elapsed: 9 yrs 1 mths 8 days			
051-15251		TOWONG, GIBSON'S SOAK	VIC	36d 7mS	147d 7mE	08/11/86	1 U	VICTORIAN WADER STUDY GROUP
05	13	SE KAIPARA HARBOUR NEW ZEALAND		36d34mS	174d26mE	23/02/89	U U	REIGEN
Distance:	2445 km	Direction: 99 degs.			Time elapsed: 2 yrs 3 mths 15 days			
051-15556		SWAN ISLAND QUEENSCLIFF	VIC	38d15mS	144d40mE	01/10/88	+3 U	VICTORIAN WADER STUDY GROUP
05	13	SE KAIPARA HARBOUR NEW ZEALAND		36d34mS	174d26mE	23/02/89	U U	REIGEN
Distance:	2631 km	Direction: 95 degs.			Time elapsed: 0 yrs 4 mths 22 days			
051-18325		SWAN ISLAND QUEENSCLIFF	VIC	38d15mS	144d40mE	19/10/85	1 U	VICTORIAN WADER STUDY GROUP
67	05	ZANGHAI SHANGHAI PROVINCE CHINA		30d48mN	121d27mE	02/05/89	U U	EAST CHINA WATERBIRD GROUP
Distance:	8015 km	Direction: 339 degs.			Time elapsed: 3 yrs 6 mths 14 days			

Some more excellent controls to China and New Zealand.

165 GREAT KNOT CALIDRIS TENUIROSTRIS

061-37861 SWAN ISLAND QUEENSCLIFF VIC 38d15mS 144d40mE 30/12/84 1 U VICTORIAN WADER STUDY GROUP
67 05 EAST CHONGMING ISLAND SHANGHAI CHINA 31d30mN 121d52mE 00/00/88 U U EAST CHINA WATERBIRD GROUP
Distance: 8076 km Direction: 339 degs. Time elapsed: 0 yrs 0 mths 0 days

061-38356 80 MILE BEACH 7 KM SOUTH ANNA PLAINS WA 19d15mS 121d25mE 24/08/82 1 U WA WADER STUDY GROUP
67 05 EAST CHONGMING ISLAND SHANGHAI CHINA 31d30mN 121d52mE 00/00/88 U U EAST CHINA WATERBIRD GROUP
Distance: 5616 km Direction: 0 degs. Time elapsed: 0 yrs 0 mths 0 days

061-44675 BEACHES CRAB CK RD ROEBUCK BAY BROOME WA 18d 0mS 122d22mE 18/04/85 1 U AUSTRALASIAN WADER STUDY GROUP
67 05 ZANGHAI SHANGHAI PROVINCE CHINA 30d48mN 121d27mE 06/04/89 U U EAST CHINA WATERBIRD GROUP
Distance: 5401 km Direction: 358 degs. Time elapsed: 3 yrs 11 mths 18 days

061-44724 BEACHES CRAB CK RD ROEBUCK BAY BROOME WA 18d 0mS 122d22mE 18/04/85 1 U AUSTRALASIAN WADER STUDY GROUP
67 05 EAST CHONGMING ISLAND SHANGHAI CHINA 31d30mN 121d52mE 00/00/88 U U EAST CHINA WATERBIRD GROUP
Distance: 5478 km Direction: 359 degs. Time elapsed: 0 yrs 0 mths 0 days

061-44755 BEACHES CRAB CK RD ROEBUCK BAY BROOME WA 18d 0mS 122d22mE 18/04/85 +2 U AUSTRALASIAN WADER STUDY GROUP
67 13 EAST CHONGMING ISLAND SHANGHAI CHINA 31d30mN 121d52mE 07/04/89 U U EAST CHINA WATERBIRD GROUP
Distance: 5478 km Direction: 359 degs. Time elapsed: 3 yrs 11 mths 19 days

061-69612 BEACHES CRAB CK RD ROEBUCK BAY BROOME WA 18d 0mS 122d22mE 23/03/88 +2 U AUSTRALASIAN WADER STUDY GROUP
67 05 EAST CHONGMING ISLAND SHANGHAI CHINA 31d30mN 121d52mE 00/00/88 U U EAST CHINA WATERBIRD GROUP
Distance: 5478 km Direction: 359 degs. Time elapsed: 0 yrs 0 mths 0 days

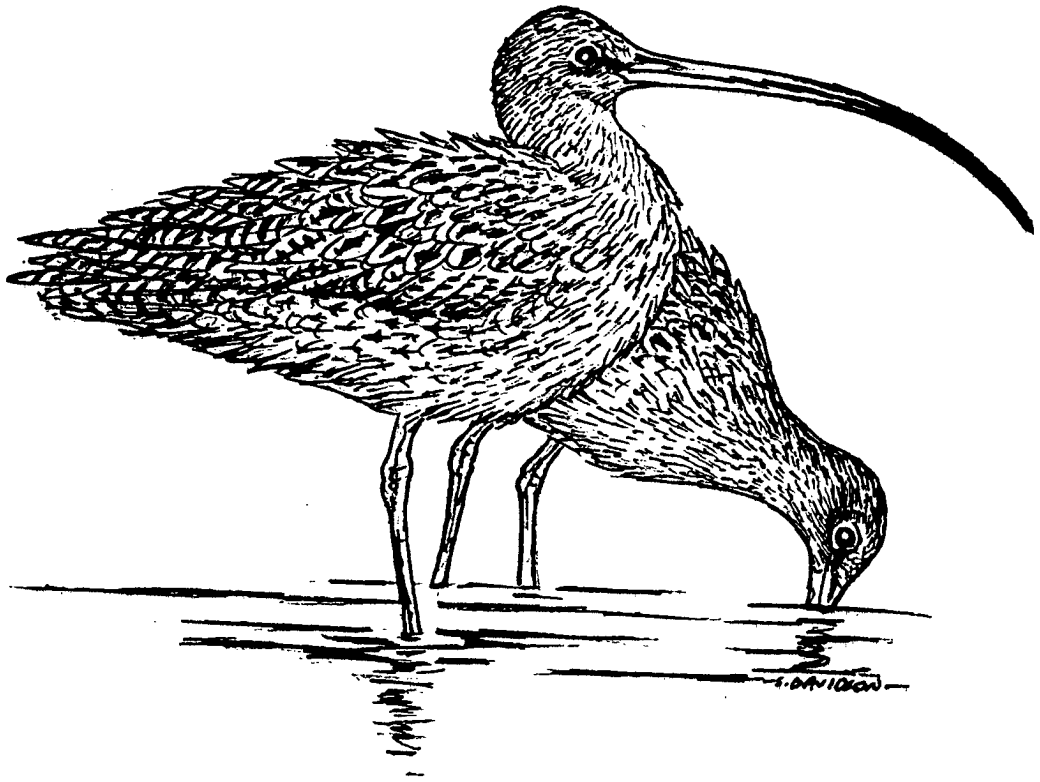
061-69632 BEACHES CRAB CK RD ROEBUCK BAY BROOME WA 18d 0mS 122d22mE 23/03/88 +2 U AUSTRALASIAN WADER STUDY GROUP
67 05 MEIOGONG SHANGHAI PROVINCE CHINA 30d52mN 121d52mE 08/04/89 U U EAST CHINA WATERBIRD GROUP
Distance: 5407 km Direction: 359 degs. Time elapsed: 1 yrs 0 mths 16 days

The second non-West Australian banded control to Shanghai. 061-44755 was netted during the Australian sponsored training course led by Doug Watkins.

167 BROAD-BILLED SANDPIPER LIMICOLA FALCINELLUS

041-46537 SALTWORKS, PORT HEDLAND WA 20d15mS 118d55mE 08/04/88 +2 U AUSTRALASIAN WADER STUDY GROUP
03 13 TA-TU-HSI TAIWAN 24d12mN 120d28mE 22/04/89 U U LIANG
Distance: 4920 km Direction: 2 degs. Time elapsed: 1 yrs 0 mths 14 days

Our first international control for this species.


S. DAVIDSON

AUSTRALASIAN WADER STUDIES GROUP
OFFICE BEARERS

Chairperson	Mark Barter 21 Chivalry Ave Glen Waverley Vic 3150	Admin Secretary	Brenda Murlis 34 Centre Ave Vermont Vic 3133
Treasurer	David Henderson PO Box 29 Legana Tas 7277	Editor "The Stilt"	David Thomas 1/Brightwater Villas Blackmans Bay Tas 7052
Co-ordinator	Brett Lane 12/262 Barkly St North Fitzroy Vic 3068	Liaison Officer	Peter Haward 30 Scotts St Bentleigh Vic 3204
Conservation Officer	Jeff Campbell 8/5 Wattle Ave Glenhuntly Vic 3163		

STATE & REGIONAL REPRESENTATIVES

TASMANIA

Cathy Bulman
100 Nelson Road
Mt Nelson 7007

INTERWADER

Duncan Parish
IPT Asian Wetland Bureau
University of Malaya
Lembah Pantai
59100 Kuala Lumpur
Malaysia.

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

NEW ZEALAND

Stephen Davies (North Island)
Dept. Philosophy
University of Auckland
Private Bag AUCKLAND

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

QUEENSLAND

Dennis Watson
6 Nainana Street
Manly West 4179

Keith Fisher
P O Box 2260
Cairns 4870

Lindsay Bone (Mackay)
2 Cooney Street,
Andergrove 4740

PAPUA - NEW GUINEA

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

WESTERN AUSTRALIA

Mike Bamford
P O Box 224
Capel WA 6271

NORTHERN TERRITORY

Niven McCrie
4 Wilfred Court
Palmerston NT 5787

The Stilt

Bulletin of the Australasian Wader Studies Group
of the
Royal Australasian Ornithologists Union

Number Fifteen October 1989