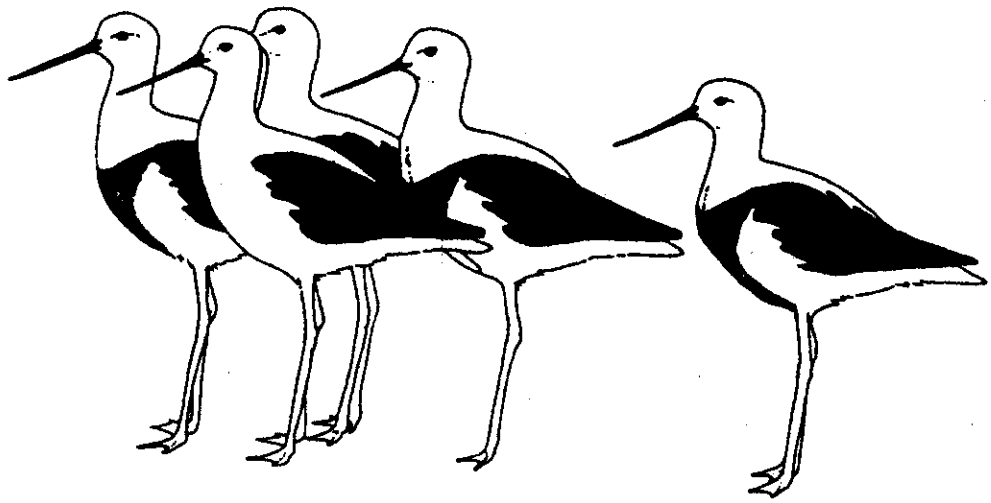
The Stilt



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BULLETIN OF THE AUSTRALASIAN WADER STUDIES GROUP

OF THE

ROYAL AUSTRALASIAN ORNITHOLOGISTS UNION

Number 22

APRIL 1993

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

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

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

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

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

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

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

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Overseas	AUS $20
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Australia and New Zealand	Other Countries
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Stilt No. 7 contains the Index for Nos. 1-6
Stilt No. 13 the Index for Nos. 7-12
Stilt No. 19 the Index for Nos. 13-18.

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NEWS VIEWS REVIEWS NEWS VIEWS REVIEWS

EDITORIAL

This issue of *The Stilt* contains a number of important papers on Australian waders. From Western Australia we have reports on two long term population studies by Vic Smith, and by Max Bailey and Kate Creed; and from Queensland a paper on a comprehensive population study in the Great Sandy Strait by Peter Driscoll. In addition this edition contains a special section containing four reports on surveys of the rare Australian endemic wader, the Hooded Plover.

Another locally sourced paper of particular interest is that by Mark Barter on Population Monitoring in Australia. In this report Mark explains the importance of monitoring wader numbers. However he omits one significant motive for participating in the project - it is enjoyable!

It is unfortunate that all of the above-mentioned papers, and the great majority of the material in this issue, emanate from Australia only. It is hoped readers from elsewhere in the flyway may be encouraged to produce similar source material from their region.

Jeff Campbell

CONSERVATION OFFICER'S REPORT FOR 1992

As in previous years a good number of wader conservation matters were dealt with in 1992.As has also previously been the case the great majority of these matters were confined to Victoria.This is unfortunate but will continue to be the case unless issues in other states are brought to my attention.

One conservation issue concerning wader habitat in a state other than Victoria, which was dealt with during 1992, was the Moreton Bay Strategic Plan.This plan is seen as being advantageous for the waders which use the bay, in direct contrast to the farcical plan of the same name earlier released by the previous Queensland government.

Of the Victorian matters dealt with perhaps the most noteworthy has been the proposal to develop the dryland area of the Cheetham Saltworks near Laverton,in conjunction with various works to protect the wader habitat of the site and a commitment to maintain the pumps needed to preserve that habitat.This proposal has received the full support of the AWSG and is a fine example of how development and conservation can coexist,given the will of both "sides" to seek common ground.

Jeff Campbell

CHAIRMAN'S REPORT FOR 1992

1992 was a year of solid achievement. The successful North-West Australia Expedition caught 6154 waders of 32 species, and yellow leg-flagged 4759 of these. The nine Expeditions to date have banded a total of 30120 waders, and these have resulted in 101 overseas recoveries to January 1992. Additionally, some seven overseas-banded waders have been caught. As usual, the Expedition was multi-national, and particularly pleasing was the presence of visitors from Russia, China, India, Indonesia and Vietnam, who came to learn more about our activities and wader study techniques. It is hoped that they will be able to use the knowledge and experience gained to good effect in their own countries. The next Expedition is planned for April 1994.

A plan is being developed to expand the Population Monitoring Project to cover more species and regions - especially in north-western Australia. This project is of critical importance as the combination of count and banding data provides the opportunity to assess how the different species are faring, in a situation in which habitat loss, hunting pressure and pollution are rife in our Flyway. We are also investigating ways and means of getting the existing, and large, data set analysed.

The report on the Regular Count Project is well advanced and is due to be published in late 1993.

The Australian National Parks and Wildlife Service generously supported the visit of Pavel Tomkovich, Chairman of the CIS Working Group on Waders, who took part in the North-West Australia Expedition and then visited Perth, Melbourne, Canberra and Sydney for discussions with wader enthusiasts and conservation departments. Pavel delighted us with his infectious enthusiasm and charm and added much to our knowledge of wader studies in the CIS. Hopefully, his visit will lead to increased co-operation between researchers at opposite ends of the Flyway. A potential area for joint work is in conducting surveys of the coastlines of the Sea of Okhotsk and the Kamchatka Peninsula for major migration staging sites. This activity could also include banding. We also determined that the cost of providing financial support to Russian scientists to carry out breeding studies is very low and the AWSG will be seeking ways to raise funds for such work. Following his visit to Australia, Pavel visited Kuala Lumpur for discussions with the Asian Wetland Bureau.

Work continued on the *National Plan for Shorebird Conservation in Australia* and the final draft went to the sponsors, WWF Australia, at year-end. Widespread distribution to relevant government and non-government organisations is planned. The report will provide focus for future wader studies and an agenda for conservation activities. It is hoped to make copies available to members at cost.

The leg-flagging project continues to provide much useful information on migratory movements, both outside and within Australia. Perhaps the most interesting sightings during the year were of three Bar-tailed Godwits from Victoria,

Queensland and New Zealand in the same roosting flock in Japan, in April. Flagging has now been extended to north-western Australia and the Australian total stands at more than 15,000 birds flagged to end-February 1993. A couple of reports covering sightings to date are published elsewhere in this edition of *The Stilt*.

The biennial Victorian Hooded Plover Count took place in November, and important data was also obtained at the same time in New South Wales, Tasmania, South Australia and Western Australia by co-operating groups. A number of the count reports are being published in this edition of *The Stilt* and the Victorian report includes an assessment of counts to date in that state.

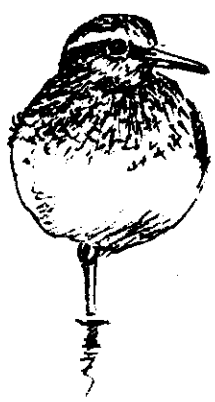
The Stilt continued to improve in both content and layout and is now the accepted East Asia-Australasia Flyway wader publication. The scope of articles published during the year was enormously varied and the expanded news section did a good job of keeping everybody up to date with developments. Complimentary copies are being sent to wader workers in Bangladesh, India, China, Russia, Kazakhstan and Vietnam.

AWSG News is circulated to a large number of people and organisations, both outside and within Australia, as a means of keeping them informed about wader study activities in the Flyway. In this it is very successful and is being widely quoted in newsletters and bulletins around the world.

It is pleasing to note that the Queensland, New South Wales and Victorian Wader Study Groups are all achieving considerable success and the former two groups have done much in the last couple of years in adding to wader knowledge in their states.

On behalf of members, I would like to thank the Committee and co-opted members for their sterling efforts during the year. Their contributions are evident from my report. I extend an invitation to anyone to contact me if they would like to discuss how they can also play a part in our activities. The more committed helpers we have sharing the work, the more that can be done to ensure that waders survive the modern-day pressures facing them.

Mark Barter



TREASURER'S REPORT FOR 1992

Membership numbers remain steady and the end-of-year balance for the AWSG Account is very close to that of last year, although it includes $80 to be transferred to the Research Fund.

The Research Fund continues to be well supported and donations were used mainly to fund activities associated with cannon-netting

The ANPSW gave $8000 towards meeting the cost of travel to Australia by Dr. Gao Yuren and Mr Pavel Tomkovich, both of whom participated in the NW Australia Expedition, and money from the Expeditions Account was used to help cover the expenses of Doug Watkins who assisted with the training programmes for four Asians who participated in the expedition.

David Henderson

Australasian Wader Studies Group
Statement of Receipts and Payments for the Period
1 January 1992 - 31 Deacember 1992

Receipts

Balance b/f	4755.15
Subscriptions	4120.38
Sales of '*Stilt*' Back Nos.	246.50
AWB Subscriptions/Book Sales	695.00
WSG (UK) Subscriptions	142.33
Payment for Radios & Accessories	4000.00
Donation	12.99
Bank Interest	142.84
Bank Error	3.00
Research Fund Donations	80.00
	$14198.19

Payments

Stilt - Typing	800.00
- Printing	1410.00
- Postage	1077.05
- Envelopes	48.50
AWB Subscriptions/Book Sales	921.11
WSG Subscriptions	159.55
Purchase of Radios & Accessories	2853.00
Balance of Payment for Radios & Accessories (to VWSG)	1147.00
Printing Membership Brochures	40.00
Secretary's expenses	816.14
Chairman's expenses	138.24
Treasurer's expenses	17.50
Bank Charges	65.50
State Govt. Tax	5.35
Balance c/f	4698.85
	$14198.19

AWSG Expeditions
Statement of Receipts and Payments for the Period
1 January 1992 - 31 December 1992

Receipts

Balance b/f	1157.87
Payment from AWPWS for NW Australia Expedition	8000.00
Payment from AWB for Jara Expedition Report	1000.00
Bank Interest	50.33
	$10208.20

Payments

NW Australia Expedition expenses	8000.00
Payment to Doug Watkins for expenses relating to NW Australia Expedition	1100.00
Counts carried out after Vietnam Expedition	266.41
Photocopying relating to Java Expedition	12.40
Chairman's expenses	225.88
Bank Charges	22.00
Govt. Tax on Debits	3.60
Govt. Duties	6.38
Balance c/f	571.53
	$10208.20

RAOU Research Fund
Statement of Receipts and Payments for the Period
1 January 1992 - 31 December 1992

Receipts

Balance b/f	2149.52
Donations	315.00
Bank Interest	74.75
	$2539.27

Payments

Purchase of Australian Tide Tables	24.95
Personal Accident Insurance	186.37
Purchase of Yellow Darvic (for leg flags)	80.00
Chairman's expenses	85.25
Bank Charges	6.00
State Govt. Tax	0.23
Balance c/f	2156.47
	$2539.27

RECENT LITERATURE

The following is a selected list of articles dealing with waders from recent publications.Notice of titles of interest would be most welcome,please forward same to the Editor.

BURGER, J. & M. GOCHFELD. 1991. Human activity influence and diurnal and nocturnal foraging of Sanderlings (*Calidris alba*). Condor 93:259-265. (Dept.of Biological Science, Rutgers Univ., Piscataway, NJ 08855,USA).

CHA WEI MAH & L.YOUNG. 1990. Food of the Spoonbilled Sandpiper in Hong Kong. Hong Kong Bird Report:192-193. (Swire Mar. Lab., Univ. of Hong Kong, Cape P'Aguilar, Shek O, Hong Kong). *Eurynorhynchus pygmeus.*

HUTTON, K.1992. Long-toed Stints in New South Wales. Australian Birds. 26:20-28. (9 Karri Road, Leeton, NSW 2705, Aust.). *Calidris subminuta.*

LAMBECK, R.H.D. 1991. Changes in abundance, distribution and mortality of wintering Oystercatchers after habitat loss in the Delta area, SW Netherlands. Acta XX Congress Intern. Ornithol. Vol.II: 2208-2218. (Delta Inst. Hydrobiol. Res.,Vierstr. 28,4401 Yerrseke, Netherlands). *Haematopus ostralegus.*

LEACH, G.J. & H.B. HINES. 1992. Waterbirds at Minden Dam, Southeast Queensland, 1979-1987, and factors influencing their abundance. Corella 16:111-118. (PO Box 568, Kenmore, Qld, 4069, Aust.). *Vanellus miles, Erythrogonys cinctus, Charadrius melanops, Himantopus himantopus, Gallinago hardwickii.*

MEIRE, P.M. 1991. Effects of a substansial reduction in intertidal area on numbers and densities of waders. Acta XX Congress Intern. Ornithol. Vol.II: 2219-2227. (Lab. Oecol. Dieren, Univ. Gent, K.L. Ledegankstr. 35,9000 Gent, Belgium).

THOMPSON, P.S. & W.G. HALE. 1993. Adult survival and numbers in a coastal breeding population of Redshank *Tringa totanus* in northwest England. Ibis 135: 61-69. (Univ. of Durham, Dept. of Biol. Sci., Sci. Lab., South Rd., Durham DH1 3LE, UK). Results of long-term capture-mark-recapture programme,1974-1988.

TOMKOVICH, P.S. 1992. Breeding range and population changes of waders in the former Soviet Union. British Birds 85:344-365. (Dept. of Ornithol., Zool. Mus. Moscow State Univ., Herzen St.6, 103009 Moscow, Russia). *Himantopus himantopus, Glareola pratincola, G.nordmanni, Pluvialis apricaria, Vanellus vanellus, Chettusia leucura, Tringa stagnatilis, Philomachus pugnax, Gallinago media, Limnodromus scolopaceus.*

WANG, H.1992. Field study of spring migratory population of Nordmann's Greenshank *Tringa guttifer* in Yancheng Nature Reserve. Zool. Research 13:36-58. (Management Div., Yancheng Nature Reserve, Yancheng 224333, Jiangsu Province, Peoples Republic of China).

Editor

BROOME BIRD OBSERVATORY REPORT

The biggest event at the BBO in recent months was undoubtedly the 1992 AWSG NW Wader Expedition. To summarise, 6171 waders of 33 species were banded and most yellow leg-flagged. One of many highlights occurred on the last day, when 11 Eastern Curlew were caught. Only one more Eastern Curlew has been caught since then, but not for want of trying! BBO wishes to thank everyone involved with the expedition for their humour, water conservation and downright hard work. It was a great honour to have participants from other parts of the flyway and elsewhere. The interest and experience added by Pavel Tomkovitch (Moscow State University); Humphrey Sitters; Rudyanto (Asian Wetland Bureau - Indonesia); Hoang Van Thang (University of Hanoi); Taej Mundkur (Asian Wetland Bureau - Malaysia); Gao Yu-ren (South China Institute of Endangered Animals) and many others was a major factor in the success of the expedition, scientifically and socially. We look forward to seeing them again.

The BBO is banding and flagging waders on an ongoing basis. As well as cannon-netting in Roebuck Bay, we have been mist-netting at the Broome sewage works, particularly for Greenshank and Marsh Sandpiper. Of 13 Marsh Sandpiper banded there in December 1992, low moult scores (all zero), leg colour (yellow/green) and brownish upperparts suggested that seven of the thirteen were recently arrived juveniles. Greenshank have proved harder to catch (5 only) and all have been adults. BBO will be staging another "mini expedition" during April 1993 to coincide with the Broome leg of "Waderbirds - Odyssey of the Wetlands". The public will be heavily involved in the event, catches, tours and migration watches planned.

The ANPWS has generously provided $5,000 to help fund wader counts and catches at Eighty Mile Beach and Roebuck Bay during 1993. BBO is to undertake the work and the first counts have been done. Numbers appeared to be low at both sites (42,769 over 15km of 80 mile and 40,261 in Roebuck Bay between Crab Creek and the Dampier Creek Mangroves. Interestingly, there were almost 20,000 Oriental Plover at 80 Mile. This species has not previously been seen in large numbers during March, suggesting that they leave around this time, earlier than other species. Recent concern over the number of Eastern Curlew was assuaged slightly when exactly 100 were counted. Numbers during August to December were consistently around 300. It will be interesting to see the effect on numbers as migrating birds arrive from SE Australia and elsewhere.

Grant Pearson from CALM and a team from the University of Western Australia will be staying at the BBO during August. The expedition will investigate feeding requirements of waders by examining movements, determining distributions of waders within the Bay and describing feeding areas of different species in relation to tidal movement. Field work will include banding, counts, observations, collection of invertebrates and diet analysis. This information is urgently required and BBO looks forward to both participating with and continuing the work.

We look forward to keeping you informed of wader news in the NW and hopefully seeing some of you in Broome in the future.

Martina and Vaughan Pattinson
Wardens.

BOOK REVIEW

Addicted to Birds Annie Rogers; self published; soft cover; 240pp, 85 colour photographs, 3 maps. $ 25.00 plus postage. (available from the author; 240 Ninks Road, St Andrews, Victoria, 3761, Australia).

It is apt that this book should be reviewed in the journal of the AWSG as it is,at least in part,a brief history of the group and has stories to tell about many of its original members.

This book,written in highly readable style,chronicles Annie's conversion from a casual birdwatcher to a confirmed and committed ornithologist; who along with husband Ken and son Danny has contributed much to our knowledge on Australian birds.Along the way she brings the reader many interesting and amusing anecdotes concerning those she has encountered in Iran,South Korea and Australia and the trials and tribulations of searching for and banding birds in Iran and Australia.Tales such as how it came to be that a Ruff was shot in Iran eight days before it was banded in South Africa and of the AWSG Chairman Mark Barters'hair raising experience when travelling with Duncan Parish in his self destructing car, are just two of the many that keep the reader enthralled.

The text of the book is complemented by many excellent colour photographs (one hopes that the inclusion of a photograph of Clive Minton in nothing but red "long-johns" does not lead to legal action!)and three maps.The layout of these maps,each covering two pages,unfortunately means that the usefulness of them is diminished as they are impossible to read on the join of the pages.The only other minor criticisms I have of this book are the rather confusing use of both imperial and metric measurements and the misspelling of a number of names in the index, but not in the text, and vice versa.

This is a thoroughly enjoyable book and is highly recommended.

Jeff Campbell

QUEENSLAND WADER STUDY GROUP

Wader Banding in 1992

They say that memories become rosier with time. I have almost forgotten the 4.15am start that day on Moreton Island, and the flu I suffered after banding in the rain at Cabbage Tree Creek wasn't that bad after all. Overall, this year of banding has been very successful considering that this was our first year. Importantly, we now have a core group of people with experience. Rapid clearing of the net is essential to prevent mortality of waders from stress. We have also learnt a few important tricks, like using shade cloth to cover trapped birds (n.b. Jeays Hardware in Sandgate are thanked for supplying shade cloth at cost price).

In addition to metal bands, dark green leg flags were attached to the legs of waders to enable identification from a distance. A small group of people, who have tolerated burnt fingers and have had their electric frying pans prematurely age, need to be thanked for making the leg flags. These people include Peter Driscoll, Ivell and Jim Whyte, John and Hilary Holt, Dawn Muir, Margaret Bernard and Andrew Geering. There is a constant demand for leg flags, so we still welcome volunteers to make more. Materials and instructions are provided.

Table 1 shows the numbers and species of waders that we have banded. The best results were the catches of 105 Grey-tailed Tattlers and Amity Spit, 60 Whimbrels and 53 Eastern Curlews at Moreton Island (Reeders Point and Mirapool), 75 Great Knots and 172 Curlew Sandpipers at Nudgee Beach and large numbers of Bar-tailed Godwit at various locations.

We still have a long way to go to match the efforts of well established groups such as the Australasian Wader Studies Group, who trapped over 5000 birds in a month at Broome this year. We now have three operational cannon nets so we should be able to trap more birds next year. If you ever have had an urge to gain a banding permit, now is the time to enquire. With the opportunity to band over 100 birds a day, you can quickly acquire a lot of experience.

Andrew Geering and Peter Driscoll

NEW SOUTH WALES WADER STUDY GROUP

Port Macquarie Report

On the week-end of 29/30 November a group of 16 members and helpers travelled to Port Macquarie from Sydney, Newcastle, Kempsey and Grafton to take part in the NSWWSG banding expedition. Accommodation was provided by the NP&WS in their workshop building which came full equipped with kitchen facilities and showers etc.

Bright and early Saturday morning everyone, plus cannon-netting equipment was ferried across the river to Pelican Island. the target species for the day was Mongolian Plovers. The birds turned up on cue and sat on either side of the net that Fred van Gessel had set up but the birds defied all attempts to twinkle them into the catching area. They finally flew down the beach to where Phil Straw had set up another net but here they were also uncooperative and insisted on sitting behind the net before they finally flew off out of sight. As the tide came in a mixed flock of Bar-tailed Godwits, Whimbrel and Curlew gathered around the second net. Whimbrel are one species we are particularly interested in trapping. Fortunately, the birds behaved almost perfectly (although we would have preferred a pure catch of Whimbrel) standing in the right place just the right distance from the net. A total of 15 Whimbrel, 40 Bar-tailed Godwit and one Red Knot were caught. The birds were banded and processed efficiently by the well co-ordinated team.

Table 1. Waders from Moreton Bay which were banded by the QWSG during 1992, and by founding members of the QWSG prior to establishment of the group. All birds were trapped using cannon nets. Site abbreviations are BI (Bishop Is.); AM (Amity Spit); NB (Nudgee Beach); RP (Reeders Point); SH (St. Helena Is.); MI (Mirapool Lagoon).

Place Date (1992)	BI 8/2	BI 7/3	BI 5/4	AM 3/5	AM 4/5	BI 7/6	NB 18/7	BI 1/8	RP 15/8	SH 12/10	BI 19/10	AM 23/10	NB 26/10	MI 30/10	Total 1992	Pre 1992	Total
Pied Oystercatcher			3	37		16				16				9	81	24	105
Large Sand Plover		1													1	47	48
Mongolian Plover																40	40
Ruddy Turnstone									1						1	1	2
Sharp-tailed Sandpiper											19		1		20		20
Red Knot							3		1			2	40		46	57	103
Curlew Sandpiper	1				3						1	1	172		178	17	195
Red-necked Stint			3					5			4				12		12
Great Knot							74					1	1		76	184	260
Bar-tailed Godwit	7	13					54		141			164	7	1	387	304	691
Black-tailed Godwit																31	31
Eastern Curlew									2					51	53	2	55
Whimbrel	1				4				60						65		65
Grey-tailed Tattler					95							10			105		105
Terek Sandpiper																3	3
Gull-billed Tern	1														1	2	3
Little Tern	2	1													3	5	8
Total	12	15	6	37	102	16	131	5	205	16	24	178	221	61	1029	717	1746

The nets were set up again to catch Golden Plover early the next morning and Bo, a dedicated volunteer, camped next to the nets overnight to deter any light-fingered fishermen from "borrowing" the nets (as happened once before at Kooragang). The rest of us retired for a hot shower and a rest before squeezing into the very popular local Chinese restaurant for a banquet dinner.

Early the following morning the group once again ferried over to Pelican Island. The Golden Plover did not co-operate at first and flew off before the nets were ready to fire and disappeared. Just when everyone had given up hope a flock of 23 turned up and were quickly herded into the catching area as if they had been trained for the job. All 23 birds were caught and once again were efficiently banded and released. So ended a successful weekend at Pelican Island which is proving to be an excellent site for waders.

Kooragang Island - Where are the waders?

The group has had two trips to Kooragang Island in the last quarter of 1992, firstly in October following the Wader Study Seminar and again over the weekend of the 12/13 December 1992. Unfortunately on each occasion we were unsuccessful in catching any waders. While some of the problem is the degradation of Stockton Spit the major problem seems to be that the numbers of waders at Kooragang Island seem to be significantly lower this year. Unfortunately, we do not yet have any reliable count data from Kooragang Island in recent years and therefore it is impossible to quantify the drop in numbers. The numbers of juvenile birds caught elsewhere in Australia recently have been low confirming Pavel Tomkovitch concerns that many of the birds which breed in the far north of Russia have had a very poor breeding season. We hope to find out later in the season if this factor is also affecting the birds which frequent the Hunter. Botany Bay has also had low numbers of waders but this was thought to be a result of the third runway construction which has severely affected wader habitat and feeding grounds.

A count of waders present in the Kooragang Island area was carried out on 12 December 1992 with the results listed below:

Eastern Curlew	150
Bar-tailed Godwit	2000+
Lesser Golden Plover	60
Grey-tailed Tattler	70
Terek Sandpiper	50
Curlew Sandpiper	750 (Stockton Sewage Works)
Marsh Sandpiper	70
Greenshank	20

Phil Straw

VICTORIAN WADER STUDY GROUP

Summary of VWSG Activities in 1991

1991 was an unusual, but valuable year for the VWSG. Fieldwork was maintained at a high level but the number of waders caught (4074) was the second lowest since cannon netting was introduced in late 1978 and well below the average for the last thirteen years (6397).

There were two main reasons - one deliberate and the other unintentional. A greater proportion of the Group's efforts was directed at the less numerous and less frequently caught species. This was particularly successful with the first major catch of Sanderlings (208), a record year for Turnstone (211), good catches of Red Knot (332) and Bar-tailed Godwit (164), and the first catch of Greenshank (22) for nearly two years. A catch of 191 Sharp-tailed Sandpipers, at Yallock Creek in December, was also the best single catch of this species for some years. The total of Pied and Sooty Oystercatchers (219) was twice the total for the previous year, though at times in the field it did not feel like that as we regularly failed to achieve the hoped-for catch size. Only Eastern Curlew (eight compared with the record 127 in 1990) disappointed.

The real shortfall in numbers in 1991 came from the Group's inability to make the usual large catches of Red-necked Stints and Curlew Sandpipers in the January/February and November/December periods at Werribee S.F., Queenscliff, Inverloch and, to a lesser extent, Yallock Creek. Bad (windy) weather on some catching days was a significant problem. Queenscliff now has much smaller numbers than formerly due to habitat change and disturbance on the Sand Island part of Swan Island. The wader roosts deserted Yallock Creek temporarily at year end due to regular disturbance by low flying micro-light aircraft from a nearby airfield.

In parallel with the different catching profile in 1991, there were also marked departures from the normal distribution of wader catch locations. There was a marked increase (to 1052) in catches at Corner Inlet (adding 25% to the total for the previous 12 years). The assistance of the Yarram Region of the Department of Conservation and Environment is particularly appreciated in facilitating, by the provision of boat transport, this expanded catching programme in the area which has the largest numbers and diversity of waders in Victoria. In contrast only 52 waders were caught at Werribee S.F.! This is the prime long-term study site for Red-necked Stints and Curlew Sandpipers and 36,234 of the 85,619 waders caught by the VWSG since operations commenced in the late 1975 have been caught there. It is to be hoped that better fortune prevails in 1992.

Killarney Beach, near Port Fairy, features in the banding locations for the first time. After some years of recceing and unsuccessful attempts an excellent catch of 208 Sanderling was finally made on 2 March. Some Turnstone were also caught then but greater success was obtained on a return visit in late November/early December when a total of 151 Turnstone was caught in five catches. 80% of these were juveniles.

The above was one of several indications that the 1991 breeding season in the Arctic was an excellent one for many of at least the smaller and medium sized species of waders. The proportion of young birds in summer 91/92 catches of Red-necked Stint, Curlew Sandpiper, Sharp-tailed Sandpiper, Red Knot and Turnstone - as well as visible sightings of juvenile Grey Plover - suggests that all of these species had a near record breeding success in 1991. This followed a fairly good breeding season for some species in 1990. If the three-yearly cycle theory is correct, the 1992 breeding season ought to be a disaster.

Biometric and moult data continues to be accumulated. Noteworthy filling of gaps in the data were the first samples of Red Knot in August (81) and Greenshank in December (21), but the monthly samples of a number of species were boosted significantly. This greatly facilitates the comprehensiveness and value of the ongoing programme of analysis and publication of biometric and moult data by Mark Barter and other VWSG members.

Valuable recoveries of banded birds continue to flow in. A highlight in 1991 was the recovery of an Eastern Curlew on its breeding grounds in the mountains of Manchuria, Northern China. Even more exciting was a Curlew Sandpiper caught on its next by a Russian wader ornithologist in the Taimyr Peninsula. This is the most northerly part of Siberia and over 13,000 km from the banding location at Werribee S.F. It is also interesting that it is in the same area as Curlew Sandpipers banded in South Africa and Western Europe have been recovered indicating remarkably diverse migrations from a common breeding ground.

The tern banding programme - both the banding of chicks and the cannon netting of adults of a variety of species - continued successfully in 1991 and in the summer of 91-92.

Overall the VWSG had another enjoyable and productive year, contributing to a greater knowledge and understanding of the waders and terns which occur in Victoria. This information is increasingly being used for habitat conservation purposes, most recently in relation to Andersons Inlet (spartina problems and recreational activities), to the western shores of Port Phillip Bay (Coode Island relocation options), to Killarney Beach (seaweed harvesting) to Sand Island/Swan Island (dredge spoil dumping) and to an assessment of the biological importance of the whole of the Victorian coast (Heritage Commission).

Acknowledgements

The VWSG thanks the many people who helped it in a variety of ways in 1991.

Permission to visit banding sites at Yallock Creek, The Gurdies, Inverloch, Swan Bay and Tooradin was kindly given by local farmers. Melbourne Water generously granted access to the Werribee Sewage Farm complex. The authorities at Swan Island were most helpful with permission to enter (including to the specially restricted area). BHP/Esso kindly allowed us to traverse their property to reach the foreshore at Barry Beach, and the Department of Conservation and Environment and the National Parks Service granted access to many areas under their jurisdiction including Corner Inlet (the Nooramunga National Park), Stockyard Point, Mud Island and Point Wilson on Spermwhale Head (Lakes National Park).

Special thanks go to Woodside Petroleum who made a generous grant of $700 for the manufacture of a new trailer to carry the Group's equipment. Finally thanks go to all members of the VWSG who participated and assisted in so many ways to make another enjoyable and successful year. I would particularly like to thank Alan Clarke for taking over the onerous task of equipment officer. His first job was to design and construct the new trailer!

Many thanks to everyone

Clive Minton

WADER BANDING TOTALS - VICTORIA - 1991

	NEW	RETRAP	TOTAL
Pied Oystercatcher	148	42	190
Sooty Oystercatcher	26	3	29
Lesser Golden Plover	12	-	12
Double-banded Plover	83	12	95
Red-capped Plover	13	1	14
Ruddy Turnstone	188	23	211
Eastern Curlew	8	-	8
Greenshank	16	6	22
Terek Sandpiper	2	-	2
Bar-tailed Godwit	155	9	164
Red Knot	301	31	332
Great Knot	2	-	2
Sharp-tailed Sandpiper	238	13	251
Red-necked Stint	1409	570	1979
Curlew Sandpiper	415	140	555
Sanderling	208	-	208
	3224	850	4074

THE ODESSA PROTOCOL ON INTERNATIONAL CO-OPERATION ON MIGRATORY FLYWAY RESEARCH AND CONSERVATION

The Wader Study Group Conference at Odessa, 13-17 April 1992: * *Reprinted from the Wader Study Group Bulletin 65: 10-12.*

CONSCIOUS that birds are an international heritage and that nations along the flyways of wading bird populations share a responsibility for the conservation of these migratory birds and their habitats, as recognised in international agreements such as the Ramsar and Bonn Conventions:

AWARE that the integrity of these flyways is at risk from habitat loss, unregulated hunting pressure, pollution and other human activities, so that there is an urgent need for effective conservation actions requiring close collaboration between research and conservation workers, international, national and local habitat preferences and migration strategies. From knowledge of these various migration systems it is possible to group the migration routes used by waders into broad flyways, each of which is used by many species, often in a similar way, during their annual migrations.

NOTING that very large proportions of wading bird populations using flyways breed and stopover at sites in eastern Europe and northern Asia (especially Ukraine, Russia, Moldova, Belorus, Lithuania, Latvia, Esti, Kazakhstan, Kirgizstan, Uzbekistan, Turkmenistan, Georgia, Armenia, Azerbaijan, Tadzhikstan), and that many states are actively involved, nationally and internationally, in actions to conserve migratory bird populations;

WISHING to make maximum use of existing valuable but dispersed information, and noting that a most effective and economic means of collating existing data and gathering critical new data is through the co-ordinated activities of both amateur and professional researchers;

1. **Stresses** the need for the production of international flyway conservation strategies for each of the wader flyways (East Atlantic, Mediterranean/Black Sea; West Asia/Africa; Central Asia/India; East Asia/Australasia), and recommends that the Wader Study Group should co-ordinate the production of such strategies;

2. **Underlines** the importance of the identification and effective conservation of international networks of sites and areas on which these birds depend;

3. **Recommends** that, to allow geographical comparisons and time-series monitoring, common standards for field methodology and data collection and handling be adopted by all organisations for work on wader populations, and that close co-ordination of systems depending on data exchange, such as ringing centres and other databases, be enhanced;

4. **Recommends** that governments and non-governmental organisations provide resources to address present urgent needs in the study and conservation of waders in eastern Europe and northern Asia (especially Ukraine, Russia, Moldova, Belorus, Lithuania, Latvia, Esti, Kazakhstan, Kirgizstan, Uzbekistan, Turkmenistan, Georgia, Armenia, Azerbaijan, Tadzhikstan) which provide the areas of breeding and non-breeding usage for a high proportion of these shared populations.

5. **Emphasises** that all countries can learn from the experience of others and recommends that those people and organisations with experience in particular aspects should assist others by:

   - providing training and training materials, including publications.
   - assisting in establishing compatible databases.
   - arranging exchange visits.
   - supporting and helping to arrange conferences.
   - continuing co-ordination of colour-marking schemes.
   - assisting with publication of results and raising public awareness.
   - encouraging further bilateral and multilateral agreements on co-operation;

   and underlines the facilitating role which the Wader Study Group and other international organisations can play in these respects;

6. **Recommends** that collaboration between volunteers and professionals be actively encouraged, with initial building of confidence, feedback of information, and other support;

7. **Recommends** that full use is made of existing relevant information, which should be made available, after being gathered by simple techniques including questionnaires, initially on aspects such as site inventories of wader habitats, information on trends in wader population sizes with time, and analyses of human activities potentially affecting these habitats;

8. **Recommends** that programmes of research into crucial gaps in knowledge of the biology of waders be developed by the collaboration of relevant organisations along flyway routes;

9. **Recommends** that all states along Wader flyways sign and implement relevant international agreements;

10. **Congratulates** the State University of Odessa and the Ukrainian Ornithological Society for their initiative in hosting the international conference and so facilitating future international collaboration on wader research and conservation.

The Wader Study Group Conference on Migration and International Conservation of Waders, held at Odessa, Ukraine, 13-17 April 1992 was attended by 79 participants from 13 countries (Belgium, Bulgaria, Belorus, Germany, Italy, Kazakhstan, Netherlands, Poland, Romania, Russia, Ukraine, United Kingdom, United States of America), with further contributions from Canada, Denmark, Turkmenistan and Uzbekistan.

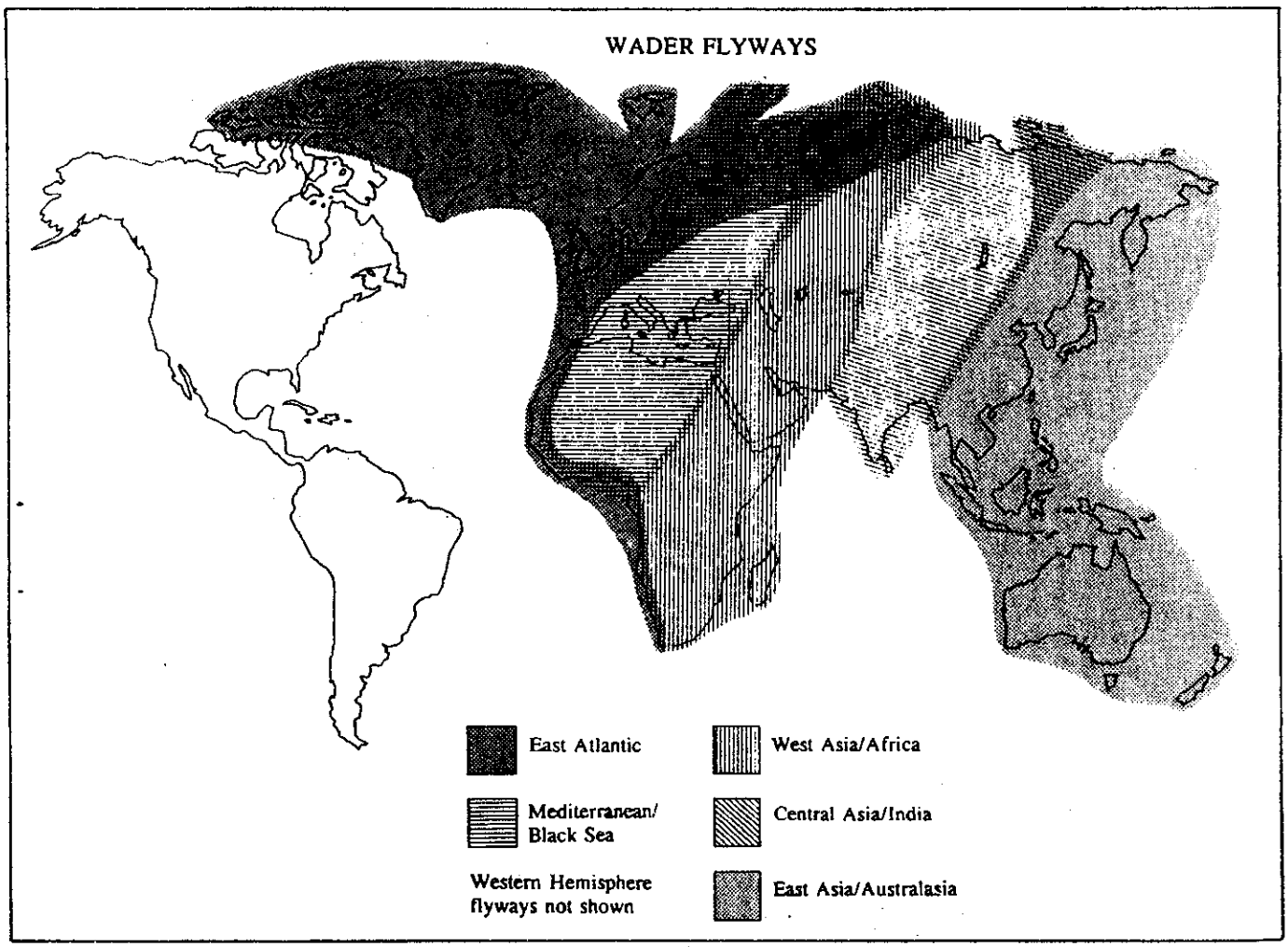
ANNEX

THE FLYWAY CONCEPT

A 'flyway' is a concept developed to describe areas of the world used by migratory animals such as waders. Flyways can be defined as the migration routes(s) and areas used by wader populations in moving between their breeding and wintering grounds. Each wader species and population migrates in a different way and uses a different suite of breeding, migration staging and wintering sites. Hence a single flyway is composed of many overlapping migration systems of individual wader populations and species, each of which has different habitat preferences and migration strategies. From knowledge of these various migration systems it is possible to group the migration routes used by waders into broad flyways, each of which is used by many species, often in a similar way, during their annual migrations.

There are no hard and fast separations between flyways, and their use is not intended to imply any major biological significance. Rather the use of the flyway concept is valuable for the convenience of its approach in permitting the biology and conservation of waders, as with other migratory species, to be considered in broad geographical units into which the migrations of species and populations can be more or less readily grouped.

Recent research into the migrations of many wader species throughout Europe and Asia indicates that in this part of the world the migration of waders can be broadly grouped into flyways: from west to east (see Figure 1) being the East Atlantic Flyway, the Mediterranean/Black Sea Flyway, the West Asia/Africa Flyway, the Central Asia/India Flyway, and the East Asia/Australasia Flyway.



THE 1992 NORTHWEST AUSTRALIA WADER EXPEDITION

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The 1992 visit to study waders in the Broome/80 Mile Beach/Port Hedland Saltworks region (the thirteenth "expedition" in 12 years) was a great success. All the main objectives were achieved - mostly exceeded - and the only disappointment was the very low numbers of juveniles from the high arctic nesting species (as predicted however by the three year cycle theories).

The main team was in the field from September 19 to October 19 (inclusive - 29 days) with a small group being present for an additional six weeks (from August 15). The 29 participants (excluding the Broome Bird Observatory wardens and other staff and helpers from the Broome area) were drawn from a wide geographic area - Russia, China, Vietnam, Malaysia, Indonesia, New Zealand (2), USA (2), UK, Germany (2) and Australia (SA,WA, NSW, ACT - 3, Vic -11).

Time was divided between Broome (12 days), 80 Mile Beach (9 days) and Port Hedland Saltworks (3 days) - the remaining days being used for travel between locations.

A total of 6154 waders (and 17 terns etc) was caught during the main part of the expedition and an additional 1006 in the preliminary period beforehand (see Tables 1 and 2). These were caught at:

Broome	4265
Eighty Mile Beach	1607
Port Hedland Saltmarsh	299

Table 1. North-West Australia 1992 Expedition Catch Details

	Broome/ Roebuck Plains 20/9,1-4/10, 12-17/10		80 Mile Beach/ Anna Plains 22-26/9,7-11/10		Pt Hedland Saltworks 27-29/9		TOTAL 20/9-17/10	
Waders								
Pied Oystercatcher	43						43	
Masked Lapwing	2						2	
Grey Plover	7		6		2		15	
Lesser Golden Plover					1		1	
Red-kneed Dotterel	12	(4)					12	(4)
Mongolian Plover	34	(11)			14	(1)	48	(12)
Large Sand Plover	306	(43)	288	(7)	5		599	(50)
Oriental Plover	1		41				42	
Red-capped Plover	16	(1)			6		22	(1)
Black-fronted Plover	5	(1)					5	(1)
Red-necked Avocet	8						8	
Ruddy Turnstone	98	(19)	11		3		112	(19)
Eastern Curlew	11						11	
Little Curlew	17						17	
Wood Sandpiper	10	(3)	1				11	(3)
Grey-tailed Tattler	181	(42)	117	(8)			298	(50)
Common Sandpiper	1						1	
Greenshank	1						1	
Marsh Sandpiper	2				3		5	
Terek Sandpiper	244	(28)	231	(17)			475	(45)
Asiatic Dowitcher	1				11		12	
Black-tailed Godwit	83				1		84	
Bar-tailed Godwit	520	(27)	88	(2)	29		637	(29)
Red Knot	247	(19)	41	(1)			288	(20)
Great Knot	550	(22)	409	(8)			959	(30)
Sharp-tailed Sandpiper	40	(5)			7		47	(5)
Pectoral Sandpiper	3	(1)					3	(1)
Red-necked Stint	1285	(96)	98	(2)	51	(1)	1434	(99)
Long-toed Stint	19	(3)	1				20	(3)
Curlew Sandpiper	495	(35)	265	(13)	101		861	(48)
Sanderling	2		4				6	
Broad-billed Sandpiper	14				61	(8)	75	(8)
(32 species)	4258	(360)	1601	(58)	295	(10)	6154	(428)
Other waterbirds								
Grey Teal	1						1	
Silver Gull			1		2		3	
Whiskered Tern	1						1	
Gull-billed Tern			2				2	
Little Tern	5				2		7	
Crested Tern			3				3	
	7		6		4		17	

NB Retrap numbers, in brackets, are included in all totals.

( ) Birds banded/recovered in north-west Australia.

* Excludes colour band sighting records.

Table 2. Wader catches at Broome 26/8 - 16/9/92

Species	Birds caught New	Retrap	Total	Number leg-flagged (Yellow)
Masked Lapwing	1		1	
Grey Plover	32		32	32
Red-kneed Dotterel	1		1	
Mongolian Plover	2		2	
Large Sand Plover	89	12	101	63
Oriental Plover	3		3	3
Red-capped Plover	1		1	
Red-necked Avocet	7		7	
Ruddy Turnstone	68	9	77	7
Eastern Curlew	1		1	
Wood Sandpiper	1		1	
Grey-tailed Tattler	36	7	43	10
Terek Sandpiper	66	9	75	14
Black-tailed Godwit	4		4	1
Bar-tailed Godwit	98	2	100	34
Red Knot	105	2	107	93
Great Knot	187	8	195	57
Sharp-tailed Sandpiper	7		7	7
Red-necked Stint	76	1	77	71
Long-toed Stint	2		2	2
Curlew Sandpiper	165	3	168	168
Broad-billed Sandpiper	1		1	1
(22 species)	**953**	**53**	**1006**	**563**
Grey Teal	1		1	

Good numbers were obtained of a wide variety of species (32 altogether). Top species in the main part of the expedition were

Red-necked Stint	1434
Great Knot	959
Curlew Sandpiper	861
Bar-tailed Godwit	637
Large Sand Plover	599
Terek Sandpiper	475
Grey-tailed Tattler	298

In spite of much effort only 288 Red Knot were caught. Other species with important additions to previous North-west Australia totals (in brackets) were 84 Black-tailed Godwit (27), 42 Oriental Plover (85), 43 Pied Oystercatcher (first), 20 Long-toed Stint (4) 12 Asiatic Dowitcher (15), 11 Wood Sandpiper (1), 11 Eastern Curlew (5) and 3 Pectoral Sandpiper (first).

A total of 32,882 waders (includes 1809 retraps/controls) of 40 species has now been caught in NW Australia since 1981 (see Table 3).

Table 3. Waders caught on North-west Australia Expeditions 1981 - 1992

	Newly banded	Retraps	Total
Pied Oystercatcher	43	-	43
Sooty Oystercatcher	7	-	7
Masked Lapwing	8	-	8
Grey Plover	89	-	89
Lesser Golden Plover	3	-	3
Red-kneed Dotterel	107	9	116
Mongolian Plover	251	43	294
Large Sand Plover	3473	284	3757
Oriental Plover	130	-	130
Red-capped Plover	280	6	286
Black-fronted Plover	9	1	10
Black-winged Stilt	120	-	120
Banded Stilt	90	-	90
Red-necked Avocet	97	1	98
Ruddy Turnstone	753	97	850
Eastern Curlew	17	-	17
Whimbrel	18	-	18
Little Curlew	364	-	364
Wood Sandpiper	10	3	13
Grey-tailed Tattler	2122	214	2336
Common Sandpiper	2	-	2
Greenshank	24	-	24
Redshank	1	-	1
Marsh Sandpiper	45	1	46
Terek Sandpiper	2260	230	2490
Swinhoe's Snipe	1	-	1
Asian Dowitcher	27	-	27
Black-tailed Godwit	115	-	115
Bar-tailed Godwit	2835	123	2958
Red Knot	2160	100	2260
Great Knot	4688	131	4819
Sharp-tailed Sandpiper	442	7	449
Pectoral Sandpiper	2	1	3
Red-necked Stint	4987	291	5278
Long-toed Stint	23	3	26
Curlew Sandpiper	4537	221	4758
Sanderling	13	-	13
Broad-billed Sandpiper	835	43	878
Red-necked Phalarope	1	-	1
Oriental Pratincole	84	-	84
40 species	**31073**	**1809**	**32882**

5300 of the waders caught in August to October 1992 were also colour marked with a yellow plastic (PVC-Darvic) flag on the right tibia. This is primarily to facilitate sightings on migration through Asia. However, it has already produced sightings of yellow-flagged Curlew Sandpipers in Victoria (Nov 92 and March 93 - different locations and probably, therefore, different birds) and - more surprisingly - of a Grey-tailed Tattler in Moreton Bay, near Brisbane (November).

Other banding highlights were the catching of two birds banded overseas - a Red-necked Stint from Taiwan and a Terek Sandpiper from Hong Kong (this bird was also caught on the last expedition to NWA in April 1990).

Although juvenile birds were almost totally absent in the species which breed in the highest latitudes, there were good numbers in some of the species which breed less far north, in the taiga zone of Siberia (eg. Little Curlew, Long-toed Stint, Wood Sandpiper, Oriental Plover), indicating a good 1992 breeding season in that area.

Much additional biometric and moult data was obtained. This is still to be analysed. The most dramatic item was a 40% weight increase in 10 days in a Pectoral Sandpiper (58 g on 4 October, 83 g on 14 October).

The Ministry of Agriculture and a team of veterinary scientists from WA and Indonesia collected over 500 cloacal swabs and blood samples from a selection of the migrant waders caught. Analysis has shown no example of avian-borne diseases, such as Avian Influenza and Newcastle Disease.

Useful data on arrival dates and population numbers was obtained at all the main sites. It was possible to monitor the population numbers of the less numerous species such as Eastern Curlew, Grey Plover, Oriental Plover and Little Curlew and track the first arrivals and the subsequent build up in numbers. Eastern Curlew peak arrivals were in mid-August with the whole population present before the end of the month. There was a very rapid build up of Oriental Plovers after the first arrival on 14 September. In contrast, Little Curlew numbers took a month to reach 100 after the first arrival on 14 September. A large wave of Grey Plover passed through in the second week of September.

A fuller report is currently in preparation. Consideration is also being given to the optimum way of analysing and formally publishing the wealth of information collected on the wader populations of North-west Australia over the last 12 years.

Meanwhile **book now** for the next main expedition - 4 weeks in **April 1994**. No previous expedition has continued beyond mid-April. Several species (Red Knot, Red-necked Stint, Turnstone, Grey-tailed Tattler and Terek Sandpiper) all mainly depart later in April. Collecting data on these will be a particular priority.

Clive Minton
Doug Watkins
-Expedition Leaders.

POPULATION MONITORING OF WADERS IN AUSTRALIA: WHY IS IT SO IMPORTANT, HOW IS IT BEST DONE AND WHAT CAN WE DO?

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Why monitor waders?

Most bird species are under some sort of threat, be it due to habitat alteration or destruction, hunting or other causes, such as pollution. Waders are no exception, especially those that migrate long distances and, therefore, not only need secure breeding and non-breeding areas, but also a series of sites, or stepping stones, at which they can replenish their fuel reserves whilst on migration.

Unfortunately, in the East Asian-Australasian Flyway habitat destruction is rife with 70% of mangroves having been cleared in The Philippines alone (Parish 1987). Mangrove loss has also been considerable in Indonesia and Singapore (Hegerl 1984). In South Korea, Japan and Singapore large areas of mudflats have been lost (Parish 1987), and there are plans to reclaim a further 480,000 ha of mudflats in South Korea by the year 2001 (Long *et al* 1988). The pressure to convert wetlands for industrial, agricultural and aquacultural purposes will be severe for many years whilst the developing countries in the flyway are striving to improve their living standards.

Hunting pressure is also a serious threat to waders. The published estimate of 250,000 to 1,500,000 waders taken by hunters each year (Parish 1985) covers a wide range, but recent experience indicates that the actual harvest may be closer to the upper limit than the lower. Hunting takes place in almost every country in the flyway, but the harvest seems to be particularly high in China, Vietnam and Indonesia. The great majority of Chinese recoveries of banded waders are of birds captured for food. Barnford (1992) estimates that, for Great Knot, hunting in China may account for up to 18% of the entire population, annually. One team, alone, of Vietnamese hunters has been reported to have been catching 70kg of waders per night (totalling, perhaps, 500 individuals) (Howes and Parish 1989). A study of waterbird netting activities in Java estimated that 40,000 Oriental Pratincoles were caught in one season (Milton and Marhadi 1989). And on it goes. In fact, the numbers of Great Knot and Oriental Pratincole being caught may exceed the recruitment rate, with obvious results.

Thus, the threats facing waders in the Flyway are very real and it is for this reason that wader populations should be monitored on a continuous and regular basis in order to determine whether their numbers are being adversely affected.

Is there any evidence that the problems being encountered by waders are having an effect on flyway populations? Count data for the Hobart region (Fletcher 1979, Fletcher 1980, Patterson 1982, Patterson 1986, Bulman 1989, Lord 1992) and Swan Bay, in Victoria, (Barter 1992) indicate substantial declines in numbers of Red-necked Stints and Curlew Sandpipers over recent years. On the other hand, larger waders seem to have held their own at Swan Bay (Barter 1992), and Bar-tailed Godwit numbers appear to be increasing generally, both in Australia and elsewhere in the world (Hewish 1990, Prys-Jones and Kirby 1989). A possible explanation for these seemingly divergent results could be the more serious effect that habitat loss would have on the smaller waders, due to their shorter flight ranges, and consequent greater need for staging sites, compared with larger waders that are capable of overflying areas of greatest habitat loss.

Care has to be taken not to react too quickly to adverse count data. This can be illustrated by the comprehensive counts for Dunlin in the UK, where a long-term population decline, which occurred between the mid-1970s and mid-1980s, has been reversed over the last five years with the population recovering to be close to that of the 1970s (Waters 1992). Similarly, Eastern Curlew numbers declined markedly in Westernport, Victoria, in the 1977-80 period, but have recently recovered to more normal levels (Dann *et al* in prep., Hewish 1990, Anon 1992, Naismith 1992)).

Thus, a decline in a wader population may be part of a long term cycle. When a substantial fall in numbers is occurring, the important questions that need answers are: Is the observed decline natural or not? At what stage should the alarm bell be rung? What are the threshold criteria for action?

How, then, can waders be effectively monitored?

Wader populations are best monitored by a combination of long-term counting and a complementary banding programme - that is an integrated approach to population monitoring that provides both information on numbers and reasons why they are changing.

Banding data may enable us to determine whether there have been changes in survival rates, if breeding productivity has altered and, possibly, allow us to determine at what stage in the annual cycle that problems are occurring.

Survival rates are estimated by analysis of the subsequent recapture rates of banded birds. The more sophisticated, and useful, models require an adequate number of annual recaptures, and this implies both the need for a large proportion of banded birds in the target population (say 20%) and annual catches of a few hundred for each target species.

In the case of arctic-breeding waders, it is very difficult to measure productivity from data collected on the breeding grounds. However, the proportion of first-year birds in catches made in Australia will be not only a good indication of variations in annual breeding success but, as these birds will have undertaken a long migration to reach Australia, the data will realistically describe the cumulative result of success rates in hatching, fledging and migration, ie. the practical recruitment rate of first-year birds into the population.

Baillie (1990) has identified four basic aims of such an integrated population monitoring programme. These are to:

a) Distingish un-natural changes in population size from natural fluctuations,
b) Identify the stage in the annual life cycle during which changes are taking place,
c) Provide data that will identify the cause of the population change, and
d) Establish thresholds for action.

CURRENT SITUATION IN AUSTRALIA

Counting

Australia is in a particularly good position to monitor the welfare of wader species and sub-species in the East Asian-Australasian Flyway because of the stability of non-breeding populations over a period of months during the austral summer and the high proportions of the flyway populations of many species that occur in this country (Watkins, in prep.).

The current counting segment of the AWSG Population Monitoring Project is providing twice-yearly data on 23 sites. The counts are undertaken in early February, when numbers are at their most stable during the non-breeding season, and in June/July, to establish the population remaining in Australia during the northern hemisphere breeding season. Most of these sites have been counted since 1982 and are providing very useful data on species occurring in the coastal regions of southern Queensland, New South Wales, Victoria, Tasmania, South Australia and south-west Western Australia.

However, the counting activity is not satisfactorily monitoring:

- wader species, or populations, that are only abundant in northern Australia, eg. Great Knot, Large Sand Plover, Terek Sandpiper, Bar-tailed Godwit, Black-tailed Godwit, Grey-tailed Tattler, Grey Plover, Red Knot, Whimbrel.
- migratory waders that are nomadic within Australia, such as Oriental Pratincole, Little Curlew, Oriental Plover, Australian Pratincole and Latham's Snipe.
- resident waders, especially those which are nomadic or widely and thinly dispersed, eg. Banded Stilt, Red-necked Avocet, Black-winged Stilt, Inland Dotterel, Black-fronted Plover, Red-capped Plover, Banded Lapwing, Masked Lapwing, Painted Snipe, Red-kneed Dotterel.

Banding

The great majority of waders have been banded in Victoria and north-western Australia (c. 80,000 and 30,000, respectively) and the total from these two regions exceeds 90% of all the waders banded in Australia during the last 15 years. It is believed that only the Victorian data is of sufficient quantity and quality for adequate determination of recruitment and survival rates, and then only for a limited number of species.

Catches for age structure determination are made when populations are stable, eg. December/February in south-eastern Australia, although an earlier start is probably suitable in north-western Australia, eg. November onwards. In Victoria, Red-necked Stint and Curlew Sandpiper are monitored at four sites, with the aim being to achieve annual catches of a total of 500 of the former species and 200 of the latter at each site. These targets have been generally achieved in most years since 1979. Preliminary data analysis has provided interesting information on the breeding success cycle, and variations in breeding success between species and in juvenile percentages between sites.

Catches for survival rate estimations can be made throughout the year. Suitably comprehensive data is only available for Red-necked Stint, Curlew Sandpiper and Double-banded Plover in Victoria. However, "rough" survival rate indications may be obtainable from the less extensive data for other species in Victoria and some in north-western Australia. Survival rate calculations have only been carried out for the Double-banded Plover (Barter 1989, 1991). However, the survival rate analysis of Victorian Red-necked Stint capture-recapture data is currently being carried out and the results should be available by end-1993.

The growth in banding activities in Moreton Bay, Brisbane, and at various places in New South Wales should allow survival rate and age structure estimations to be carried out for a variety of species at these sites at some time in the future.

The future

Firstly, it is extremely important that the existing counting activities be continued. They represent an enormously valuable data set covering the last 13 years. Complementary counting activities conducted by the Bird Observers Club at Westernport, Victoria, and the Bird Observers Association of Tasmania, in the Hobart area, are of even longer duration and are, consequently, of exceptional value.

Very long term count data, say of 20 years duration or more, provides the basis for distinguishing between natural and un-natural population changes and cycles. Such data can also allow statistically reliable deductions to be made concerning changes in population numbers. Relatively slow, but important, declines need to continue for a number of years before they become statistically significant, eg. Pied Oystercatchers in Swan Bay, Victoria, where numbers have fallen from 65 to 50 over a ten year period (Barter 1992).

Thus, it is essential that the existing AWSG Population Monitoring Project be maintained and that every effort be made to ensure that the data collected is complete and continuous. Similarly, the Victorian Wader Study Group should continue its complementary banding programme.

Secondly, counting and banding activities need to be expanded to include species and regions not currently covered. The recent commencement of such activities in Queensland and New South Wales will assist considerably in this respect. It is desirable that the AWSG and sister state organisations coordinate their activities to ensure that as many species as possible are being adequately monitored.

A programme of twice-yearly counts should be started at Eighty Mile Beach, in north Western Australia, to cover species and populations occurring mainly, or only, in this region. The activity can be best handled by Broome Bird

Observatory. The Observatory has cannon-netting equipment and qualified banders to conduct a complementary banding activity.

Expansion of population monitoring to New South Wales, Queensland and north Western Australia and maintenance, and improvement where necessary, of the existing programme, will go most of the way towards covering those migratory species which occur in Australia in sufficient numbers, and at suitable concentrations and locations, to be monitored effectively. The nomadic and resident waders will require the development of different monitoring techniques.

The final need is to commence detailed analysis of the existing count data and continuing analyses of banding data for estimation of both survival rates and annual recruitment of first-year birds. An important part of these analyses should involve a review of the design and adequacy of the current Population Monitoring Project.

How can all this be achieved? It's certainly a large task for a group of volunteers to undertake. The effort in just organising and collating the current programme is considerable. Publishing the half-yearly results, with some interpretation, adds to the load. Expansion of the Project to incorporate data from additional sites in New South Wales, Queensland and Western Australia, probably means that the task is beyond that of one person, and a team will be needed - perhaps a national coordinator with individual state coordinators.

The task of analysing the existing count data set will require at least one-half man-year of specialist time and it is proposed to seek funds to carry out this work.

I hope that I've managed to convince readers of the great importance of monitoring wader populations in Australia and of the need to continue, and expand upon, the current programme. There can be no more important AWSG project than this one!

The AWSG is seeking volunteers to assist in coordinating and running the project. Those interested should contact me to discuss ways in which they can be involved in this essential task.

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WAYWARD WADERS IN THE SOUTH OF WESTERN AUSTRALIA

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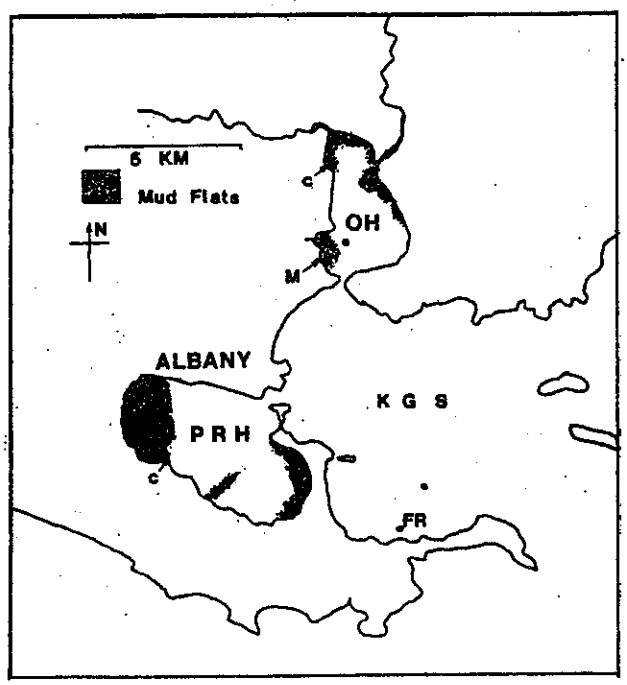
Holarctic waders visit a number of sheltered inlets on the south coast of Western Australia. Amongst these inlets the two harbours at Albany (see Figure 1), Oyster Harbour, 34° 57' S; 117° 58' E, and Princess Royal Harbour, 35° 05' S; 117° 53' E, attract a summer population of 2,000-3,000 migratory waders which feed on the shallow mudflats of both harbours. Since 1985 the annual numbers have been relatively constant (Table 1), in spite of heavy metal pollution in Princess Royal Harbour algal growth stifling much of the natural sea-grass in both harbours in recent years and increased urban development on their shores. Although each harbour seems to support a distinct population, some intermingling of the waders occurs during high tides at night, when larger species from both harbours roost on Flat Rock in King George sound. During the summer these local populations of migratory waders, particularly the smaller species which prefer to feed or roost on a sheltered lee shore, favour the east sides of both harbours and are not readily accessible. Not many migratory waders over-winter in the two harbours, though numbers vary and more have been counted during some winters, for instance 110 in 1988 and 161 in 1989.

Figure 1 OH = Oyster Harbour, PRH = Princess Royal Harbour, KGS = King KGeorge Sound, FR = Flat Rock



In addition to those species which have been banded (Table 2), Eastern Curlew, Whimbrel, Ruddy Turnstone, Sanderling, Wood Sandpiper, Common Sandpiper, Terek Sandpiper, Black-tailed Godwit, Asian Dowitcher and tattler species have also been recorded.

Table 1 Summer Total Wader Counts

Season	'85/86	86/87	87/88	88/89	89/90	90/91	91/92
OH	1099	1041	719*	1068	648*	1529	1282
PRH	700*	849*	528*	985	1044	1172	1478

* Counts not complete
OH = Oyster Harbour, PRH = Princes Royal Harbour

Table 2 Holarctic waders banded at Albany since 1985

Season	85-86	86-87	87-88	88-89	89-90	90-91	91-92
Grey Plover *Pluvialis squatarola*			2		2		1
Pacific Golden Plover *Pluvialis dominica*				11			
Large Sandplover *Charadrius leschenaultii*	1		1	1	3	4+1*	1
Mongolian Plover *Charadrius mongolus*					1		
Greenshank *Tringa nebularia*	3	1	2				
Bar-tailed Godwit *Limosa lapponica*	1						
Red Knot *Calidris canutus*	9		2			28	
Great Knot *Calidris tenuirostris*			2		3	23	
Sharp-tailed Sandpiper *Calidris acuminata*		9			2	1	
Red-necked Stint *Calidris ruficollis*	71	52	63+3*	22	85+ 13*	23+5*	66+6* #
Curlew Sandpiper *Calidris ferruginea*	1	12		5	4	2	

* Recaptures from previous years
\# Including 57+5 in September 1992.

Since 1985 a modest number of migratory waders have been banded in both harbours (Table 2), using mist-nets (at site "M" on Map) or small cannon-nets (at sites "c" on Map). Prior to this, during the early 1980s, I understand Ken Mills banded several hundred waders in Oyster Harbour.

One would expect the movements of the Albany birds to be simply north-south, with the south coast the end of the line, for directly south of Albany lies Antarctica. The recovery in Oyster Harbour of a Red-necked Stint banded in north-western Australia substantiates this. Although the number of this locally-banded Red-necked Stint recaptured

(Table 2 - 7% of total) indicates some degree of fidelity to their non-breeding haunts, some considerable lateral displacement inevitably occurs. Weather patterns must play an important part in deciding the ultimate destination of many waders which pass through. Along the south coast, prevailing winds are generally west to south during the winter and spring. During January to April, high pressure cells in the Bight bring days of strong easterly winds. Thus along the south coast the prevailing winds favour movement eastwards in spring and westwards in autumn.

An orange-flagged Red-necked Stint, seen amongst 150 in Oyster Harbour late in September 1992, was presumably banded in Victoria subsequent to January 1990 (Minton 1991). It was not seen again and was not amongst 62 Red-necked Stints caught by cannon-net three days later at the same site. In the catch 12 birds were in their second year and 50 were 3+, five of which had been banded previously in Oyster Harbour. Thus the flagged bird may have joined a group of Albany birds somewhere in transit from their breeding grounds and pressed on eastwards after a brief rest.

During the late summer in Albany the strong regular east winds not only cause problems with counting and catching, but undoubtedly affect wader movements during migration later in the season. When migratory populations from further east (Victoria, and even New Zealand) should be heading north, strong easterly winds will deflect some birds westwards along the south coast following the coastline, as has already been commented on by Minton (1991), who refers to sightings of flagged waders and remarks on the surprisingly strong westerly component (from Victoria) in the initial stage of the "northward" migration back to their breeding grounds.

Other observations tend to substantiate that a westerly movement of some migratory waders in autumn may be a regular occurrence but is unobserved because it occurs at night or because of the paucity of observers. For instance Alcorn (1987) refers to Lola Broadhurst's observation of 15,000 Red-necked Stints seen in Wilson Inlet (west of Albany) in April 1986.

On two occasions in early April (1988 & 1989), after days of strong easterly winds, mixed flocks of waders were observed by me, apparently in transit as they seemed unfamiliar with the area, feeding like Sanderling in the rough surf of a beach facing east in King George Sound. In both flocks were Red Knot, Ruddy Turnstone, Red-necked Stint and Large Sandplover, though strangely no Sanderling. Such behaviour had never been noticed amongst the "local" waders, most of which had already departed by the end of March.

Two Red Knot, banded in Princess Royal Harbour in mid-March 1991, were recovered in New Zealand during the winter of 1992. When first netted they were amongst a mixed flock of 150 Red and Great Knot, many in almost complete breeding plumage, which, from their behaviour, were part of the "resident" Albany summer population ready to depart. The catch, by cannon-net, was 23 Great Knot, 28 Red Knot and 4 Large Sandplover; one of those rare occasions when adequate helpers justified firing the net.

As these two Red Knot were recovered in New Zealand two winters later, they were most probably first year birds at the time of banding, but recorded as 2+, even though both were completing primary moult and their weights were low. Even so this must confirm that some Red Knot do not breed until their third year or later. During the intervening 15 months, since no Red Knot were seen overwintering in the Albany area in 1991, can one postulate that these two birds went north part of the way with the remainder of their flock, and then during the subsequent spring moved down the east side of Australia on their way to New Zealand? Or, soon after banding, did they head eastwards and southwards?

The value of these inlets on the south coast of Western Australia seems to lie not only in providing a suitable summer environment for small local populations of migratory waders but in also providing staging posts for passage birds which spend their summers further east.

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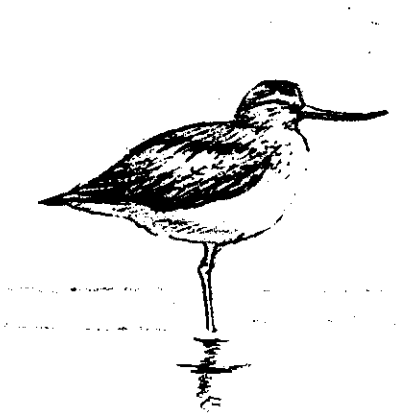

OBSERVATIONS ON WADERS RECORDED AT PELICAN POINT, WESTERN AUSTRALIA, FROM 1971 TO 1991.

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Summary

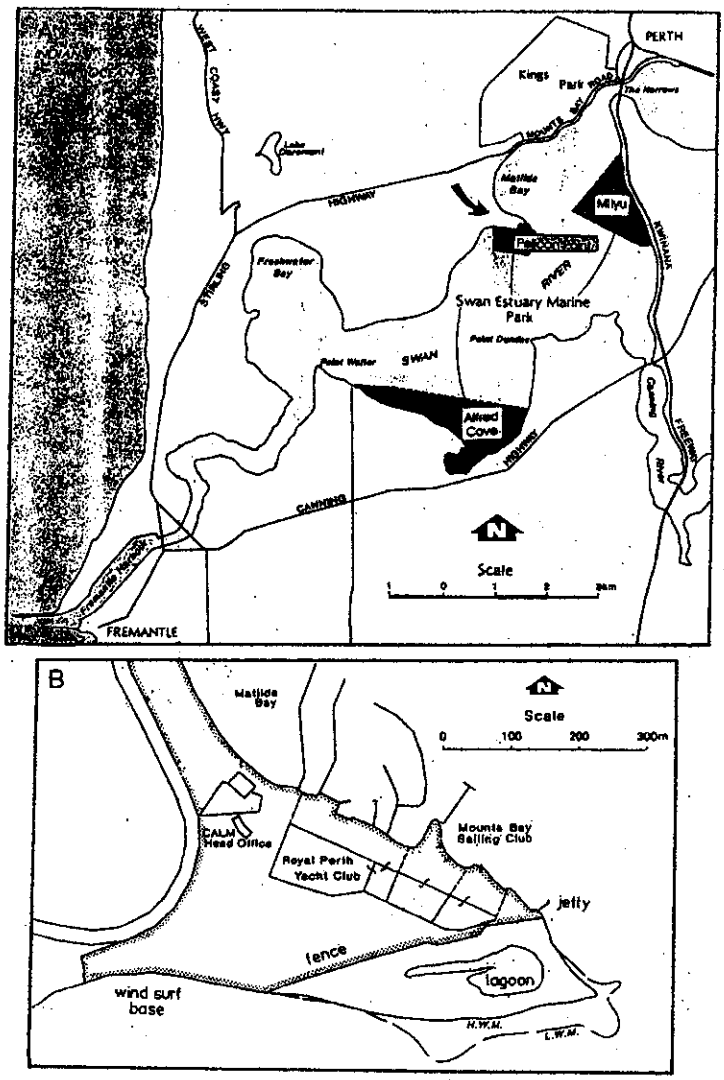
Twenty years of wader observations at Pelican Point on the Swan River, Perth are analysed. Of 23 species observed, 10 were present in 18 or more years and seven were seen sporadically in five or fewer years. Over the 20 years, there has been a decline in numbers of two of the 10 commoner species; a further three species have shown a decline over the last 10 years. One species, the Black-winged Stilt, has increased. The Pied Oystercatcher has been seen each year since 1986 but not previously. Most waders were observed from September to March. The monthly abundance was similar for the two 10 year periods for most species but in the second period the Bar-tailed Godwit was seen less often throughout the year and the Black-winged Stilt more often in August to December. Overall fewer birds were seen in the second period. It is concluded that the same species may be seen at Pelican Point now as 20 years ago but some species are seen less often.

Introduction

Many waders, found in Australia from September to April, breed in the northern hemisphere during the northern hemisphere during the northern summer, some within the Arctic Circle. The birds are dispersed along coasts and estuaries around Australia and during most of this period have drab non-breeding plumage. With the increased use of field guides, binoculars and telescopes, accurate identification is now possible and there are detailed records of the current distribution of species (eg. Blakers *et al.* 1984). However, little is known of the changes that may have occurred during this century. These may have resulted from changes in the environment within Australia but also from developments along the migration routes through China, Japan and other parts of eastern Asia or in the breeding sites in Australia and the northern hemisphere.

The Swan River flows into the Ocean through sand and to the north and south of the estuary there used to be a series of lakes and swamps. With the development of Perth and Fremantle, much of the wetland has been filled in and the sandy river beaches built upon. Pelican Point (Fig. 1) is a sandy spit projecting into the Swan River at Crawley and has always been a popular roosting place for waders. It was first suggested that it should be a reserve in about 1958 and since 1976 two hectares have been separated from the adjacent open space by a fence. Along two sides, sandy beaches front onto the river. These are separated by low dunes from a small lagoon which used to have a drainage channel to the river. The lagoon is surrounded by sedges (*Carex* and *Juncus*) and some samphire, and trees and shrubs grow between this and the fence including the introduced *Casuarina glauca*. A total of 110 species of plant has recently been identified in the reserve (G. Keighery personal communication). In the present project, detailed records of waders have been documented for the past 20 years at Pelican Point and these have been compared with earlier reports for the area. A short report of all bird species including waders has already been published (Bailey and Creed 1989).

Figure 1: A Swan River Estuary showing the three components of the Marine Park. B. An enlargement of Pelican Point showing the high and low water marks (H.W.M. and L.W.M.), the fence erected in 1976 and the lagoon. Adjacent water recreation areas are indicated.



Methods

Records of numbers of species of waders (and other species) at Pelican Point were made for 20 years from July 1971 to June 1991. Except in 1975-76, the reserve was visited at least once a week in summer (October to March), usually at 1730 on a weekday. In winter visits were made less regularly. Between July 1975 and June 1976 visits were made on 19 weeks; in the other 19 years, the number of weeks that visits were made ranged from 24 to 49 weeks (mean ± SD 34.53 ± 6.36, n=19). Visits were made in 305 weeks between July 1971 and June 1981 and in 370 weeks between July 1981 and June 1991.

All records for one week were pooled and the number of weeks in which a species was seen was expressed as a percentage of the total number of weeks in which observations were made in that year. In addition data was analysed for the months in which each species was observed and for relative numbers of individuals of each species seen during visits. The reserve was visited in 99 of the 120 months in the first 10 year period and 102 months in the second period. Although numbers of individuals were not routinely counted, estimates of numbers were recorded when unusually high numbers were present and counts were made for less common species. Comparisons were made between data collected in the two 10 year periods, July 1971 - June 1981 and July 1981 - June 1991.

Results were compared with Student's t-test.

Results

Total species present

23 species of waders have been seen at Pelican Point over the twenty years (Table 1). Of these five have been seen every year and a further five were present in 18 or more years. Pied Oystercatchers were first recorded in 1986-87 and have been seen every year since then with increasing regularity (3% of weeks in 1986-87; 77% in 1990-91). Mongolian Plovers have occurred slightly more often in recent years. Nine species have been seen sporadically throughout the 20 years, usually on single occasions (Golden Plover, Banded Stilt, Grey-tailed Tattler, Terek Sandpiper, Black-tailed Godwit, Sanderling) but sometimes on several visits in succession (Large Sand Plover, Mongolian Plover, Ruddy Turnstone). The number of individuals seen on these rare visits was usually one or two for most species.

Trend over 20 years

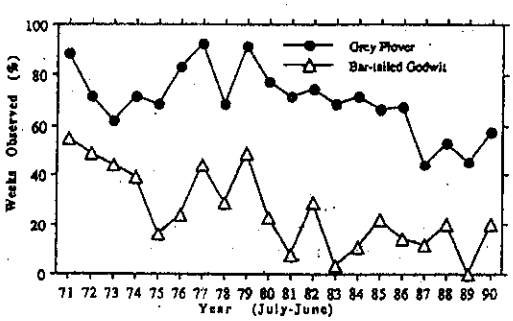
Of the 10 species seen most frequently, the number of weeks they were present (expressed as a % of total weeks visited that year) was compared over the 20 year period. Two species, Grey Plover and Bar-tailed Godwit, were found to occur progressively less often (Fig 2), with a significant difference between the means for the first and second 10 year periods (77.1 to 61.7% for Grey Plover, 37.2 to 14.0 % for Bar-tailed Godwit; $P < .01$). One species, Black-winged Stilt, showed a significant increase (57.2 to 84.8%; $P < .01$) (Fig 2). Common Sandpiper and Greenshank (usually single individuals) have also been seen on more occasions but

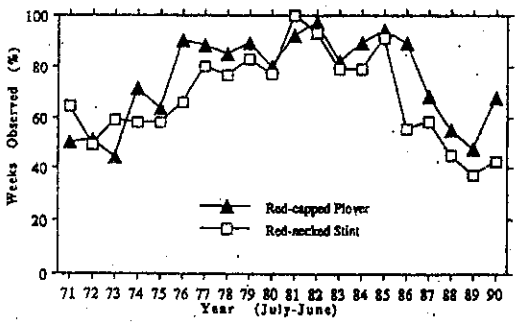
Table 1 - Number of years waders were seen in 20 years of visits to Pelican Point

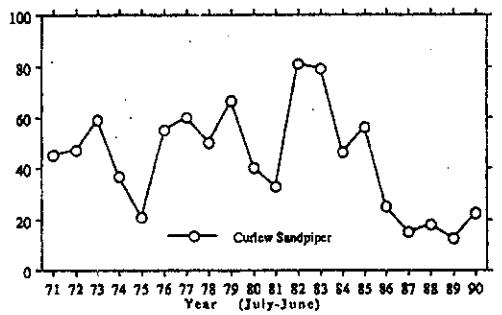
	total 20 yrs	1st 10 yrs	2nd 10 yrs
Pied Oystercatcher *Haematopus longirostris*	5	0	5
Grey Plover *Pluvialis squatarola*	20	10	10
Lesser Golden Plover *Pluvialis dominica*	3	1	2
Hooded Plover *Charadrius rubricollis*	2	0	2
Mongolian Plover *Charadrius mongolus*	8	3	5
Large Sand Plover *Charadrius leschenaultii*	5	2	3
Red-capped Plover *Charadrius ruficapillus*	20	10	10
Black-winged Stilt *Himantopus himantopus*	20	10	10
Banded Stilt *Cladorhynchus leucocephalus*	7	4	3
Red-necked Avocet *Recurvirostra novaehollandiae*	19	10	9
Ruddy Turnstone *Arenaria interpres*	5	2	3
Grey-tailed Tattler *Tringa brevipes*	7	4	3
Common Sandpiper *Tringa hypoleucos*	18	8	10
Greenshank *Tringa nebularia*	19	9	10
Terek Sandpiper *Tringa terek*	6	4	2
Black-tailed Godwit *Limosa limosa*	4	3	1
Bar-tailed Godwit *Limosa lapponica*	19	10	9
Red Knot *Calidris canutus*	19	10	9
Great Knot *Calidris tenuirostris*	16	6	10
Sharp-tailed Sandpiper *Calidris acuminata*	14	7	7
Red-necked Stint *Calidris ruficollis*	20	10	10
Curlew Sandpiper *Calidris ferruginea*	20	10	10
Sanderling *Calidris alba*	4	1	3

comparison of the two 10 year periods indicates that this may not be significant (13.2% compared with 26.1% of weeks ($P = .05$) for Common Sandpiper; 10.5% to 18.1% ($P = .06$) for Greenshank. Three species, Red-capped Plover, Red-necked Stint and Curlew Sandpiper, showed a tendency to be recorded more often up to about 1980 (Fig 2) but have been present less often over the last six years. The overall frequency for Red-capped Plover and Red-necked Stint was similar in 1987-91 as in 1971-74 (Fig 2) though the Curlew Sandpiper was seen on only about 20% of weeks recently compared with 45% in the earlier years. Two species, Red-necked Avocet and Red Knot, have shown no overall trend over the years though there were wide fluctuations in % weeks they were seen. Red-necked Avocets were not seen in 1989-90 but were present in 84% of weeks in 1985-86 (mean 22.7% for 20 years), and Red Knot were not seen in 1981-82 but were present in 39% of weeks in 1972-73 (mean 14.9% for 20 years).

Figure 2: Occurrence of six species of wader recorded at Pelican Point over 20 years. Each point represents the % of weeks a species was observed between July of the year indicated and the following June.







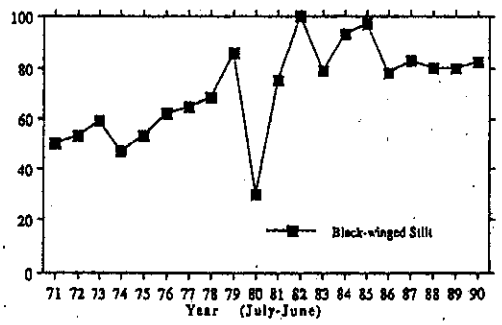


Table 2 - Summary of observations on the 10 waders seen most frequently at Pelican Point.

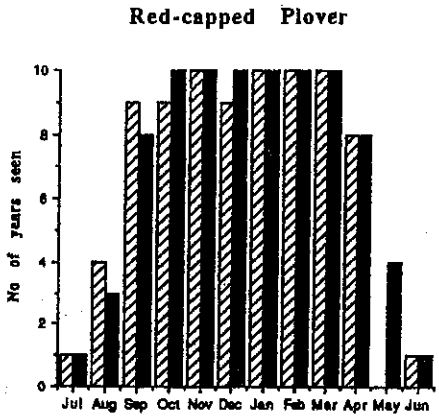
	weeks seen	months seen		number of times 10+ birds seen		breeding
		71-81	81-91	71-81	81-91	
Grey Plover	→ ↓	84	78	12	38	arctic
Red-capped Plover	↑ ↓	81	85	26	46	local
Black-winged Stilt	↑ ↑	69	94	20	50	local
Red-necked Avocet	→	50	43	60	31	local
Common Sandpiper		26	42	0	0	arctic
Greenshank		26	31	0	0	arctic
Bar-tailed Godwit	↓ ↓	63	31	55	2	arctic
Red Knot	→	36	25	22	12	arctic
Red-necked Stint	↑ ↓	78	76	61	57	arctic
Curlew Sandpiper	↑ ↓	64	60	68	34	arctic

The arrows in the "weeks seen" column indicate whether there was an increase (↑), decrease(↓) or no change (→) in the % of weeks the species was seen in successive years within each 10 year period. The Point was visited in 99 months between July 1971 and June 1981 and 102 months between July 1981 and June 1991 out of a possible 120 months.

Months Birds Present

Few waders were seen at Pelican Point in July, but there were occasional sightings of Red-capped Plover and Black-winged Stilt, both resident in WA throughout the year. Maximum sightings occurred in November, December and January. Grey Plover, Red-capped Plover and Red-necked Stint were present in each month from October to March in 90% or more years (i.e. in 18 or more of the 20 years observations were made) and in September and April in 70 to 90% of years (Fig 3). By May the birds were less often seen and were infrequently present in June (less than 20% of years). Curlew Sandpiper were present in December and January every year but less often earlier or later (Fig 3). Red-necked Avocet, Black-winged Stilt and Bar-tailed Godwit were most likely to be seen in November and December when they were present in 80% or more years (Fig 4). Black-winged Stilt were then present in all months through to March in 80 to 100% of years whereas Red-necked Avocet and Bar-tailed Godwit declined gradually from January to June and neither species was ever seen in July. Greenshank, Great Knot, Red Knot and Sharp-tailed Sandpiper were most likely to be seen between November and February but were only seen in 60% or fewer years.

Figure 3: Histograms to show the number of months each wader was observed in the two 10 year periods July 1971 to June 1981 and July 1981 to June 1991. Visits were made at least once a month between September and April in each year and in more than 50% of months May to August. There was little variation between the two 10 year periods for these four species.



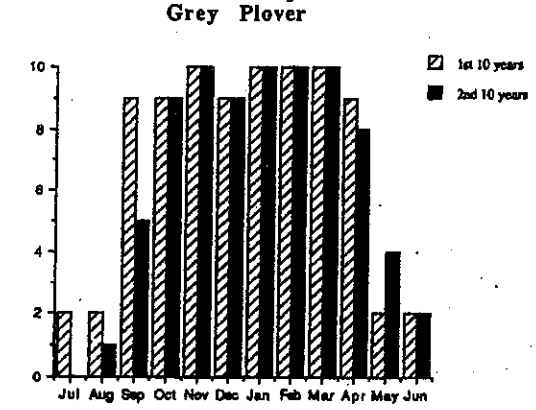
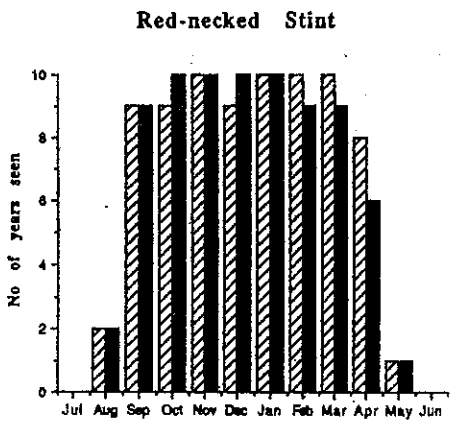
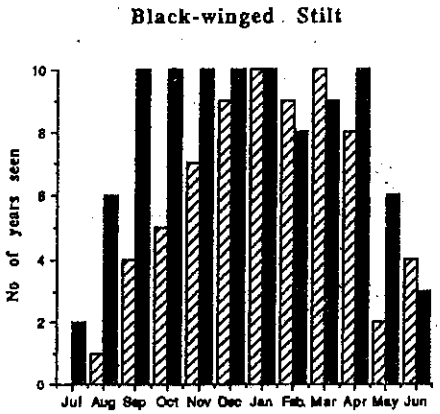
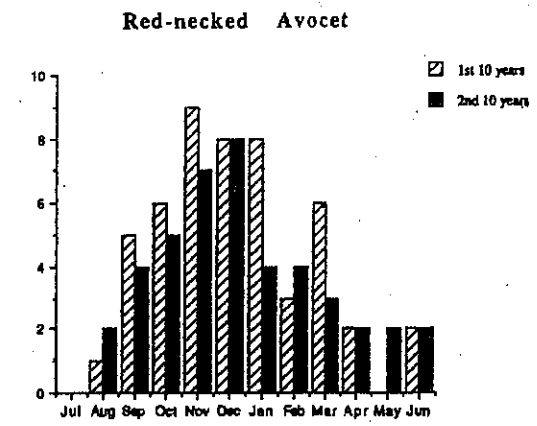
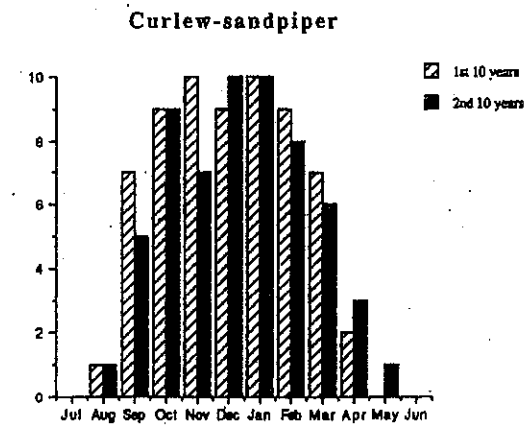


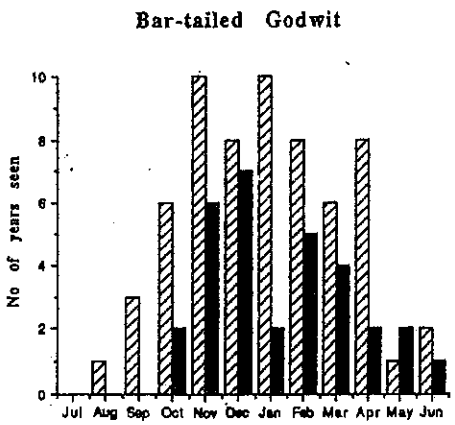
Figure 4: Histograms for four species for which there was some difference in records between the two periods.

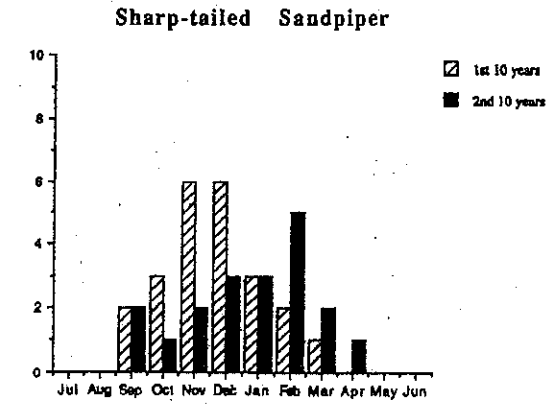




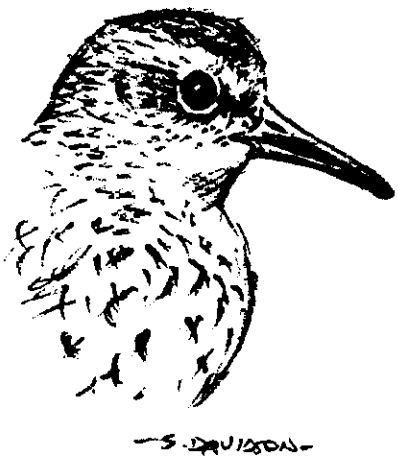








When the months the birds were seen was compared for the two 10 year periods, the occurrence of Red-capped Plover, Red-necked Avocet, Red-necked Stint, Curlew Sandpiper and Greenshank was found to be similar. Of the two species that have been recorded in fewer weeks in the second period, the Grey Plover (Fig 3) showed a similar monthly distribution for the two periods. However, the chance of seeing a Bar-tailed Godwit has declined for each month (Fig 4). The increase in sightings of the Black-winged Stilt can be explained by its more frequent appearance in August to December in the second period (Fig 4). The Sharp-tailed Sandpiper, which was reported to be abundant by Serventy (1938) and Serventy *et al.* (1962) was seen in November and December in only six of the 10 years between 1971 - 1981 and in less than three in 1981-1991 (Fig 4). It was not observed at all in 1989-90 or 1990-91.



Relative number of Species

Comparison between the two 10 year periods indicated that for several species larger numbers of individuals tended to be present in the earlier period. For the two most numerous species, Red-necked Stint and Curlew Sandpiper, 100 to 1000 birds were seen on 78 and 28 occasions respectively in 1971-81; and on 58 and 10 occasions in 1981-91. 10 to 100 individuals were less often recorded for three other species (Red-necked Avocet, Bar-tailed Godwit and Red Knot) in the second 10 year period. However 10 to 100 individuals of three species (Grey Plover, Red-capped Plover and Black-winged Stilt) were seen more often in the second 10 year period.

A summary of the weeks and months species were seen together with the number of occasions 10 to 100 individuals were seen in summarised in Table 2 for the 10 commonest species.

Discussion

23 species of wader were seen at Pelican Point over the 20 years 1971 to 1991. The 10 species recorded most frequently (in 18 or more years) were all observed by Serventy (1938) and Job (1972) except that Serventy did not report Red Knot and Job did not report Greenshank. Of the less common species, Serventy did not report Pied Oystercatcher, Mongolian Plover, Ruddy Turnstone or Grey-tailed Tattler. However, he has expressed some doubts about his ability to identify Red Knot (Serventy 1938) and his uncertain description of Double-banded Plover may have been Mongolian Plover (Ford 1970). Grey-tailed Tattler had previously been seen by Jenkins (1932) and Ruddy Turnstone was seen by Job (1972). Both these species are uncommon visitors to other parts of the Swan River fore-shore (Jenkins 1956, 1961). The Pied Oystercatcher appears to be a recent visitor to Pelican Point and also to the Swan River. Occasional additional sightings of Terek Sandpiper, Black-tailed Godwit and Hooded Plover have been reported (Serventy 1950, Stranger 1964, Lindgren 1955). Waders not appearing on our list for 1971 to 1991 but recorded by others are Eastern Curlew (Serventy 1938) and Whimbrel (Serventy 1938, Job 1963); Australian Pratincole (Lane 1973) and Red-necked Phalarope (Prince 1983). The last two are rare visitors to south-west Australia but the Eastern Curlew and Whimbrel were seen elsewhere on the Swan River (Como - Jenkins 1961, Causeway foreshore - Tarburton 1974). They were recorded by early observers in the area (Alexander 1921) but are rare now.

The results presented here indicate that the number of species of waders found at Pelican Point has changed little over 20 years. However, some species are now present less often and numbers of birds seen are reduced. This may result from changes in the local environment or from different patterns of distribution of birds along the coast of Western Australia. Changes in the local habitat include the progressive development of the adjacent land as a recreational area and the increasing use of the river by boats and windsurfers. However the reserve has had some protection following the erection of a fence to limit access in 1976. The point itself has altered due to the planting of shrubs and trees, some not native to the area, some vegetation of the dunes which has tended to stabilize them and silting up of the channel draining the lagoon into the river. The dune vegetation may have been a direct result of the fence and planting of shrubs but also of a jetty erected east of the point, all of which have reduced the impact of NE winds. The level of the water in the lagoon still fluctuates with river levels due to seepage through the sand so that at times sandy areas are exposed below the surrounding reeds. For the most part, there have been few changes to the sandy river beach where most waders are found.

There are few documented reports of changes with time of waders along the coast of Australia and none are known in Western Australia. Close and McCrie (1986) recorded monthly sightings of waders in Gulf St. Vincent, South Australia, over 10 years but did not report the observations for individual years. Other counts have covered much shorter periods.

For individual species, it should be noted that the frequency of observations and months seen were almost identical for Red-capped Plover and Red-necked Stint, although only the latter migrates and the two species occupy different niches. The Bar-tailed Godwit, Grey Plover and Sharp-tailed Sandpiper have been seen progressively less often over the twenty years. The Bar-tailed Godwit and Sharp-tailed Sandpiper were less likely to be seen in any month throughout the year since 1981, whereas the Grey Plover was seen about equally in the two 10 year periods but the number of individuals seen was very variable. There were several occasions in the second 10 year period when no birds were seen and at other times over 10 birds were observed. The Black-winged Stilt was seen more often in the second 10 years due to its appearance earlier in the year (it was seen in September to January every year in the second period). The reasons for these differences are not apparent from our data but may depend on local food sources or development of areas along the coast of Western Australia as well as on changes along the migration routes or at the breeding sites.

Acknowledgements

The authors gratefully acknowledge the enthusiasm, support and contribution that has been provided by innumerable people over many years in the compiling of bird lists at Pelican Point.

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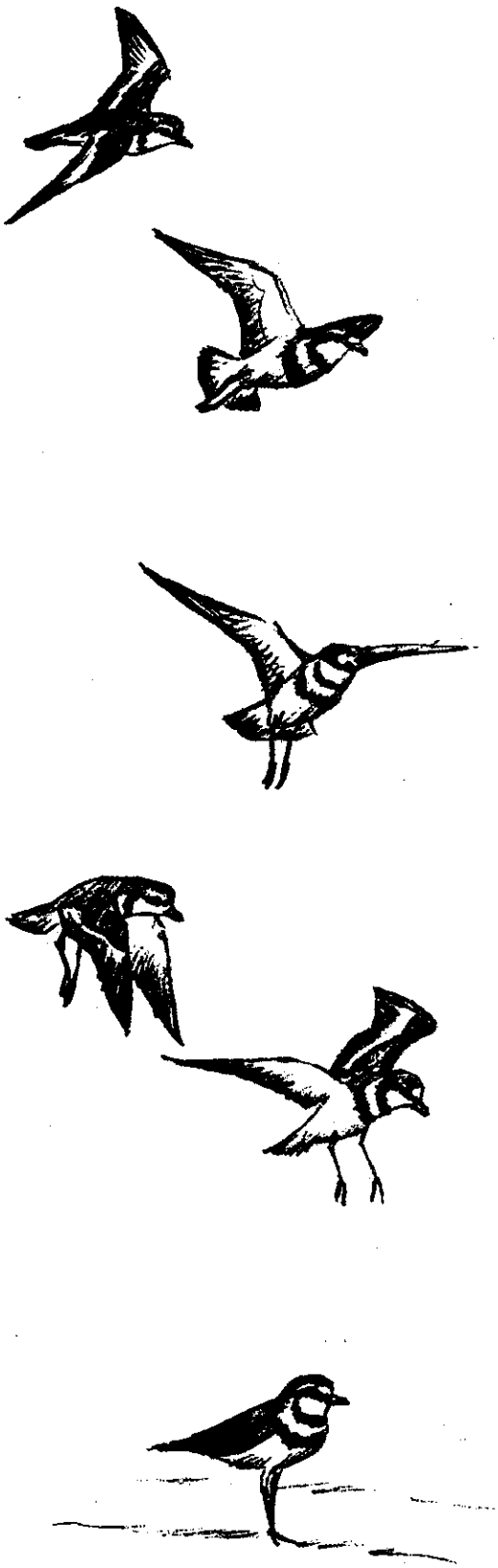

SURVEY OF WADERS IN THE GREAT SANDY STRAIT, SOUTH-EASTERN QUEENSLAND, AUSTRALIA

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Abstract

Surveys of wader activity were undertaken during the non-breeding season (austral summer) and period of northward migration (autumn) in the Great Sandy Strait, southeastern Queensland. Population estimates for waders were made using a combination of high tide roost counts of Bar-tailed Godwits and Eastern Curlews, and counts of all species feeding at low tide. The estimates are generally much higher than those based on previous assessments of the area that were limited to a few readily accessible sites.

Bar-tailed Godwits and Grey-tailed Tattlers make up over half the 40,000 waders using the Great Sandy Strait and there are substantial numbers of Eastern Curlew, Whimbrel, Terek Sandpipers and Greenshanks. Bar-tailed Godwits were common at low tide throughout the Strait, whereas the other species were less uniform in distribution. At the time of sampling during the northward migration, Grey-tailed Tattlers predominated in certain areas, and the diversity of waders at any particular site was lower than during summer. Details of roosting sites, feeding areas and movements on and off feeding areas are given, and highlight the importance of mainland roosting areas which are inadequately protected.

Introduction

The Great Sandy Strait is a major wetland in Queensland (Stanton 1975) and the largest area of tidal swamps within the Southeastern Queensland Region (Arthington & Hegerl 1988, Stanton & Morgan 1977). Tin Can Bay is the southward extension of the Great Sandy Strait and the area as a whole is the fifth largest enclosed embayment along the coastline of Queensland (Dredge *et al.* 1977). Roughly a third of the area is intertidal mudflat and the remainder includes mangroves, seagrass, saltmarsh, sandy spits and forested islands. Three Fisheries Habitat Reserves have been established (Olsen 1977), and the extent to which the area is undisturbed is unique in southern Queensland.

Information on hydrological conditions, and the distribution and abundance of seagrasses, mangroves, juvenile prawns, and certain species of teleosts is given in Dredge *et al.* (1977) and Hyland & Butler (1988).

There have been no previous detailed reports on the birdlife of the Great Sandy Strait, although Vernon & Barry (1972) and Barry & Vernon (1976) present annotated lists of species for Fraser Island and adjacent waters. The Great Sandy Strait is a major feeding ground for migratory waders on the east coast of Australia (Lane 1987) and important for a wide range of other waders, waterbirds and seabirds. An analysis of substrate particle size from a range of intertidal sites throughout the Great Sandy Strait (Driscoll 1989) has shown very little coarse material such as shells or stones, and a fairly consistent nature to the substrate with 15 out of 20 samples having a mean particle size in the "medium sand" range of between 2.1 and 2.5 phi units (extremes of 3.5 and 1.8, geometric Wentworth scale where phi values increase as grain size decreases).

Methods

Fourteen days were spent surveying the study area (Figs. 1 a & b) in autumn between mid April and early May 1989. A second survey of 15 days was undertaken in summer between mid January and late February 1990. During both surveys, scan counts of birds feeding on mudflats and roost counts were recorded as were many incidental observations. The objectives were to ascertain the location of roost sites and feeding areas and to determine local movement patterns to and from feeding areas. Seasonal changes in numbers are considered and for summer, the number of each species in the area has been estimated. A complete species list of all birds for the Great Sandy Strait and Fraser Island was compiled and observations and counts of waterbirds and seabirds were also made, but are not reported here (see Driscoll 1989, 1990).

The scan counts of birds were made on exposed intertidal areas using a telescope (20x lens) and counting within a radius of up to 150 m of the observation point through an arc of between 20° and 180°. Sites were approached from the land and using a motor-powered canoe so that counts were not necessarily done from near the shoreline, although this was often the case. Prior choice of sites was made to represent as wide a coverage of the study area as possible. The exact location was often determined by a combination of the presence of reasonable numbers of birds, the type of substrate and my progress between mudbanks in relation to suitable tide levels.

For the scan counts in summer, several point samples were taken at the one location rather than a single count as on the autumn (first) survey when 21 locations were sampled. In summer, 64 samples were taken at an average of about 3 samples for each of 20 locations, although the number varied between 1 and 6 for individual sites depending upon available time and the nature of the area. It was hoped multiple samples would better represent the composition of birds using particular locations. Scan counts were mostly taken within 90 minutes before or after low tide.

Searching for roost sites was done either by watching for movement of birds onto roosts as the tide rose or by visiting likely sites during high tide. Locating and counting Bar-tailed Godwits and Eastern Curlews at high tide was a principal objective. Apart from being very common in the area, these two "key" species readily congregate in large groups at high tide and offered the best opportunity of gaining an accurate assessment of overall numbers. Other species were counted at roost sites but their numbers have primarily been estimated using roost counts of the key species and the ratio of key species to the other species recorded from the low tide scan counts (see Thompson 1992b, 1993). No attempt was made to estimate the density of feeding birds, although the scan

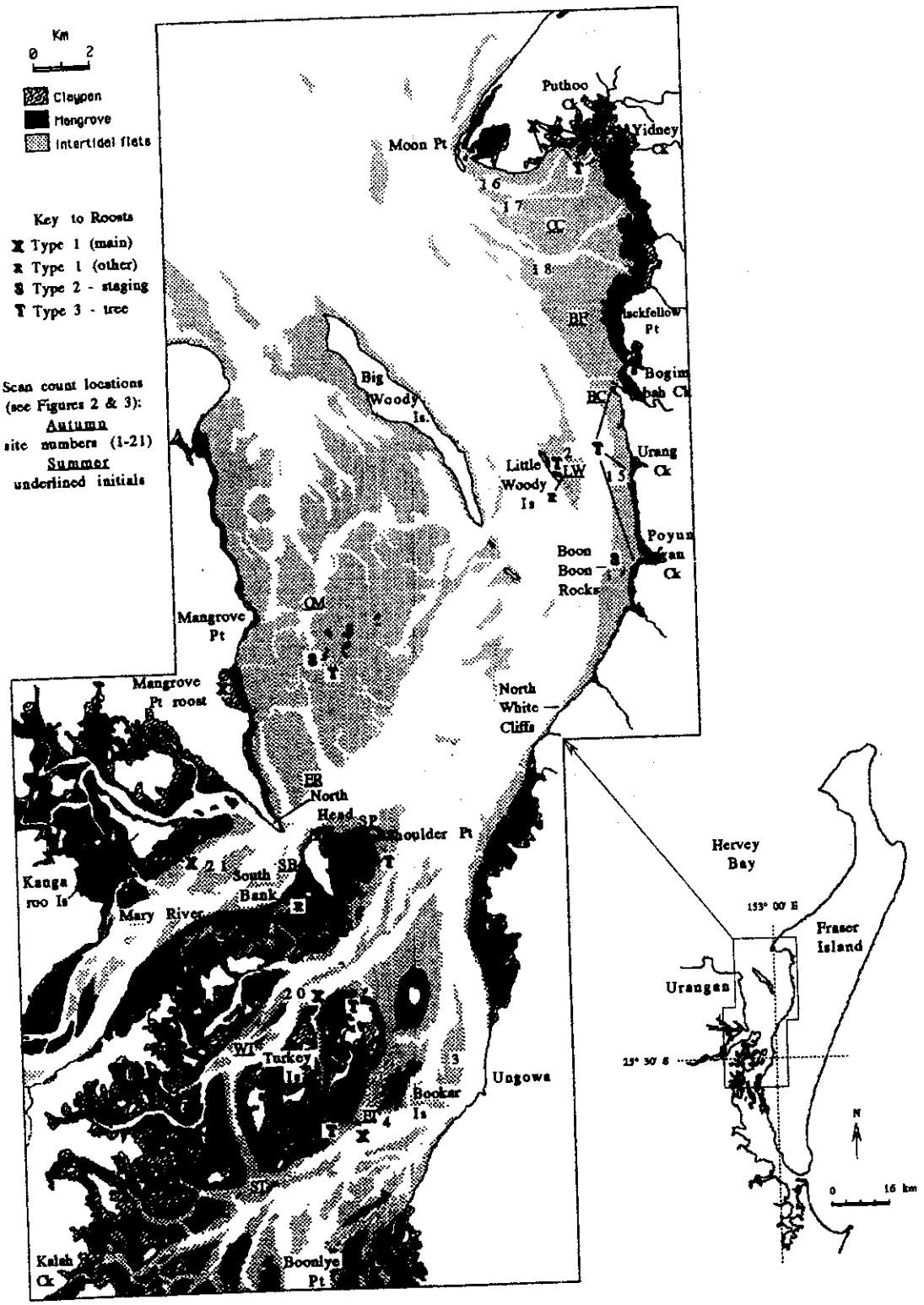

Figure 1a. Northern section of the Great Sandy Strait showing roost sites and the location of low tide sampling sites (scan counts).

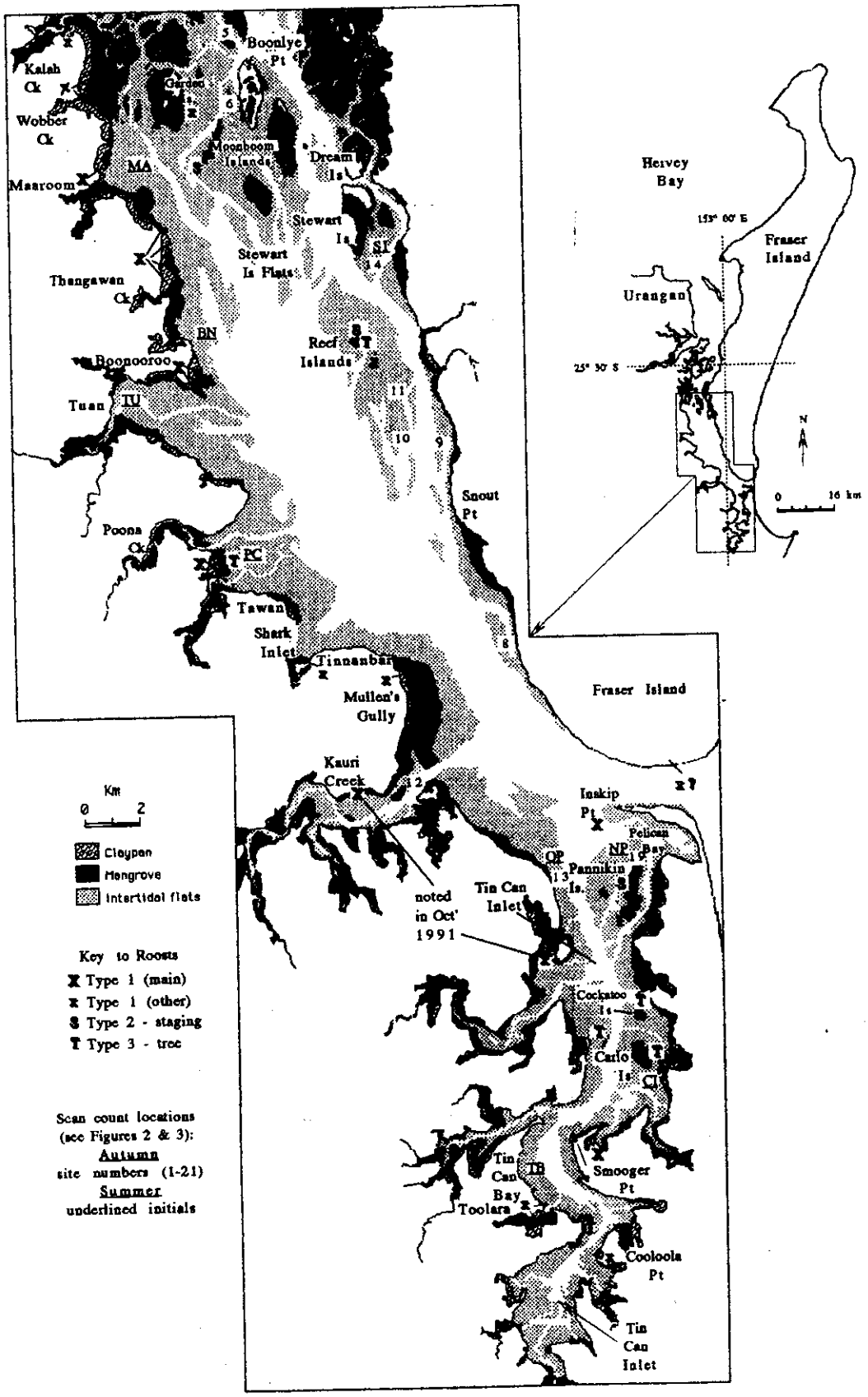

Figure 1b. Southern section of the Great Sandy Strait, and Tin Can Bay showing roost sites and the location of low tide sampling sites (scan counts).

counts give some idea of the variation in utilisation of intertidal areas.

A number of high tide roosts were counted more than once, especially if the first count was affected by birds being unsettled due to some exceptionally high tides in January. The largest count of those made at any particular roost has been presented in the results. Roosts in this category are Smooger Point, Inskip Point, Poona Creek, Puthoo Creek and Mangrove Point. Due to difficult circumstances, sometimes a rough count had to suffice.

Knowledge of roost sites, activity patterns and feeding areas gained on the autumn survey meant that the summer survey was more thorough. On the summer survey, effort was concentrated where birds were known to be plentiful, where information was lacking or where the location of roosts or feeding areas was in question from the previous study. Certain areas were not revisited either because few birds were seen there during the autumn survey (e.g. north west of Urangan) or because other areas took precedence.

Data analysis included the calculation of basic statistics, diversity indices and t-tests. For the more common species, estimates of population size and 95% confidence intervals have been calculated through combining information from roost sites and feeding grounds. Also, feeding sites were classified according to scan counts of birds, using the BIOSTAT suite of programs available for microcomputers. Classification is a technique to search for patterns in multivariate data sets (Williams 1976). A dissimilarity matrix between sites was first calculated based on Gower's General Similarity Coefficient and sites were grouped using a flexible sorting strategy and alpha value of -0.25.

Results

Seasonal and spatial variation in feeding assemblages

Table 1 shows the overall contribution to scan counts made by species in autumn and in summer. These contributions are expressed as both percentages of the overall total for each survey and as mean percentages for individual scan counts. The latter approach offers the opportunity of calculating standard errors of the means, coefficients of variation and t values for testing for significant changes in the contribution of species between seasons.

With the exception of Greenshanks, species with percentage contributions of about 3% or less show no significant seasonal change and have high coefficients of variation, i.e. give variable results within seasons which makes detection of seasonal changes more unlikely statistically. For the 6 species with higher percentage values and lower coefficients of variation only the Grey-tailed Tattler shows a significant change having a lower value in summer (19%) than in autumn (32%).

Seasonal differences can also be highlighted by examining counts from particular locations. Data from neighbouring sites have been combined to represent larger areas (Figures 1a & b and 2) and the results for autumn and summer are contrasted using graphs in Figure 2. The graphs are arranged in areas going from north to south of the Great Sandy Strait.

Between seasons the species mix in the same area often differs markedly. For instance, in the large feeding area to the south of Moon Point during autumn more than half the birds were Bar-tailed Godwits, whereas in summer there was a more even mix of species, although Eastern Curlews and Whimbrels were relatively uncommon. A little farther south around Bogimbah and Urang Creeks, Grey-tailed Tattlers were predominant in the autumn sample and Bar-tailed Godwits in the summer sample. At three areas farther south, Little Woody Island, near Mangrove Point and in the mouth of the Mary River, the predominance of Grey-tailed Tattlers apparent in autumn differed to a more even representation of species in summer.

Site 3, out from Ungowa, was particularly sandy and was sampled only in autumn when Eastern Curlews and Whimbrels were by far the most common species. The central straits region around Turkey and Moonboom Islands appeared to carry a similar complement of species in both seasons. This is not unlike the situation farther south on the western and eastern side of the strait although in autumn, once again there tended to be a greater predominance of one or two species, namely Grey-tailed Tattlers or Bar-tailed Godwits.

On three out of four sampling occasions, in the vicinity of one of the largest roosts in the Great Sandy Strait, Inskip Point near Pannikin Is and Pelican Bay, Bar-tailed Godwits constituted over 50% of the birds scanned, while on the fourth occasion in autumn, Grey-tailed Tattlers represented 76% of birds. Scan counts were taken in Tin Can Bay (Carlo Island and near the township) only during summer and revealed a moderate predominance of Bar-tailed Godwits but a good representation of other species as well. In autumn in particular, the very southern end of Tin Can Bay was little used by waders generally.

The areas just discussed were subjected to a classification analysis based on the percentages of the 5 most common species and the combined percentage representation of all other species. The result is shown in Figure 3 which depicts 5 groups of "season-area" combinations. The averaged percentage representation of species for members of each of these 5 groups is shown in Figure 4. These graphs show the 5 basic types of species mix that were seen on the mudflats for both autumn and summer. The first and probably most common assortment of species (Group A) is where about a third of birds are Bar-tailed Godwits, over a quarter are Grey-tailed Tattlers, about a tenth Eastern Curlews and a tenth Terek Sandpipers, about a twentieth Whimbrels and nearly a fifth are a mixture of other species, invariably including Greenshanks. This typical combination of species occurred in both seasons but probably more consistently in summer in major feeding areas such as near Moon Point, Mangrove Point, the central Straits, the western shoreline between Maaroom and Tinnanbar, and the eastern shoreline around Stewart Island.

Five out of the six members of Group B were areas sampled in summer where, in comparison with Group A,

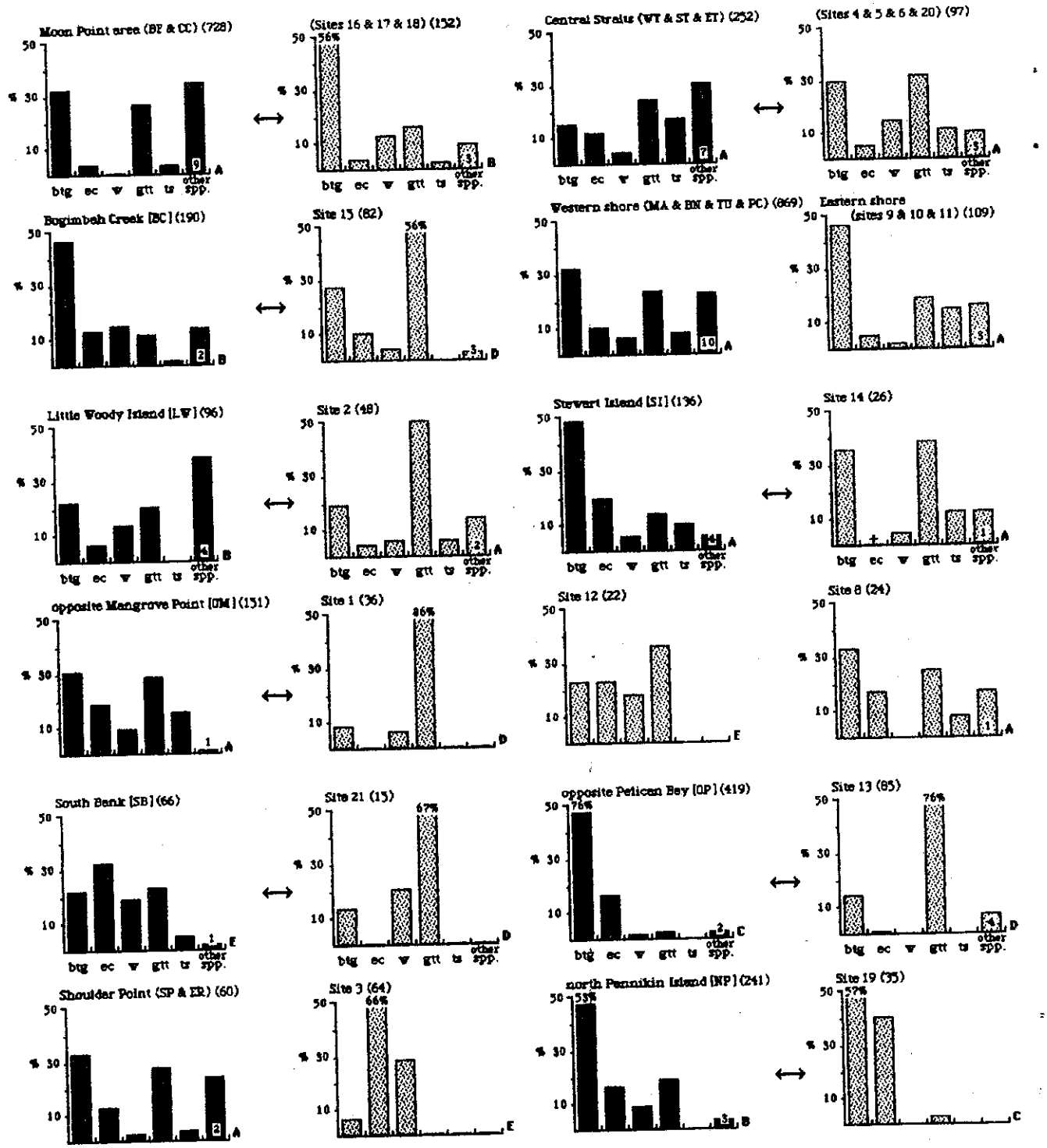

Figure 2. Graphs showing % contribution to scan counts of the 5 most common spp. and the remaining spp. together. Data have often been combined from neighbouring locations and are presented for summer 1990 (dark) and for autumn 1989 (light). Reference to locations is given as initials in brackets for summer sampling (Fig. 1) and as site numbers for autumn sampling (Fig. 1). Data from the same area in both seasons are indicated with 2 pronged arrows. Locations are arranged down two main columns in a north - south sequence. Bold letters (A-E, bottom right of graphs) refer to Group codes for the classification (Fig. 3). Numbers in brackets are total counts of birds for each graph. Spp. codes: btg - bar-tailed godwits, ec - eastern curlew, w - whimbrel, gtt - grey tailed tattler, ts - terek sandpiper.

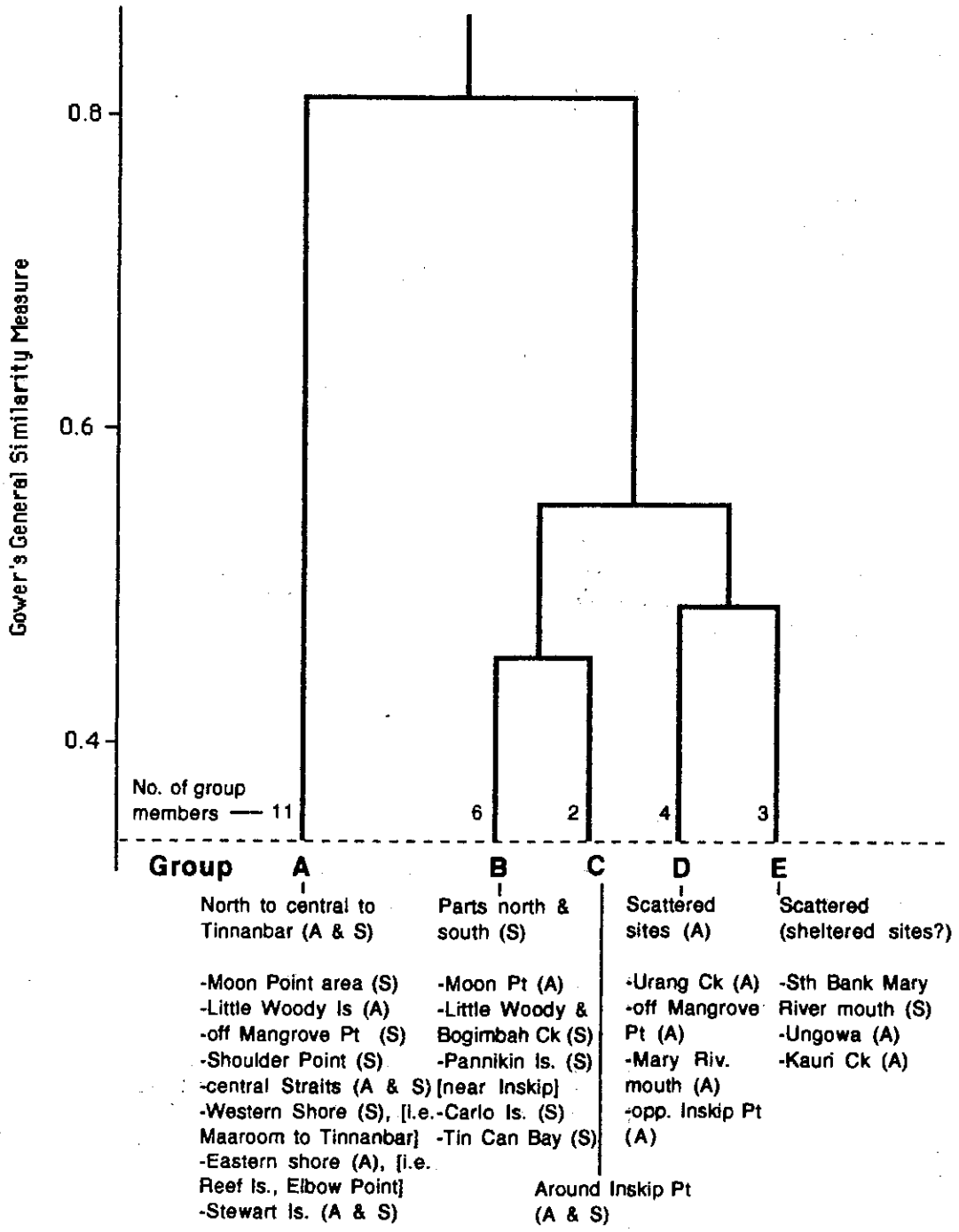

Figure 3. Dendrogram showing results of a classification of summarised scan count data (proportions of various species counted) from 26 combinations of autumn (A) and summer (S) sampling from different areas in the Great Sandy Strait. The 26 'individuals' classified are detailed in Figure 2. The dendrogram is truncated at the level of 5 groups. See Figure 4 for more information on the contribution of species to the makeup of the groups.

there were relatively more Bar-tailed Godwits, Eastern Curlews and Whimbrels and fewer Grey-tailed Tattlers and Terek Sandpipers. The subjective impression I had was that these areas were a littler sandier than most, and the larger species tended to occupy sandier sites more readily. The remaining 3 groups have few members and were atypical sites. Group C was typified by well over 50% Bar-tailed Godwits with almost all remaining birds being Eastern Curlews and the situation arose in both seasons in the proximity of the Inskip Point roost. The possible explanation is that because birds were close to their high tide roost their numbers and species mix was simply a reflection of the ratio of species that occur on the roost. Inskip is a major roost site for both species and offers little local roosting opportunity for Whimbrels and Grey-tailed Tattlers which tend to roost in mangroves. Terek Sandpipers congregated alone in small groups, usually away from the more open waterways.

Group D consists of sites sampled in autumn where Grey-tailed Tattlers clearly predominated and I suspect is based on migratory gatherings of this species which, judging by the generally higher numbers of Tattlers in autumn, was moving through the Great Sandy Strait at the time of autumn sampling to a far greater extent than other species.

The final group, group E, exhibits the highest ratio of Eastern Curlews and Whimbrels and consists of 3 sites, the sandy site near Ungowa (autumn, mentioned above), the South Bank at the mouth of the Mary River (summer), which also has a sandy substrate and Kauri Creek. Kauri Creek is one area that was not adequately sampled and a visit to the area in October 1991 revealed a higher density of waders than noted previously (see Section on Population estimates).

Variation in feeding density

No proper measure of the density of feeding birds was taken and the following comments concerning overall numbers are largely based on subjective assessments and scan counts (see Driscoll 1989, 1990). In general, there are expansive intertidal areas beside the main waterways that are intensively used especially in the vicinity of seagrass beds. Rockier, sandier substrate is generally less preferred as are narrower waterways among the central maze of mangroves and up into the creeks, especially those around Tin Can Inlet. The areas of greatest activity seem to be located within the vicinity of major roosting areas or sites used as staging points for movement to and from roosts. Higher densities of birds also tended to occur on finer grained substrate supporting seagrass. As a general rule, fewer species occurred on sandier sites where large species, Eastern Curlews and Whimbrels, predominated (Driscoll 1989).

Seasonal changes in diversity

Fourteen species were recorded from scan counts in autumn compared with 18 in summer and the graphs in Figure 2 indicate that at particular locations slightly more species were present in summer. However, sampling was generally more intense in summer which could explain the seasonal difference. To gain an unbiased comparison between seasons, t tests were conducted on mean values per scan count for a range of parameters concerning diversity (Table 2). On average, scan counts in summer recorded slightly but significantly higher diversity than those in autumn in terms of both species number (means of about 6 and 5 species) and evenness of species abundances.

The four species missing from the scan counts for autumn 1989 were nevertheless seen, at the time, on roosts. The lower diversity for autumn scan counts is not necessarily due to the consistent lack of particular species but perhaps to a random absence of different species from different scan counts. Of 18 wader species recorded, 11 showed a decline in their percentage contribution to scan counts between summer and autumn and the others an increase (Table 1). However, as mentioned earlier, only one species, the Grey-tailed Tattler showed a significant change, i.e. an increase between summer and autumn.

Roost counts

Many but not all roost sites were located during the initial survey in autumn. Counts for autumn are given in Driscoll (1989) together with some earlier results for Boonooroo obtained by Cyril Webster. At five major roosts visited during both surveys, there were 65% fewer birds counted in autumn. During the summer survey, probably all major roost sites had been found and counts made. A reliable total count was sought for Bar-tailed Godwits and Eastern Curlews for the whole area. Table 3 lists the results for major and most minor roosts and additional information is given below. Population estimates for summer are given in the next Section.

I have mapped the location of roost sites in Figure 1 and categorised them as follows:

Type 1 - ground sites that cater for birds even on very high tides (saltmarsh-claypan or high level sand spits),

Type 2 - sites that serve as roosts on low high tides and/or function as staging points where birds collect on incoming or outgoing tides as they move on and off their feeding grounds,

Type 3 - tree roosts that serve only a selection of species adequately.

Type 1 roost sites include Boonooroo Point, Mangrove Point, Puthoo Creek, Inskip Point, Poona Creek, Maaroom, Thangawan Creek, Kangaroo Island, and Turkey Island (not located or counted accurately). Type 1 roosts with fewer birds include Smooger Point, Cooloola, Mullen's Gully, Little Woody Island, Shark Inlet, Wobber Creek, Garden Island, South Bank (Mary River), Teewah Creek, Kalah Creek (minor), Dream Island (minor) and the southern tip of Fraser Island (possibly only used on extreme high tides).

In general, very few birds were found roosting on the eastern shore or on mangrove islands (except Turkey) through the central maze of mangroves from Stewart Island to North White Cliffs.

Some additional miscellaneous counts not listed in Table 3 include a small collection of 30 Eastern Curlews on main-

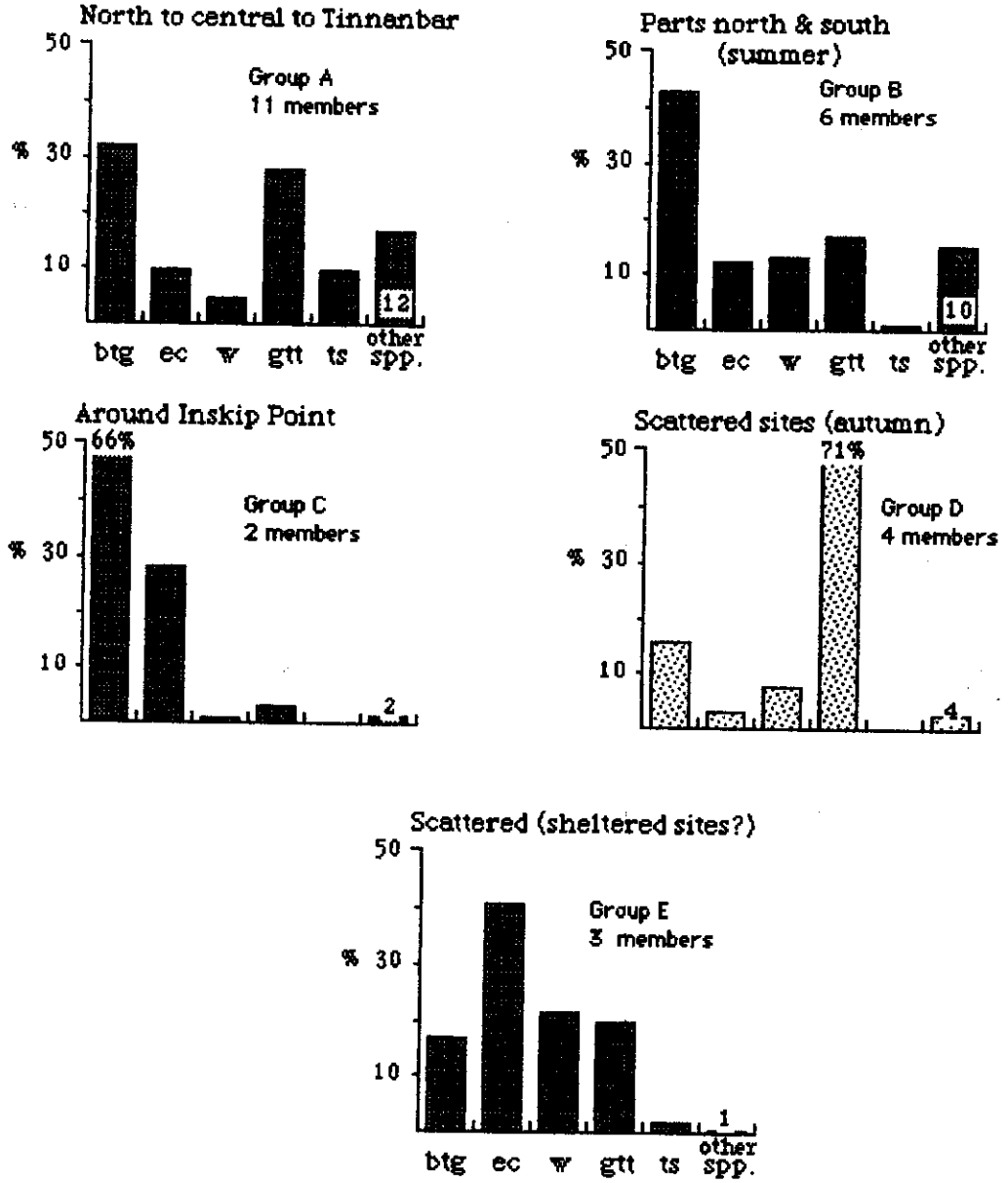

Figure 4. Histograms showing the percentage contribution to scan counts of the 5 most common species and the remaining species together. Data have been combined from different broad scale areas and seasons on the basis of the classification presented in Figure 3. Five groups were defined by the classification and the graphs are averaged percentages taken from the members of each group. With one exception for group B, dark shading indicates data are from summer sampling, light shading from autumn sampling and intermediate shading indicates data are from both sampling periods. The species codes are as follows: btg - bar-tailed godwits, ec - eastern curlew, w - whimbrel, gtt - grey tailed tattler, ts - terek sandpiper.

Table 1. Percentage contribution of species to low tide scan counts throughout the Great Sandy Strait for summer 1990 and autumn 1989. Values are expressed as both percentages for the grand total of bird counts (3793 from 64 scans in summer and 801 from 21 scans in autumn), and as mean percentages for individuals scan counts which allowed calculation of coefficients of variation (C.V.) and statistical comparisons between seasons using t-tests on the 6 most common species and the remaining species collectively. A significant result ($t=2.575$, $df=83$, $p<0.01$) was obtained for grey-tailed tattlers only (asterisk). Values in brackets are for autumn 1989.

Species	% of grand total	Mean % per scan	C.V. of mean
Haematopus longirostris Pied Oystercatcher	0.92 (0.62)	**1.14** (0.68)	306. (244)
Charadrius leschenaultii Large Sand Plover	0.21	**0.20**	423
Charadrius mongolus Mongolian Plover	1.50 (0.25)	**1.65** (0.41)	307. (458)
Charadrius ruficapillus Red-capped Plover	1.29 (1.50)	**1.70** (1.67)	355. (244)
Pluvialis dominica Lesser Golden Plover	1.48	**2.07**	363
Pluvialis squatarola Grey Plover	0.24 (0.25)	**0.09** (0.11)	404. (458)
Vanellus miles Masked Lapwing	0.18 (0.12)	**0.40** (0.79)	638. (458)
Arenaria interpres Ruddy Turnstone	0.03 (0.12)	**0.03** (0.79)	800. (458)
Calidris acuminata Sharp-tailed Sandpiper	0.76	**0.78**	457
Calidris ferruginea Curlew Sandpiper	2.21	**1.65**	374
Calidris ruficollis Red-necked Stint	2.95 (0.75)	**2.48** (0.51)	288. (205)
Calidris tenuirostris Great Knot	2.90 (0.62)	**3.37** (0.43)	300. (458)
Limosa lapponica Bar-tailed Godwit	38.28 (31.96)	**32.80** (34.56)	57. (58)
Numenius madagascariensis Eastern Curlew	12.34 (11.49)	**15.23** (9.76)	90. (163)
Numenius phaeopus Whimbrel	6.88 (8.24)	**7.95** (8.82)	115. (145)
Tringa brevipes Grey-tailed Tattler	19.85 (34.96)	* **19.43** (31.75)	83. (82)
Tringa nebularia Greenshank	2.90 (3.12)	**2.70** (4.04)	151. (167)
Tringa terek Terek Sandpiper	5.06 (5.99)	**6.34** (5.67)	145. (178)

Table 2. Diversity statistics for 64 counts made in summer 1990 and 21 counts made in autumn 1989. Results of t-tests comparing the seasons are given for each type of statistic. Degrees of freedom were 83 for all tests.

Statistic	Mean per transect summer	autumn	t	
Brillouin's diversity index, H ($\log_2$)	1.77	1.39	3.51	$p<0.0005$
Evenness of species abund. (H/H_{max})	0.70	0.62	2.95	$p<0.005$
Number of species (S)	6.05	4.90	2.39	$p<0.01$
Sample size (N)	58.27	38.14	1.65	$p<0.1$ (ns)

Table 3. Counts of roosting birds made mostly in January and February 1990. Counts for the first 4 roosts were taken in mid November 1989. Counts of smaller numbers of birds at other locations are mentioned in the text. Greatest attention was given to counts of Bar-tailed Godwits and Eastern Curlews. Other species were seldom accurately counted due to lack of time and difficulty of access to many roosts. A "+" indicates that the species was sighted but not counted. The locations of roost sites are mapped in Figure 1.

Species		Roost site code (see below)																
		PC	SH	MG	KI	MP	SM	PU	LW	BO	GI	TC	MA	WC	TI	IP	SB	Total
Haematopus longirostris	Pied Oystercatcher	+							2	23		55	28			19		127
Himantopus himantopus	Black-winged Stilt										250		+					250
Charadrius leschenaultii	Large Sand Plover									15								15
Charadrius mongolus	Mongolian Plover	130						110	60	210		235						745
Charadrius ruficapillus	Red-capped Plover	+		5	15		+			21				+				41
Pluvialis dominica	Lesser Golden Plover	30			45					+		5		15	15		7	117
Pluvialis squatarola	Grey Plover									25						85		110
Vanellus miles	Masked Lapwing							5			5	15						25
Arenaria interpres	Ruddy Turnstone									2		4						6
Calidris acuminata	Sharp-tailed Sandpiper	+																+
Calidris canutus	Red Knot							+		+								+
Calidris ferruginea	Curlew Sandpiper	+						+				+	+			25		25
Calidris ruficollis	Red-necked Stint	33			105	25			55	35			20	+		15		288
Calidris tenuirostris	Great Knot							+		19		220	6			50		295
Limosa lapponica	Bar-tailed Godwit	173	800	41	40	1865	329	1942	140	1945		1380	1230	+	+	1690		11575
Numenius madagascariensis	Eastern Curlew	574		220	161	944	179	1116		22	200	1210	95	531	40	334	65	5691
Numenius phaeopus	Whimbrel	95	200	210		12	150	200	72		25			18	50		54	1086
Tringa brevipes	Grey-tailed Tattler							+	75			210			+		29	314
Tringa nebularia	Greenshank	35		49			40	29		25	60	70						308
Tringa terek	Terek Sandpiper							+		12							+	12
	Total	1070	1000	525	366	2846	698	3402	404	2354	540	3404	1379	564	105	2218	155	21030

Key to Roost Locations (the map references are to maps a & b, Figure 1)

PC: Poona Creek-map b
MP: Mangrove Point-map a
BO: Boonooroo-map b
WC: Wobber Creek-map b
SH: Shark Inlet-map b
SM: Smooger Point-map b
GI: Garden Island-map b
TI: Turkey Island-map a
MG: Mullen's Gully-map b
PU: Puthoo Creek-map a
TC: Thangawan Creek-map b
IP: Inskip Point-map d
KI: Kangaroo Island-map a
LW: Little Woody Is. map a
MA: Maaroom-map b
SB: South Bank-map a

land claypan just to the south of Pannikin Island (Figure 1b) and even more birds (50 Eastern Curlews, Bar-tailed Godwits and Greenshanks) in and around the mouth of Teewah Creek (Toolara). A small flock of 80 Bar-tailed Godwits was noted on a sandspit (and 70 Whimbrels in mangroves) at Tawan, between roost sites at Shark Inlet and Poona (Figure 1)

Type 2 roost sites or staging points are scattered throughout the Great Sandy Strait anywhere there is a relatively high point between a good feeding area and mangroves. Such sites that serve as major staging points and can be used to follow birds onto high tide roosts include the southern tip of Western Moonboom Island, Reef Islands, mangrove islands opposite Mangrove Point, Boon Boon Rocks, the northern end of Bookar Island, the western side of Pannikin Island, and a cluster of mangroves (also used as a roost by Grey-tailed Tattlers) out from the western shoreline opposite Carlo Island.

Type 3, or mangrove roosts are also prevalent and scattered throughout the Great Sandy Strait and mostly cater for Grey-tailed Tattlers, Terek Sandpipers, Whimbrels and, less often, Greenshanks. There are certain favoured areas, many of which are close to high tide roosts on claypan. Type 3 sites include Poona Creek, Puthoo and Yidney Creeks, southern side of the entrance to Bogimbah, Urang and Poyungan Creeks, Little Woody Island, Shoulder Point, the northern end of Turkey Island, the southern entrance to the channel through Turkey Island, mangroves between Carlo Island and the mainland and on the shoreline to the north of Carlo Island and Cockatoo Islands (also scattered roosts of godwits and curlews on suitable tides)

Population estimates

In addition to the roost count data in Table 3, at least another 410 Bar-tailed Godwits and 177 Eastern Curlews were counted in small groups at scattered locations listed above and a rough estimate of 350 Eastern Curlews and 800 Bar-tailed Godwits were roosting somewhere on Turkey Island (as noted above). If these miscellaneous values are added to the totals in Table 3 an unadjusted estimate of total numbers is 12785 for Bar-tailed Godwits and 6218 for Eastern Curlews. Furthermore these 2 species represented 48% of birds (on average) recorded during scan counts. That is, 19003 birds represent 48% of the total birds in the area and the total for all 18 wader species included in scan counts would be 39590.

The estimated numbers of the different species based on this figure and the contribution of species to scan counts, are given in Table 4. Confidence limits based on the standard error of the scan count ratios are included for the estimates, but no account is made of the error associated with the total roost count of the two key species which is likely to be an underestimate. For example, not until a return visit in October 1991 were 2000 Bar-tailed Godwits and 300 Eastern Curlews noted roosting well inside the mouth of Kauri Creek on the northern shoreline, 3 km from the mouth (Figure 1). The area was not inspected adequately during the summer survey to be sure that the roost was not in use at the time.

One reassuring aspect of the roost count data is that if the calculation of total bird numbers is based on roost counts of Bar-tailed Godwits alone, it lies within a few thousand birds or about 5% of the calculation using only Eastern Curlews. That is, the ratio of Bar-tailed Godwits and Eastern Curlews for total roost counts is similar to the ratio for scan counts. These 2 species were often found in large numbers at different roost sites implying that perhaps most of the principal roosts of both species were found for their numbers to balance in relation to the scan counts.

Daily and seasonal movements of birds

The location of roosts and major feeding grounds, and observations of birds moving back and forth with the tide tend to suggest the following daily movement patterns of waders. These patterns are generalisations and less relevant for particular species, such as Grey-tailed Tattlers which tend to roost in trees, and Sharp-tailed Sandpipers and Lesser Golden Plovers that tend to forage close to their roosts and not necessarily in the intertidal area.

1) The expansive feeding area in the far north eastern section of the Strait (south of Moon Point on Fraser Island) is served primarily by the roost at Puthoo Creek. Birds have been seen movi north on an incoming tide from as far away as Blackfellow Point and beyond. Birds may come into this roost from as far south as Boon Boon Rocks. Suitable land on Little Woody Island can cater for only small flocks at high tides.

2) The major roost on the opposite shore is just south of Mangrove Point and large numbers of birds move to and from this roost via the mangrove islands 3 km to the east. From here they move out primarily to the north, east and west and there appears to be no other major wader roost north of here on Woody Island or the mainland. Birds also move onto the Mangrove Point roost from the south towards the Mary River and even from inside the mouth of the river, although in this vicinity there are alternative sites at Kangaroo Island and, to a lesser extent, at the South Bank roost.

3) The main roost sites in the area to the south of Shoulder Point appear to be on Turkey Island. The density of feeding birds is high in the vicinity of Turkey Island but farther to the west into the maze of channels or to the south towards Boonlye there is less activity.

4) Birds feeding and roosting to the south of Boonlye Point and North of Inskip Point generally use mainland roosts on claypan and saltmarsh on the western side of the Strait at a series of sites between Wobber Creek and Tinnanbar. Birds feeding to the south of the Reef Islands move north on the incoming tide and 'stage' from the Reef Islands to the Boonooroo and Poona Creek roosts. Species feeding around Stewart Island and farther north tend to move across the Stewart Island Flats and the southern most Moonboom Island where they may finally gather at the staging point on the southern tip of the western Moonboom Island before crossing to roosts including Thangawan Creek, Maaroom, Wobber Creek and Garden Island. Birds feeding more centrally and on the western side of the Strait are much closer to their high tide roosts.

5) Birds feeding south of Kauri Creek on the western shoreline either roost at Inskip Point to the south east or in smaller numbers on the northern shores of Kauri or Teebar Creeks. Birds feeding to the north of Kauri Creek probably move onto the Mullen's Gully roost.

6) Inskip Point collects large flocks that move in from the south and west from both sides of Tin Can Inlet, whereas Smooger Point and the mangroves around Carlo and Cockatoo Island cater for birds that feed more locally, to the west and to the south towards Toolara. Much smaller roosts occur farther into the Inlet.

The seasonal movement patterns of birds are far more difficult to decipher and probably vary somewhat from year to year. The easonal differences in scan counts indicate a change in the occupancy of the region by waders between summer and autumn. The most valid comparison would have been between a consecutive summer and autumn, rather than autumn and the following summer with an intervening migration. Nevertheless, the results obtained are consistent with general patterns observed in Moreton Bay.

In autumn, there appears to be a greater preponderance of particular species at different sites which is in accordance with the notion (Thompson 1992a) that species are more selective of preferred habitat during the northward migration when their nutritional requirements are at a premium. The lower diversity at sites in autumn may be a reflection not only of the thinning of bird populations with the onset of migration but also the greater preferential use of habitat at this time of year. In summer, populations are more stable but there is possibly less urgency to obtain maximum benefit from time spent feeding and birds may be less selective of their feeding area.

The significantly higher ratio of Grey-tailed Tattlers in autumn suggests the species makes concentrated use of the Great Sandy Strait on its northward migration, especially specific areas. The dependence of other species on the region during autumn would not be as obvious if their pattern of movement up the east coast is less synchronised or occurs at times other than when the sampling was conducted. The high counts of Eastern Curlews recorded at Boonooroo by Cyril Webster (pers. comm.) during late winter and spring suggests another pattern of utilisation that needs further clarification.

Conclusions

These results better represent the numbers and activity of waders in the Great Sandy Strait than any previous assessments. Lane (1987) gives a maximum count of 13,000 birds for the Great Sandy Strait based upon Australasian Wader Studies Group counts at a limited number of roost sites. A similar revision of numbers for Moreton Bay based upon a Queensland Ornithological Society Incorporated low tide census is made by Thompson (1990). For such large and significant areas for waders as the Great Sandy Strait and Moreton Bay, roost counts at just a few sites are obviously useful but inadequate to properly represent the wa. om-munity. Whether major revision of the number of birds using other areas is needed before they can be compared with updated estimates for the Great Sandy Strait and Moreton Bay, needs to be addressed on a site by site basis.

With the exception of sites near Moon Point and Urang Creek, the shoreline of Fraser Island is used less for roosting than mainland sites and mangrove islands. Nevertheless, the density of feeding birds on suitable intertidal areas close to Fraser Island is as high as anywhere in the Strait. Claypan roosts on the mainland cater for a high proportion of birds within the Strait and must be given special consideration for the long term maintenance of the area as a very significant site for waders and other birdlife.

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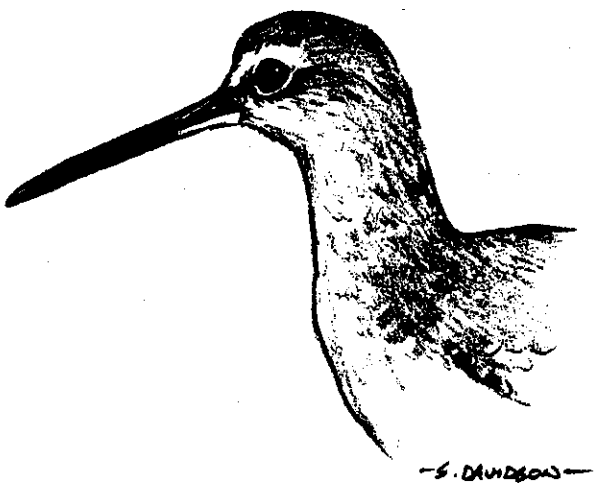
Table 4. Wader population estimates for summer 1990 in the Great Sandy Strait. The estimates are based on 1) the total roost count of two species, Bar-tailed Godwits and Eastern Curlews, 2) scan counts of feeding birds that indicate the ratio of species that occur in the area (see text for details). The confidence limits incorporate sampling error in relation to the ratio of feeding birds (scan counts, Table 1). No account is taken of the likely error in the total roost count of the two key species.

Species		% of scan cts with S.E. of mean		Popn est.	upper & lower 95% conf. limits	
Limosa lapponica	Bar-tailed Godwit	32.8	(2.3)	**12986**	[11164	14807]
Numenius phaeopus	Whimbrel	7.9	(1.2)	**3128**	[2257	3999]
N. madagascarienis	Eastern Curlew	15.2	(1.7)	**6018**	[4672	7364]
Tringa brevipes	Grey-tailed Tattler	19.4	(2.0)	**7680**	[6097	9264]
Tringa nebularta	Greenshank	2.7	(0.5)	**1069**	[673	1465]
Tringa terek	Terek Sandpiper	6.3	(1.2)	**2494**	[1544	3444]
Other waders (12 species - see Table 1)		15.7	(2.5)	**6216**	[4236	8195]
Total				39590		



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SPECIAL SECTION
HOODED PLOVER IN AUSTRALIA

1992 SURVEY OF THE HOODED PLOVER IN TASMANIA

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Summary

During October 1992 approximately 500 km of Tasmanian beaches were surveyed for the Hooded Plover, *Charadrius rubricollis*. A total of 865 birds were recorded at an average density of 1.73 birds/km. Regional densities ranged from a low of 1.05 birds/km on King Island to 2.69 birds/km along the east coast. A comparison of Hooded Plover densities on east coast beaches recorded during a 1982 survey and this survey showed no significant difference. This suggests the population has not been adversely affected by human and other impacts over the last decade. However, more rigorous and frequent sampling is required before this can be verified. This census forms the basis of an annual or biannual count, in line with other states, to establish more clearly the dynamics of the species in Tasmania.

Introduction

The Hooded Plover *Charadrius rubricollis* was last systematically surveyed in Tasmania in 1982 (Newman and Patterson 1984). Other surveys in Tasmania have systematically counted isolated areas of the southwest coast (Schulz 1990a; Schulz and Menkhorst 1984), King and Flinders Island (Schulz 1990b) and areas along the north west coast (Schulz 1993). However, the more accessible beaches of the north, east and southeast coasts have not been surveyed to coincide with these counts. Furthermore, the timing of counts have not been keyed in to the optimal time for an effective population estimate ie., October when fledging has not occurred and birds are generally attached to breeding territories.

Newman and Patterson (1984) undertook Hooded Plover counts throughout most regions of Tasmania as part of the Royal Australasian Ornithologists Union national survey which formed the basis for establishing population trends. The realisation that a decade had passed since the last Tasmanian count and the suspicion by local ornithologists that the species was in decline in some areas of the state, prompted this survey. Considering the species is listed as Rare (Garnett 1992) it is appropriate that the population be monitored regularly throughout its range, the results from which can then assist strategic management plans to reduce impacts on the species. This study brings Tasmania in line with other states in conducting more regular and rigorous surveys.

Method

This survey began on 20 September and was undertaken on a regional basis by staff from the Department of Parks and Wildlife (DPW) and members of the Bird Observers Association of Tasmania (BOAT), in association with other amateur organisations. The preferred timing of counts was October to coincide with counts in other states. By October birds are occupying breeding territories and are less mobile thus making counting much easier for observers. This also minimises counting the new seasons cohorts. Ninety six of a total of 123 count records were conducted within October.

Many beaches surveyed in 1982 (Newman and Patterson 1984) were re-censused. In addition recorders were instructed to count all (or as many) potential Hooded Plover beaches in regional areas. Observers were required to walk, or on some extensive beaches drive, along beaches and record on a prepared pro-forma all wader species, their activity, nests of nesting behaviour and note signs of predation or human impact. Some beaches were covered by several observers so that wide beach front and dune areas could be adequately covered. Most regional areas were completed over several consecutive days to minimise double counting.

Results

A total of 865 birds were recorded over 500.23 km of beach around the state. The density of birds ranged from 0 birds/km on some beaches to 5.11 birds/km at Maurourd Beach on the east coast (beach length over 1 km). The average density of Hooded Plovers around the state was 1.73 birds/km of beach.

Table 1 shows the number of Hooded Plovers on individual beaches and average densities in each region. Regional densities ranged from 1.05 birds/km on King Island to 2.69 birds/km on the east coast. The results from King Island are low probably because of inclement weather experienced by observers during the count. This is likely to have reduced detection of plovers and observer concentration.

A comparison of the beaches surveyed in 1982 and resurveyed in 1992 is shown in Table 2. Results were similar at most sites and statistical analysis showed there was no significant difference in the population densities between the two surveys (One Way Anova, $F(1,46)=0.71$, $p=0.40$ NS).

Table 1: Areas surveyed for Hooded Plover during 1992 showing densities (birds/km) for each region and statewide.

Region/Beach Name	Length of Beach (km)	No. of Plovers
Flinders Is.		
Big River Cove	0.9	2
Long Point	5.0	9
Whitemark	6.0	6
Planter	23.5	59
Marshall Bay	9.2	9
Totals	**44.6**	**85**
	birds/km	**1.91**
Bruny Is.		
Adventure Bay	2.4	6
Great Bay	0.5	0
Cloudy Bay	6.5	18
Mars Bluff	0.1	2
Miles	1.0	2
The Neck	9.6	16
Whares Pt.	2.2	1
Butlers	1.2	4
Totals	**23.5**	**49**
	birds/km	**2.09**
Maria Is.		
Four Mile Ck.	0.5	2
Riedle Bay	3.5	0
Shoal Bay	3.3	8
Darlington	0.8	2
Hopgrounds	0.7	4
Totals	**8.8**	**16**
	birds/km	**1.83**
King Is.		
City Melb.-Barrier Ck.	7.0	2
Phoques-Quarantine	10.0	15
Pass R.-Porky	3.2	6
Currie-Porky	4.0	4
Etterick R.-Currie	5.6	5
Fraser Bluff	2.0	2
Surprise	1.0	4
Colliers-Broken Arm	10.0	10
Seal Bay	8.0	8
Fitzmaurice Bay	1.5	6
Martha Lavina-Sea Ele	20.0	9
Sandblow-City Melb.	12.0	15
Pass R.-Arrow	3.5	6
Totals	**87.8**	**92**
	birds/km	**1.05**
South East		
Roaring (Dover)	2.1	0
Planters	0.3	2
Little Lagoon	3.0	10
Rocky Bay	3.0	6
Seven Mile/Five Mile	14.4	2
Gorringes	2.2	2
Calverts Bch	2.0	0

Region/Beach Name	Length of Beach (km)	No. of Plovers
South East cont...		
Clifton	1.9	0
Calverts Lag.	2.0	6
Hope	2.5	0
Monk & Lime	1.0	2
Roaring (Nubeena)	0.6	2
Sloping Main	3.0	2
Safety Cove	1.4	2
Pirates Bay	0.6	2
Two Mile	2.4	6
Lagoon Bay	0.7	2
Marion	10.0	19
The Spit	2.1	12
Eagles	1.1	4
SW Orford Spit	0.3	2
Orford	1.8	2
Earlham & Rheban	4.3	10
Boltons	3.6	7
Lisdillon	1.5	6
Mayfield	1.0	2
Kelvedon	2.0	4
Bluff Rock - Meredith	4.5	6
Nine Mile	12.0	11
Totals	**87.3**	**131**
	birds/km	**1.5**
East		
Friendly (north)	5.2	9
Friendly (south)	3.0	10
Schouten Is.	4.0	2
Hazards (north)	2.5	0
Hazards (south)	2.0	0
Half Moon	2.0	0
Denison	5.0	24
Denison	3.0	2
McIntyres	1.0	3
Wrinklers	8.0	13
Beaumaris	4.6	11
Diana's	3.5	4
Dora's Point	2.0	5
Taylors	4.0	2
Binalong Bay	1.3	4
Jeanneret	0.5	2
Courland Bay	2.0	3
Steels	5.0	8
Mariposa	1.9	14
Mauroura	9.0	46
Seymore	3.4	15
Templestowe	5.2	28
Lagoons - Hughes Pt.	0.5	8
Lagoons - Piccaninny	5.0	12
Totals	**83.6**	**225**
	birds/km	**2.69**

Region/Beach Name	Length of Beach (km)	No. of Plovers
North East		
Cape Portland	6.1	13
Eddystone Point	3.0	4
Musselroe Point	2.5	4
Swan Island	5.5	34
Sth. Croppier-W'house	3.0	14
Policemans Point	1.0	0
St. Albions Bay	4.0	4
Bell Bouy	2.5	2
Springlawn	1.0	12
Bakers	7.0	3
Point Sorell	2.0	2
Griffiths Pt.-Bakers	2.0	5
Greens	1.5	0
Murdochs	2.0	4
Bay of Fires	1.5	2
Little Musselroe	3.0	6
Totals	**47.6**	**109**
	birds/km	**2.29**
North West		
Peggs	3.0	7
Black River	6.0	16
Seven Mile	9.0	8
Valley Bay	1.0	0
Perkins Is.	7.0	14
Detention R.-Hellyer	3.5	2
Rocky Cp.-Detention R	6.0	2
Inglis R.-Cam R.	12.0	2
Tatlows	3.0	11
Somerset - Wynyard	10.0	5
Anthony	12.0	22
Totals	**72.5**	**89**
	birds/km	**1.23**
West		
Trial Hbr.	0.8	2
Arthur	4.0	8
Mawsons Bay	8.0	9
Greens Point	3.0	9
Mt Cameron	2.8	11
Woolnorth Pt.	5.0	2
Pieman River	1.0	5
West Point	4.0	18
Ocean	16.0	5
Totals	**44.6**	**69**
	birds/km	**1.55**
Statewide Totals	**500.2**	**865**
	birds/km	**1.73**

Table 2: Comparison of Hooded Plover numbers recorded in October 1982 and this study.

Densities are shown as number of plovers per kilometre (birds/km). One way ANOVA analysis on repeated sites shows no significant difference between counts. ($F(1,46)=0.71$ $p=.4037$)

	1982		1992	
Beach Name	**Length of beach(km)**	**No. of Plovers**	**Length of beach(km)**	**No. of Plovers**
Lisdillon	4.0	6	1.5	6
Calverts Lagoon	2.0	9	2.0	6
Two-Mile	2.5	16	2.4	6
Rheban	4.0	25	4.3	10
Lagoon	2.0	2	0.7	2
Sloping Main	3.0	0	3.0	2
The Neck	10.0	29	9.6	16
Adventure Bay	5.5	11	5.0	6
Cloudy Bay	6.5	13	6.5	18
Darlington	1.0	2	0.8	2
Hopgrounds	1.0	0	0.7	4
Bloodstone	2.0	0	*	*
Riedle Bay	5.0	2	3.5	0
Fortescue	1.0	0	*	*
Seven Mile	7.0	4	14.4	2
Roaring	1.0	2	2.1	0
Whites	2.0	0	*	*
Marion	10.0	34	10.0	19
Hope	5.0	0	2.5	0
Calverts Beach	3.0	0	2.0	0
Wineglass Bay	2.0	0	2.0	0
Hazards	3.0	4	3.0	0
Kelvedon	0.5	2	2.0	4
Gorringes	3.0	5	2.2	2
Friendly	13.0	24	8.2	19
Point Bagot	1.0	4	1.0	0
Carlton	3.5	0	3.5	0
Primrose Sands	1.5	0	*	*
Totals	**105.0**	**194**	**92.9**	**124**
	birds/km	**1.85**	**birds/km**	**1.18**

* not repeated this survey

Discussion

There is a large body of anecdotal and documental evidence which suggests that many Hooded Plover areas have been adversely affected by human activity, primarily by destruction of eggs and chicks or through interruption to breeding activities by off-road vehicles, trampling by humans horse riders and livestock and through predation by dogs and feral cats (Schulz and Bamford 1987; Buick and Paton 1989). The results of this survey show that in Tasmania little or no significant change in the Hooded Plover population has occurred on the east coast beaches since 1982. This would suggest that the species has not suffered any serious decline over the last decade despite the fact that many of the east coast beaches are experiencing greater usage.

There may be, however, a number of reasons as to why no change in densities have been detected over the 10 year period. The time delay between counts makes it difficult to

assess seasonal differences which may have biased results, particularly if an exceptionally favourable or unfavourable season occurred at the time of either survey. In addition the expertise and effort by observers lacked continuity and may have bias results further. The establishment of annual or biannual counts will help reduce these effects in the future. It will also enable a more accurate assessment of population trends and indicate which Hooded Plover populations are most vulnerable to disturbance. From this the DPW will be able to formulate management prescriptions to reduce impact on specific beaches.

The additional information recorded by observers, particularly relating to breeding and species management, will be discussed in future publications.

Acknowledgements

This survey was a co-operative effort between DPW and BOAT. The Burnie Field Club, King Island Field Naturalists and many friends assisted in field observations. We thank all observers for their efforts (and leg work!) in compiling records throughout the state. A special thank you to Sally Bryant for assistance with organising the survey and comments on the manuscript.

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A SURVEY OF THE HOODED PLOVER ON THE NORTH-WEST TASMANIAN COASTLINE, FROM MACQUARIE HARBOUR TO BLUFF POINT

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Summary

A total of 376 Hooded Plovers were recorded at an average density of 3.5 individuals/km along the north-west Tasmanian coastline between Macquarie Harbour entrance and Bluff Point from 13 April to 19 April 1991. The maximum density observed was 19.2 individuals/km between Granville Harbour and Four Mile Beach. This coastline is generally regarded as remote and hence a refuge for this species. However, varying dregres of human-induced threatening processes, including direct disturbance, off-road vehicle activity and the presence of livestock, were observed on all beaches visited.

Introduction

The Hooded Plover *Charadrium rubicollis* is listed as vulnerable in Australia by the Australia-New Zealand Environment Conservation Council (ANZECC 1991) and Schulz (1990a), or rare following the IUCN definitions proposed by Mace and Lande (1991). Reported densities of this species are highest (up to 3.5 individuals/km) on sections of the Tasmanian shoreline, such as the south coast (e.g. Schulz and Menkhorst 1984, Schulz 1990b), and western Victoria (up to 4.4 individuals/km) (Murlis 1989). It is frequently stated that the remote coastlines of Tasmania are likely to form a more secure habitat for this species (e.g. Garnett 1992). However, few systematic counts have been conducted on the remote west coast beaches of Tasmania. Little is known about the actual population densities present in this region and the threatening processes facing this population. Schulz and Menkhorst (1984) and Schulz (1990b) conducted systematic counts on the far south west coast between Port Davey and South West Cape. In this region the densities of Hooded Plovers recorded were 3.7 individuals/km (1984) and 2.8 individuals/km of beach (1989). This paper presents the results of a systematic count of the Hooded Plover population conducted in April 1991 from Braddon Point at the entrance to Macquarie Harbour north to Bluff Point on the far north-west coast of Tasmania.

Methods

The survey was conducted over a period of seven days (13 to 19 April 1991) and the coastline was systematically sampled from south to north during this period. All beaches on this coastline were surveyed, with the exception of the beach at Hardwicke Bay at the mouth of the Pieman River, Darty's Corner, Nelson Bay, the north side of the Arthur River mouth and Slaves Bay.

The census method employed involved walking or running at a slow pace in the storm tide zone of the beach whilst continually scanning ahead for Hooded Plovers. When individuals were detected care was taken to minimise disturbance

and birds were only counted when passed. On the wide sections (over 400 m in width) of some beaches (e.g. adjacent to the Henty River mouth) this method could not reliably account for all individuals. Instead such sections were traversed twice in order to detect all the Hooded Plovers present - once in the vicinity of the high tide mark and once adjacent to the edge of the primary sand dunes. Where possible the sandy shorelines of all estuaries were investigated for this species.

Since this survey was only conducted by a single observer it was not possible to complete the large distance of the coastline over a one or two day period as is the case with the biennial Hooded Plover surveys such as conducted in Victoria (Murlis 1989). In order to avoid confusing count results, all beaches were surveyed from beginning to end in the one observation period.

The grid references for all localities identified in the text are listed in the attached appendix.

Results and Discussion

A total of 376 Hooded Plover were recorded at an average density of 3.5 individuals/km. All beaches supported a population of this wader. The densities of individuals varied greatly from beach to beach, from a low 0.8 individuals/km on the 36.5 kilometre long Strahan Ocean Beach to a maximum density of 19.2 individuals/km on the coastline between Granville Harbour and Four Mile Beach (Table 1).

The length of the beach appeared to have little bearing on the population densities present. For example, both Arthur and Mawson Beaches are approximately 6.5 km in length; the former supported a density of 2.2 individuals/km and the latter 6.2 individuals/km. The Hooded Plover appears to favour wide beaches, with large amounts of beachwashed seaweed and storm wrack (Schulz and Bamford 1987). Over 50% of Arthur Beach was narrow and covered at high tide with piles of logs deposited in the high and storm tide zones. Consequently, the plovers were forced to leave such areas at high tide and this situation may be regarded as suboptimal for the Hooded Plover. In contrast, Mawson Beach was wide (> 100m), lacked piles of logs in the high and storm tide zones and contained large amounts of storm wrack in the high tide line area.

The maxaimum density observed of 19.2 individuals/km on the coastline between Granville Harbour and Four Mile Beach was due to a single flock of forty-eight individuals, including eight immature-plumaged birds, at Stingray Bay. As this was probably a mobile flock this high density is likewise probably not representative. This beach was gently sloping in profile with large amounts of embedded string and bull kelp present on all sections from the low tide mark to the edge of the primary dunes. An extensive network of reef platforms was present off the beach and along the adjacent coastline. In some parts of the species' range (e.g. central Victoria) the Hooded Plover forages extensively on intertidal reef platforms (Schulz 1986). As the tide receded individuals were observed to move on to recently exposed tidal reef platforms off Stingray Beach. Only four other flocks of ten or more individuals were recorded: 17 birds (including two immatures) at Barney Creek mouth, 12 birds (including four immatures) at Hazard Bay and two flocks of 10 birds at Mawson Bay. The mean group size of all Hooded Plovers encountered along the entire stretch of coastline was 3.4 ± 0.40 (SE) individuals.

The low Hooded Plover density (0.8 individuals/km) on Strahan Ocean Beach was a surprise. When the beach length was divided into three sections, densities remained low throughout, particularly in the southern section of the beach (0.2 individuals/km) (Table 2). The explanation for these observed low densities is unclear given the numbers of other shorebirds present. For example, adjacent to the Henty River mouth the following aggregations of waders were recorded: Pied Oystercatcher (16), Sooty Oystercatcher (2), Double-banded Plover (151), Red-capped Plover (36), Red-necked Stint (86) and Sanderling (242). However, in this area only 8 Hooded Plovers were encountered.

Although much of this section of the Tasmanian coastline is commonly regarded as remote, this survey demonstrated that Hooded Plover populations should not be considered secure. In this region the species is exposed to a number of human-induced threatening processes.

1. Off-road Vehicles

The Hooded Plover is vulnerable to the deleterious effects of off-road vehicles during the breeding season. Buick and Paton (1989) estimated that up to 81% of all nests on beaches in the Coorong region of South Australia would have been run over in the 1985-86 breeding season. In addition runners frequently shelter in wheel ruts and are sometimes run over (T. Dennis pers. comm., Author per. obs.). The lower density of Hooded Plovers on far south-eastern South Australian beaches where off-road vehicles are common as compared with adjacent Victorian beaches, where such vehicles are banned, suggests a negative correlation between off-road beach usage and Hooded Plover densities (Garnett 1992).

Although this survey was conducted in April when fewer numbers of human visitors would be expected along the coastline it was a surprise how many off-road vehicles were encountered. A total of eight beaches out of fifteen beaches sampled (53.5%) and 90 km out of a total of 109 km (82.6%) of beach surveyed contained direct evidence of off-road vehicle activity (Table 1). This included encountering four-wheel drive vehicles or motor bikes, and fresh sets of tyre tracks. It is likely that in the summer months the same beaches would be exposed to higher levels of off-road usage and other beaches would be exposed too. Although it is not possible to draw any direct conclusions from this survey on the effects of off-road vehicles a number of points can be made:

- The large flock of 48 Hooded Plovers was recorded on a beach with a minimal off-road vehicle activity. The only evidence of such activity was associated with the launching of boats at a single point.
- Beaches with a high density of Hooded Plovers (excluding Stingray Beach) all displayed no sign of off-road vehicle activity. These were Greenes Creek to Hazard

Bay (8.0 individuals/km), Gaffney Point to Rebecca Point (8.7 individuals/km) and Hazard Bay (6.8 individuals/km). Such sites supported densities rarely reported on the south-east Australian mainland (e.g. Schulz and Bamford 1988, Murlis 1991).

- Beaches with evidence of off-road vehicle activity did not support similar densities of Hooded Plovers. The highest densities observed in this case were Mawson Bay (6.2 individuals/km) and Studland Bay (5.8 individuals/km).
- Beaches with heavy off-road vehicle usage supported low densities of Hooded Plovers. For example, Strahan Ocean Beach between Braddon Point and Henty River mouth (0.7 individuals/km) and Sandy Cape Beach (2.8 individuals/km).

2. Livestock

Cattle have been observed trampling nests on Flinders Island (Schulz, in prep.) and both cattle and horses have trampled nests in parts of Victoria (Schulz 1992). Cattle are widespread along the north-west Tasmanian coastline, and are frequently observed grazing in the primary and sand dunes (important location for Hooded Plover nest sites) and moving along or grazing on beach cast seaweed on all sections of the beach, including the storm tide zone.

Livestock were present on eleven beaches out of the fifteen beaches sampled (66.7%) and 82.5 km out of a total of 109 km (75.7%) of beach surveyed contained evidence of livestock presence (Table 1). All beaches, with the exception of Lighthouse Beach, north of Sandy Cape displayed evidence of livestock presence in the form of tracks and faeces. Hooded Plover densities on these beaches varied from 8.7 individuals/km on the coastline between Gaffney and Rebecca Points to 0.8 individuals/km on Strahan Ocean Beach.

3. Direct Disturbance

The Hooded Plover is vulnerable to direct disturbance when breeding. For instance, incubating individuals usually leave the nest if approached by people and will not return until after the people have left. This exposes the nest to predation and extremes of temperature (Schulz and Bamford 1987).

Despite the time of the year, numbers of people were encountered fishing, surfing, beachcombing and walking dogs on beaches close to two-wheel drive access points between Arthur River and Three Mile Beach. Such usage increases during the spring and summer months corresponsing to the breeding season of the Hooded Plover.

Significantly, only one beach, Lighthouse Beach, contained no evidence of off-road vehicle usage or livestock presence. This beach only represented 0.5 km of the 109.0 km of beach surveyed. However, numbers of people walking dogs (n=4) and surfers (n=6) were present on the beach during the survey. This beach experiences heavy visitor usage during the summer months from sunbathers, surfers, beachcombers and fishermen (pers. obs.). It is likely that the two individuals present on this beach are subject to direct disturbance during the summer months.

Therefore, although a relatively high population density of the Hooded Plover is present on the north-west Tasmanian coastline, the entire population is exposed to human-induced threatening processes in the form of off-road vehicle activity, the trampling effects of cattle and/or direct disturbance. With the trend of increasing off-road vehicle usage as a leisure activity throughout Tasmania, the level of human induced threats on this population is likely to increase. Consequently, no component of the Hooded Plover population on the north-west coast of Tasmania can, at present, be considered to be secure.

Table 1 Summary of Hooded Plovers recorded on the north-west coast of Tasmania, 13-19 April 1992.

Locality	Extent of Sandy Beach (km)	No. of individual Hooded Plovers present	Hooded Plover Density (Individuals /km)	Off-Road vehicle evidence	Livestock evidence
Strahan Ocean Beach (Braddon Point to Trial Harbour)	36.5	30	0.8	+	+
Granville Harbour to Hoyle Creek	2.5	48	19.2	+	-
Four Mile Beach	6.0	21	3.5	+	-
Interior River mouth to Native Well Bay	17.5	48	2.7	+	-
Sandy Cape Beach	10.0	28	2.8	+	+
Greens Creek to Hazard Bay	2.0	16	8.0	-	+
Hazard Bay	2.5	17	6.8	-	+
Gaffney Point to Rebecca Point	4.5	39	8.7	-	+
Arthur Beach	6.5	14	2.2	+	+
Mawson Bay	6.5	40	6.2	+	+
Lighthouse Beach	0.5	2	4.0	-	-
Three Mile Beach	5.0	22	4.4	-	+
Two Mile Beach	4.0	23	5.8	-	+
Calm Bay	0.5	2	4.0	-	+
Studland Bay	4.5	26	5.8	+	+
TOTAL	**109.0**	**376**	**3.4**	**N/a**	**N/a**

Off-road vehicle/livestock evidence: + present, - not present.

Table 2: Summary of Hooded Plovers recorded on three sectors of Strahan Ocean Beach

Section	Location	Distance (km)	No. of Individual Hooded Plovers	Hooded Plover Density (Individuals / km)
1.	Braddon Point to Muttonbird Rookery	9.5	2	0.2
2.	Muttonbird Rookery to Henty River mouth	14.0	14	1.0
3.	Henty River mouth to Trial Harbour	13.0	14	1.1
	TOTAL	36.5	30	0.8

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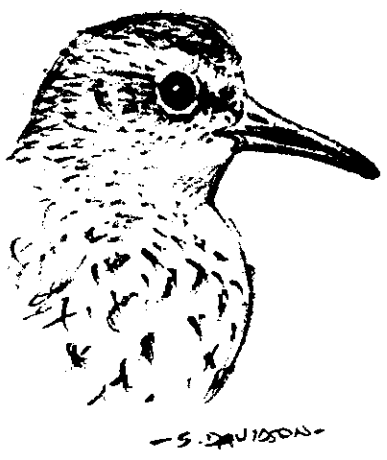
APPENDIX

Grid References of Localities identified in the text

Arthur Beach	41°04'S	144°40'E
Arthur River mouth	41°02'S	144°39'E
Barney Creek mouth	41°12'S	144°42'E
Braddon Point	42°13'S	145°13'E
Calm Bay	40°48'S	144°41'E
Darty's Corner	41°14'S	144°41'E
Four Mile Beach	41°44'S	144°58'E
Gaffney Point	41°13'S	144°41'E
Granville Harbour	41°48'S	145°01'E
Greenes Creek mouth	41°20'S	144°43'E
Hardwick Bay	41°40'S	144°55'E
Hazard Bay	41°15'S	144°42'E
Henty River mouth	42°02'S	145°14'E
Hoyle Creek	41°45'S	144°59'E
Interview River mouth	41°35'S	144°52'E
Mawson Bay	40°59'S	144°37'E
Native Well Bay	41°26'S	144°45'E
Nelson Bay	41°08'S	144°40'E
Pieman River mouth	41°40'S	144°55'E
Rebecca Point	41°10'S	144°41'E
Sandy Cape Beach	41°22'S	144°46'E
Slaves Bay	40°54'S	144°39'E
Stingray Bay	41°46'S	145°00'E
Studland Bay	40°45'S	144°41'E
Three Mile Beach	40°53'S	144°41'E
Trial Harbour	41°55'S	145°10'E
Two Mile Beach	40°51'S	144°42'E



1992 HOODED PLOVER SURVEY, SOUTH AUSTRALIA

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The 1992 Spring survey of the beaches between the Victorian border and the Murray Mouth in South Australia was conducted by the Beach User Group over several weeks (between 7 and 28 November), rather than over one weekend as has been the case.Due to mechanical failure of the vehicle used plus a shortage of surveyors it was necessary to extend the count period.

The weather for this survey was fair to good.The overall figure of 153 birds is slightly up on previous years with the numbers of adult Hooded Plovers being higher in some areas and lower in others.The numbers of Hooded Plovers counted in all surveys since 1988 are presented in Table 1.

Table 1 - Beach User Group Hooded Plover surveys, 1988-92

						J. Bransbury Surveys	
Area (Date of 1992 Survey)	1992	1991	1990	1989	1988	Spring '82	Spring '87
Vic-Border-Cape Douglas (16/11)	7	6	12	8	8	6	4
Cape Douglas-Carp Rocks (16/11)	0	7	2	7	11		
Carp-Rocks-Southend (28/11)	20	32	37	26	21	41	22
Southend-Robe (7/11)	39	42	36	41	35	38	30
Robe-Kingston SE (7/11)	11	11	10	7	27	19	13
Kingston SE-42 Mile (7/11)	36	20	29	24	21	27	13
42 Mile-Murray Mouth (7/11)	40	14*	21	24	47	27	8
TOTAL	153	132	147	137	170	158	90

* Only 50 km (approx - 50%) surveyed

It is interesting to note that the Coorong area (Kingston SE to the Murray Mouth) produced the highest numbers counted since the surveys by this group began in 1988.No particular reasons can be given for the higher or lower numbers.

The area between Southend and Nora Creina (part of the Southend to Robe section in Table 1) was counted twice on the same day.The morning count produced 15 birds (0700-1000,cool with a slight breeze,tide medium) whereas the afternoon count was 25 (1,600-1,900,warm and windless,tide high).The higher figure is used for the survey total.

As in 1990 a pair of Hooded Plovers was found nesting 600 metres inland from Cullens Bay near Southend (see Stewart 1991).Breeding success for both years is unknown.

Neither the large dunal areas behind the beaches nor the coastal lakes were surveyed.

Pied Oystercatchers were also counted during the survey and count results,along with those since 1989,are presented in Table 2.

Table 2 - Pied Oystercatchers counted, 1989-1992

Area	1992	1991	1990	1989
Vic. border-Cape Douglas	11	0	9	12
Cape Douglas-Carp Rocks	0	3	1	2
Carp Rocks-Southend	0	7	6	1
Southend - Robe	22	14	11	19
Robe Kingston SE	3	3	5	0
Kingston SE - 42 Mile	7	19	16	10
42 Mile - Murray Mouth	118	44*	182	155
TOTAL	161	90	220	199

* Only 50 km (approx 50%) surveyed

Anyone interested in participating in future surveys can contact me on 087 354269.My thanks to those who participated in this survey.

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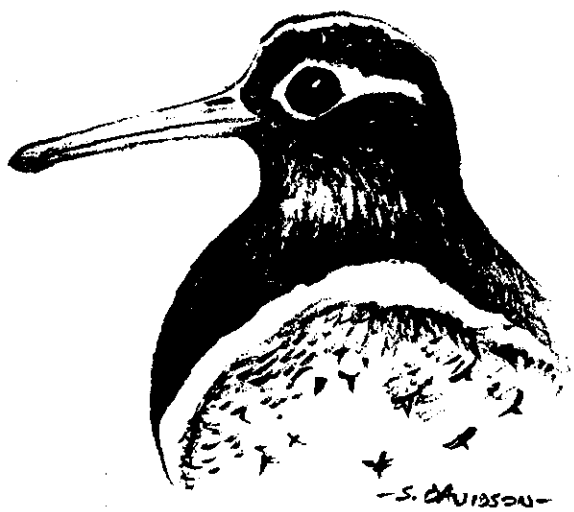

RESULTS OF THE 1992 HOODED PLOVER/PIED OYSTERCATCHER SURVEY OF THE VICTORIAN COAST.

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"Obviously, within any area, the best method to determine where major concentrations of shorebirds are located is to go to the area and look." (Howes & Bakewell 1989).

The 1992 Hooded Plover *Charadrius rubricollis* and Pied Oystercatcher *Haematopus longirostris* survey was conducted around the weekend of 7 and 8 November. Unlike the 1990 count (Lane 1991) the weather on the 7th and 8th was generally mild and conducive to counting, although some regions reported poor weather.

Methods

Regional organisers were appointed to each of the 18 coastal divisions used by Murlis (1989). Counting was performed on foot and from vehicles and boats giving an estimated total of 899 km covered. 760 km of the surveyed area was ocean beach, which represents about 98% of suitable Victorian coastline (according to Lane 1991). Counters completed pre-formatted sheets which allowed details of habitat usage, breeding biology and age structure to be recorded. This paper presents the results of the 1992 count.

Results and Discussion

Hooded Plovers and Pied Oystercatchers

Table 1 shows the number of Hooded Plovers and Pied Oystercatchers counted along the Victorian coastline for 1992, and its relation to previous counts. For a detailed breakdown of provisional results for the 1992 count see Table 1 in Weston (1993). Of all Hooded Plovers counted 79.82% were in pairs and 19.06% were alone or in flocks. It should be noted that the count concentrated on open ocean environments. All Hooded Plovers in Victoria are believed to occur on or near ocean shores and so the count is considered to be a good estimate of the total number in the State (Lane 1987). The total number counted in the present study was 466 and the average density of all areas surveyed was 0.5 birds per kilometre. When near-coastal wetlands and embayments are excluded the density is 0.6 birds per kilometre. The maximum density of any one stretch was 4.7 birds per kilometre. Seven nests were located.

Of all Pied Oystercatchers counted 61.5% were in pairs and 30.7% were alone or in flocks. Because significant numbers of Pied Oystercatchers occur in tidal embayments and inlets the present count is not considered to represent the total number of this species in Victoria. The total number counted in the present study was 706 and the average density over all surveyed areas was 0.8 birds per kilometre. Twenty-one nests were located.

Table 1 summarises the results of all Hooded Plover surveys to date. Different coverage and weather conditions make comparisons between years difficult and in some regions the variation between counts appears high. The total of the 1992 count represents a 39.5% increase above the 1990 result, a count which had lower coverage and suffered from poor weather. The 1992 result is 13.4% lower than the high coverage 1988 count. This may be some cause for concern.

Table 1. Summary of Hooded Plover Survey Results in Victoria, 1980-1992. (* = incomplete coverage; - = no coverage; # = includes substantial areas not covered by other counts.).

Stretch	'80	'82	'84	'86	'88	'90	'92
NSW Border - Point Hicks	34	30*	34	18*	43 *	33*	41
*Point Hicks - Marlo	43	-	-	-	30*	-	37
Marlo - Ninety Mile Beach	23	5*	0*	6*	43*	22	28
McLoughlin's Beach - Snake I.	14	-	4*	22	35	-	31
Wilson's Promontory	18	-	19	7*	0*	0*	2*
Darby Beach - San Remo	77	105	105	86	66	56	54
Phillip I.	14	27	20	8*	28	23	18
Point Leo - Point Nepean	5	36	15	27	26	5*	34
Queenscliff - Cape Otway	17	9	24	-	26	16	8
Cape Otway - Warrnambool	10	-	0	-	7*	-	21
Warrnambool - Nelson	197	208	183*	192	234	179	141
Total	474	420	394	366	538 (#)	334	466(#)

Habitat Usage

Information on habitat usage for both species was collected and is summarised in Tables 2 and 3 which show the percentage of birds located in each habitat/activity category.

Table 2. Habitat Usage of Hooded Plovers.

	In Water	Water Edge	Beach	Amongst Seaweed	Dunes	Rocks	Total
Roost	0.00%	3.75%	29.96%	15.73%	3.00%	1.50%	53.94%
Feed	0.75%	22.85%	5.99%	6.37%	0.00%	0.75%	36.71%
Nest	0.00%	0.00%	3.37%	0.37%	4.5%	0.00%	8.23%
Other	0.00%	0.00%	0.00%	0.00%	1.1%	0.00%	1.12%
Total	0.75%	26.60%	39.32%	22.47%	8.61%	2.25%	100.0%

Table 3. Habitat Usage of Pied Oystercatchers.

	In Water	Water Edge	Beach	Amongst Seaweed	Dunes	Rocks	Total
Roost	0.64%	15.61%	50.32%	0.00%	3.50%	0.64%	70.71%
Feed	1.59%	12.42%	4.46%	1.59%	0.64%*	1.59%	22.29%
Nest	0.00%	0.00%	2.55%	0.00%	2.87%	0.00%	5.42%
Other	0.00%	0.00%	0.96%	0.00%	0.64%	0.00%	1.60%
Total	2.23%	28.03%	58.29%	1.59%	7.65%	2.23%	100.0%

*These birds were recorded feeding in salt-marsh.

More Hooded Plovers were found roosting on open beaches rather than any other habitat type. Beside roosting, activities apparent on open beaches were feeding and nesting with 39.3% of the total number of Hooded Plovers being counted there. Many birds were associated with seaweed-strewn beaches (22.5%), a result concordant with the data of Murlis (1989) which shows that *c.*22% of coastal stretches that contained Hooded Plovers also contained significant amounts of seaweed. Hewish (1989) observed Hooded Plovers using seaweed as shelter from a strong wind. The present study also found that a high percentage of birds amongst seaweed were roosting (70.0%).

Overall, the results show the high dependence of Hooded Plovers on beaches, with only 10.9% of counted birds found elsewhere. Birds were observed in the dunes and occasionally on rocks (also noted by Schulz 1986). Nesting Hooded Plovers used the dunes and the beach to roughly the same extent (birds nesting amongst seaweed are also on the beach); however the small number of nests located makes this conclusion tentative.

Although there was a greater search effort on ocean shores, few birds were located elsewhere, there were notable exceptions including two Hooded Plovers seen in Bunga Arm in the Gippsland Lakes. This lake is, however, close to an open ocean beach. Movement between the coast and wetlands further inland is known from both Eastern and Western Australia (Lane 1987).

Pied Oystercatcher habitat preference cannot be determined from the current survey because many potential habitats were not surveyed. Over 65% of birds counted were found roosting on the beach or at the water's edge. Nests were found on the beach and in the dunes. Some birds were seen on rocks, a habitat also noted by Weston (1992).

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SIGHTINGS OF WADERS LEG-FLAGGED IN VICTORIA, AUSTRALIA

Clive Minton

The addition of an orange leg-flag to migratory waders caught in Victoria commenced in January 1990, with the prime objective of increasing knowledge of the migration routes and key staging posts of birds on their way to and from their breeding grounds.

The flag was generally placed on the right tibia, although it was put on the right tarsus in some earlier experiments (and latterly on the tarsus also on some Sanderling and Ruddy Turnstone, for greater visibility).

Experience has shown a high (greater than 90%) retention rate and little colour fading over a 2-3 year period. Some field observers were occasionally unsure of the colour, with a few records suggesting a red or yellow (before this was used in north-west Australia recently) colour. Most, but not all, observers correctly identified the leg (note the occasional bird is genuinely, but incorrectly, flagged on the left leg!).

The metal band position is not part of the code and, although most frequently on the right tarsus, the position is not changed if a bird is retrapped with the metal band on the left tarsus.

The approximate numbers of birds of each species orange leg-flagged in Victoria between January 1990 and the end of February 1993 is given in the table below.

Red-necked Stint *Calidris ruficollis*	5981
Curlew Sandpiper *C. ferruginea*	2929
Sharp-tailed Sandpiper *C. acuminata*	390
Red Knot *C. canutus*	353
Ruddy Turnstone *Arenaria interpres*	348
Sanderling *C. alba*	208
Bar-tailed Godwit *Limosa lapponica*	169
Greenshank *Tringa nebularia*	49
Pacific Golden Plover *Pluvialis dominica*	26
Latham's Snipe *Gallinago hardwickii*	22
Mongolian Plover *Charadrius mongolus*	14
Eastern Curlew *Numenius madagascariensis*	35
Terek Sandpiper *Xenus cinereus*	4
Great Knot *C. tenuirostris*	2
Grey Plover *P. squatarola*	1

Birds have been leg-flagged at the following locations (only):

Port Phillip Bay	-	Werribee Sewage Farm
	-	Queenscliff/Swan Island
Westernport	-	Yallock Creek
	-	Stockyard Point
	-	The Gurdies
	-	Tooradin
Anderson Inlet	-	Inverloch
Corner Inlet	-	Barry Beach
	-	off Manns, Robertsons and Mclaughlins Beaches
Western Victoria	-	Killarney Beach, Port Fairy (Sanderling and Turnstone only)

All sightings of orange leg-flagged birds away from the above areas are reported in the lists which follow.

There has been an unexpectedly large number of sightings already reported and some of the knowledge gained from these is given below the data on each species. As well as the hoped for sightings of birds on migration through Asia, there has been a widespread series of sightings from within Australia illustrating dispersal and migration routes within the continent. Of the 108 records listed, 48 were from overseas and 60 were within Australia. This is more than double the number of recoveries of banded waders reported via the Banding Scheme to the Victorian Wader Study Group over the same three year period and emphasises the considerable value of leg-flagging in relation to generating data on migration routes and stopover sites.

The flagging scheme within Victoria will continue for a number of years in order to extend the data and, hopefully, enable a greater quantification of migration patterns. Please continue to send in sightings to Mark Barter, the Australian Bird Banding Scheme or myself.

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It is hoped to introduce, in the near future, a more formal arrangement for maintaining records and for acknowledging sightings made by observers, even though it is not possible, of course, to give exact distances moved, or time elapsed since marking, because of the generic nature of the flagging code.

Acknowledgements

The efforts of all those field observers whose records are included (and attributed) in this note are greatly appreciated. So too are those people and organisations who in many cases facilitated the transfer of the original records to the Victorian Wader Study Group.

Pacific Golden Plover

11/09/91	Tuggerah Lakes, Ourimbah, New South Wales	Alan Morris

This is further evidence to support the count/previous recoveries indication that Pacific Golden Plover use a north east route into and out of Victoria. This bird would have been flagged at either Werribee Sewage Farm or Yallock Creek between 21/10/90 and 12/01/91.

Bar-tailed Godwit

28/04/92	Arao, Ariake Sea, Kumamoto Pref., Kyushu, JAPAN (32°59- N, 130°26- E)	Jeremy Thompson
19/07/92	Karaka, South Manukau, NEW ZEALAND (37°07- S, 174°54- E)	Tony Habracken
22/09/92	Miranda, Firth of Thames, NEW ZEALAND (37°10- S, 175°19- E)	Pam and Des Agnew

The bird at Arao in Japan was with other colour-flagged individuals from Queensland and New Zealand (as well as three banded but unflagged birds). It is interesting that populations from widely different non-breeding areas should be sharing the same migratory "stopover" site. Prior to the above sighting in New Zealand, there were no recorded movements of Bar-tailed Godwits between Victoria and New Zealand.

Red Knot

31/03/92	Miranda, Firth of Thames, NEW ZEALAND (2 birds) (37°10- S, 175°19- E)	Stella Rowe *et al*
27/04/92	" (2 birds)	Bev Woolley
05/09/92	"	Pam and Des Agnew
30/09/92	"	"
02/01/93	"	Stella and John Rowe
26/10/91	Manawatu Estuary, NEW ZEALAND (40°28- S, 175°13- E)	J.L. Moore and S.E. Creswell
27/10/91	"	Roger Slack *et al*
25/11/91	"	W. Chelley
26/11/91	"	D. Medway
01/02/92	Manawatu Estuary, NEW ZEALAND (40°28- S, 175°13- E)	R. Guest
30/10/91	Port Whangarei, NEW ZEALAND (35°46- S, 174°20- E)	Ray Pierce
23/12/91	"	per NZ Banding Office
02/11/92	Mangauhai, NEW ZEALAND (36°08- S, 174°34- E)	Richard Parrish
22/11/92	Ruakaka, NEW ZEALAND (35°54- S, 174°26- E)	"
25/10/91	Mangere Sewage Ponds, NEW ZEALAND (36°57- S, 174°46- E)	Ray Clough
06/05/92	Seagrove, Manukau Harbour, NEW ZEALAND (37°07- S, 174°54- E)	Tony Habracken
20/06/92	Karaka, " (3 birds)	"
02/08/92	Karaka, "	"
02/08/92	Gordon's Road, "	"
28/11/92	Yarrs Flat, Lake Ellesmere, NEW ZEALAND (43°42- S, 172°30- E)	Colin Hill
20/10/92	Darling Point, Moreton Bay, Queensland	Marjorie Andrews
25/10/92	Nudgee Beach, Moreton Bay, Queensland	Margery Plymire and Peter Driscoll

This excellent series of sightings in New Zealand adds to the existing band recovery evidence of a considerable interchange between the Red Knot populations in Victoria and New Zealand. Given that the majority of Red Knot flagged in Victoria have been immatures and/or caught during the April-to-August "over-wintering" season, it is likely that these sightings in New Zealand do not refer only to birds marked whilst on migration through Victoria. Note that several of the sightings may refer to the same individual.

The sightings from Queensland are the first indication of a link with Victorian Red Knot. Note the continuing absence of sightings (or recoveries) in north-west Australia.

Sharp-tailed Sandpiper

24/04/92	Tanjung Pecinan, Situbondo, East Java, INDONESIA (7°04- S, 114°02- E)	A.P. Setiadi and I. Setiwan
05/04/92	Luggage Point, Brisbane River mouth, Queensland	David Stewart
20/09/92	Raby Bay, Brisbane, Queensland	Don Gaydon
06-28/09/92	Seven Mile Lagoon, 60km W of Brisbane, Queensland	Rod Hobson
28/09/92	" (different bird to above)	"

This is the first report of a Victorian-banded Sharp-tailed Sandpiper in Indonesia. The sightings in Queensland provide further evidence that this is the principal route taken by birds on their way to and from Victoria.

Red-necked Stint

12/05/92	Sungai Bera Estuary, Seria, BRUNEI DARUSSALAM (4°37- N, 114°21- E) (2 birds)	Jennifer Elkin
16/05/91	Mai Po Marshes, HONG KONG (22°29- N, 114°02- E)	Wendy Young

05/05/92	"	Sue Earle
22/12/90	Lake Ellesmere, Christchurch, NEW ZEALAND (43°42- S, 172°28- E)	Kathleen Harrison
18/4/91	"	Kathleen Harrison and Sheila Petch
26/10/92	"	Colin Hill
29/10/92	"	Sheila Petch
29/12/92	" (2 birds)	"
28/09/92	Seven Mile Lagoon, 60km W of Brisbane, Queensland	Rod Hobson
29/09/92	Cooktown, Queensland	John McLean
30/03/91	Tullakool Treatment Works, New South Wales	Phil Maher
06/09/92	Botany Bay, New South Wales	Graham Pry
24/08/91	Orielton Lagoon, Hobart, Tasmania	Alan Fletcher
13/10/91 (and throughout 91/92 summer)	Orielton Lagoon, Hobart, Tasmania(2 birds)	Alan Fletcher
02/04/91	Gantheaume National Park, Kangaroo Island, South Australia	Chris Lester
26/05/91	Lake Eyre South, South Australia	John Read
10/03/91	ICI Saltfields, South Australia	John Cox
10/02/93	"	David Close
15/04/91	Eyre Bird Observatory, Western Australia	Gwen and Graham Goodreid
22/04/92	"	"
12/08/92	Roebuck Bay, Broome, Western Australia	per Broome Bird Observatory
15/03/91	Lake Murdeduke, Victoria (2 birds)	George Appleby
22/03/91	Cundare Pool, Victoria	"
04/04/92	Lake Tutchewop, Victoria	Chris Doughty
17/04/92	Glenelg River, Victoria	Martin Schulz

There have also been sightings in Victoria at other locations (Barwon Heads, Point Cook/Altona, Sandy Point) away from the flagging locations. Most probably refer to movements of birds marked in their first year, as retraps suggest that adults are strongly site-faithful.

The sightings in New Zealand, of at least two individuals, are the first indications of movements through Australia of Red-necked Stints on their way to and/or from New Zealand. The report from Brunei is also a first, although there has been an earlier recovery from nearby Sabah.

The wide spread of sightings within Australia is especially interesting. Some, if not all, of the March/May reports concern the wanderings of first-year birds, as many were not showing any signs of breeding plumage. Also given the pre-departure weight increases observed in adults in Victoria, they would not be expected to land again in southern Australia, once they had taken off.

The Queensland records are again "firsts" but, given the number of Red-necked Stints flagged, would not necessarily suggest that the east coast is a major migration route for this species.

Curlew Sandpiper

09/04/90	Mai Po Marshes, HONG KONG at least (22°29- N, 114°02- S)	per David Melville
13/04/90	" two	"
16/04/90	" individuals	"
17/0490	" involved	"
06/05/92	"	Paul Leader
25/04/92	Tainan, TAIWAN (22°50- N, 120°20- E)	Per Taiwan Banding Centre
16/09/92	Cairns, Queensland	Danny Rogers
02/10/92	"	John Crowhurst
20/10/92	Nudgee Beach, Brisbane, Queensland	Margery Plymire and Peter Driscoll
21/09/91	North Botany Bay, New South Wales	Trevor Quested
22/02/92	Tullakool Evaporation Ponds,	Tom Wheller New South Wales
13/10/91	Orielton Lagoon, Hobart, Tasmania	Alan Fletcher
24&29/10/91	Georgetown, Tasmania	Ralph Cooper
07/01/92	"	Alan Fletcher
19/07/92	Ocean Beach, Strahan, Tasmania	Tim Reid
26/08/92	Cape Portland, N.E. Tasmania	Ralph Cooper
06/07/91	Lough Calvert, Victoria	Mark Barter
04/04/92	Mystic Park, Kerang, Victoria	Chris Doughty
05/04/92	Lake Tutchewop, Victoria	"
15/05/92	Streatham, Victoria	George Appleby
22/11/92	Lake Goldsmith, Beaufort, Victoria	BOCA Ballarat

A nice range of sightings. The evidence of a strong passage on northward migration through the "China region" is compatible with previous banding recoveries.

There was no previous evidence for any passage via Queensland to Victoria on southward migration. On the other hand there was evidence of a link with Tasmania, though the number of sightings there is more than might have been expected, considering few passage birds have been flagged.

The inland sightings in Victoria and New South Wales are likely to be largely a dispersal of immature birds.

Sanderling

01/09/91	Yotugonyu Beach, Maki, Niigata Pref., JAPAN (37°51- N, 138°53- E)	per Yamashina Institute and
29/09/91	Torinonmi Beach, Watari, Miyagi Pref., JAPAN (38°02- N, 140°55- S)	Jeremy Thompson
14/08/92	Yatou, Narashino, Chiba Pref., JAPAN (35°41- N, 140°00- E)	"
22/08/92	Yotogonyu Beach, Maki, Niigata Pref., JAPAN (37°51- N, 138°53- E)	"
19/05/91	Discovery Bay, Victoria 100 km WNW	Martin Schulz
30/12/91	Port MacDonnell, South Australia 140 km WNW	David Robertson *et al*
18/02/92	Sandy Point, Victoria 340 km ESE	John Simpson
02/12/92	Snapper Point, Portland, Victoria 65 km W (at least 6 individuals in flocks totalling 525)	Rob Farnes

A fabulous collection of sightings from one catch of Sanderlings! All were banded and leg-flagged at Killarney beach, near Port Fairy, on 2 March 1991. This is the only significant catch (208 birds) of Sanderling yet made in Australia. These are also the first "recoveries" for this species. Japan seems to be a major stopover area on migration. Most of the individuals seen there were also photographed. The occurrence at other locations on the Victorian coast is also interesting and may indicate a less strong attachment to non-breeding site than in some other migratory waders.

SIGHTINGS OF WADERS LEG-FLAGGED IN NORTH WESTERN AUSTRALIA

Clive Minton

Leg-flagging of waders, with a yellow flag on the right tibia, commenced in north Western Australia (Broome, 80-Mile Beach and Port Hedland Saltworks) in August 1992. Some 5300 migratory waders have been flagged since then, mostly in the period between mid-September and mid-October, during the AWSG Expedition.

Two distant sightings have been reported to date (February 1993).

Curlew Sandpiper

22/11/92	Stockyard Point, Westernport, Victoria	Jeff Campbell

Grey-tailed Tattler

23/11/92	North Stradbroke Island, Moreton Bay, Queensland	Peter Driscoll and Andrew Geering

Whilst the onward passage of a Curlew Sandpiper to south-eastern Australia is to be expected (there are previous banding recoveries and sight records of colour-dyed birds to support this), the Grey-tailed Tattler movement to Moreton Bay is totally unexpected. It will be most interesting to see in the future whether any further evidence emerges of similar cross country movements in tattlers or other species.

Please report all sightings of yellow leg-flagged waders to Mark Barter, or the Australian Bird Banding Scheme, or Broome Bird Observatory (PO Box 1313, Broome, WA 6725, Australia) or myself (see previous article for the other addresses).

AWB ACTIVITIES

WATERBIRD HUNTING ON THE RED RIVER DELTA, NORTHERN VIETNAM

The Asian Wetland Bureau, with the support of the Australian International Development Assistance Bureau (AIDAB) is undertaking work to identify the level of waterbird hunting on the Red River Delta in northern Vietnam. Dr Le Dien Duc and Mr Hoang Van Thang from the University of Hanoi's Wetland and Waterbird Working Group have been undertaking field work at three coastal sites on the delta: Cua Van Uc in the northern delta; Xuan Thuy Reserve in the central delta and Cua Day in the southern delta.

Work documenting the level of hunting began in September 1992 and will continue until May 1993. This will be followed by an economic assessment of the value of natural resources in the area as a basis for developing alternative livelihood projects for local people currently engaged in hunting. It is hoped that this will reduce the hunting pressure on waterbirds.

Counts at the three sites have found up to 3,660 at Cua Van Uc, 8,000 at Xuan Thuy and 2,900 at Cua Day. The Red River Estuary is clearly one of the important sites for migratory shorebirds in South-east Asia.

Figures for hunting to date show that at the three sites, a total of 9,342 waterbirds (including 7,835 waders) were caught/trapped by local hunters from September to December. By weight this represented over 2,300 kilograms! Hunting levels are similar to those in the Shanghai area, China and in central Java, Indonesia where AWB has also supported investigations with help from AIDAB.

Among the hunted birds, a number of banding recoveries have been made, including a Large Sandplover from Broome in Western Australia, a Common Redshank from Hong Kong and a Kentish Plover banded in Malaysia. This brings to seven the total number of international recoveries of migratory waterbirds on the Red River Delta.

Counts as part of the investigations have revealed that the total number of birds harvested may represent between 10 and 15 percent of the total numbers of birds in the three study sites. Uncertainty is attached to this estimate because of the likely turnover of birds in the area during migration.

AWB will continue to support the work of the Wetland and Waterbird Study Group in Vietnam and it is hoped that AWSG and others will follow up their earlier work there which was so important in initiating detailed studies.

BRETT LANE

BIRD MIGRATION STUDIES IN SOUTH ASIA

The Bombay Natural History Society (BNHS) has carried out sporadic bird banding activities in the Indian sub-region for over 30 years. However, in 1980 substantial funds were made available to the BNHS by a grant from the US Fish & Wildlife Service under the PL-480 programme. This enabled the BNHS to organise comprehensive and systematic field programmes for bird banding in the country through a network of banding stations.

During the 10-year tenure of the project, a total of about 183,230 birds involving 545 species were banded at 35 stations and sites in the country. Of these species, 140 (25.7%) consisted of waterbirds (including waders). The habitats covered included alpine Himalayas, broadleaved foothills, flood plains, desert grasslands, coastal mudflats and estuaries, and tropical dry-evergreen, moist deciduous and wet-evergreen forests.

This paper briefly summarizes part of the results of the study. A detailed report of the study is under preparation. In the interim, some of the results have been presented at various conferences and meetings, most recently at the 1992 wader conference (HUSSAIN ANYTHING ELSE).

Banding and Recoveries

Out of a total of 135,440 migrants banded only about 1,092 were recovered (about 0.8% recovery rate), mainly of waterbirds originating from Russia (formerly USSR). Most of recoveries coming from hunted birds and the recovery pattern also indicates that the data available was from only those areas where hunting was carried out. Vast areas in Tibet and parts of China are poorly covered, though the birds may have used these areas during passage.

Most of the reports of waders were from the banding schemes in Russia with a few from China. Table 1 summarizes the species of waders banded and recovered abroad. The recovery/banding ratio is rather low. Fortunately, the low recovery rate has been partially balanced by the large number of retraps (controls) obtained within the country that have served to identify some of the routes used. The bulk of the recoveries of waders, was restricted to Ruff (60 recoveries/10,328 banded; 0.58%), Curlew Sandpiper (34/16,887; 0.20%) and Little Stint (29/42,810; 0.06%).

The sampling profile appears to be inadequate to get a true picture of the migration pattern. Sampling areas were limited to a few sites and trapping could not be effected on a large scale. To overcome this problem it is necessary to have a network of bird banding stations scattered over the subcontinent to monitor a wide population spectrum and also to monitor the movements within the non-breeding sites.

Table 1. Total number of waders banded and recovered (1980-1992)

English name	Latin name	Number banded	Number recovered
Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	259	
Bronze-winged Jacana	*Metopidius indicus*	50	
Painted Snipe	*Rostratula benghalensis*	471	1
Crab Plover	*Dromas ardeola*	103	1
Eurasian Oystercatcher	*Haematopus ostralegus*	7	
Ibisbill	*Ibidorhyncha struthersii*	11	
Black-winged Stilt	*Himantopus himantopus*	393	2
Avocet	*Recurvirostra avosetta*	123	
Stone Curlew	*Burhinus oedicnemus*	4	
Great Thick-knee	*Esacus recurvirostris*	18	
Northern Lapwing	*Vanellus vanellus*	10	
River Lapwing	*Vanellus duvaucell*	i2	
Yellow-wattled Lapwing	*Vanellus malabaricus*	6	
White-tailed Lapwing	*Vanellus leucurus*	130	
Red-wattled Lapwing	*Vanellus indicus*	534	
Eurasian Golden Plover	*Pluvialis apricaria*	1	
Grey Plover	*P. squatarola*	671	1
Pacific Golden Plover	*P. fulva (dominica)*	245	1
Ringed Plover	*Charadrius hiaticula*	5	
Long-billed Plover	*C. placidus*	1	
Little Ringed Plover	*C. dubius*	321	
Kentish Plover	*C. alexandrinus*	1,817	1
Lesser Sandplover	*C. mongolus*	6,909	2
Large Sandplover	*C. leschaultii*	186	
Black-tailed Godwit	*Limosa limosa*	419	1
Bar-tailed Godwit	*Limosa lapponica*	81	
Whimbrel	*Numenius phaeopus*	54	
Eurasian Curlew	*N. arquata*	100	
Spotted Redshank	*Tringa erythropus*	198	1
Redshank	*T. totanus*	2,128	
Marsh Sandpiper	*T. stagnatilis*	1,916	2
Greenshank	*T. nebularia*	543	2
Wood Sandpiper	*T. glareola*	6,615	4
Terek Sandpiper	*Xenus cinereus*	290	
Common Sandpiper	*Actitus hypoleucos*	81	
Ruddy Turnstone	*Arenaria interpres*	311	1
Red-necked Phalarope	*Phalaropus lobatus*	148	
Solitary Snipe	*Gallinago solitaria*	5	
Pintail Snipe	*G. stenura*	22	
Common Snipe	*G. gallinago*	1,748	2
Jack Snipe	*G. minima*	499	
Asian Dowitcher	*Limnodromus semipalmatus*	15	
Red Knot	*Calidris canutus*	55	
Great Knot	*C. tenuirostris*	81	
Sanderling	*C. alba*	156	
Red-necked Stint	*C. ruficollis*	9	
Little Stint	*C. minuta*	42,810	29
Temminck's Stint	*C. temminckii*	1,372	1
Long-toed Stint	*C. subminuta*	35	
Sharp-tailed Sandpiper	*C. acuminata*	1	
Dunlin	*C. alpina*	685	
Curlew Sandpiper	*C. ferruginea*	16,887	34
Spoon-billed Sanpiper	*Eurynorhynchus pygmaeus*	12	
Broad-billed Sandpiper	*Limicola falcinellus*	1,429	1
Ruff	*Philomachus pugnax*	10,328	60

Biometrics and Moults

When handling birds, various standard morphometric parameters were examined. In addition, age, sex, breeding conditions, moult and plumage conditions were recorded. Particular attention was paid to record the factors most relevant to migration, such as weight and moulting strategy. Table 2 summarizes the information obtained regarding the primary moult of waders.

Table 2: Primary Moult Duration of Waders

Species	Duration (days)
Grey Plover	72
Lester Sandplover	200
Large Sandplover	150
Redshank	90-110
Little Stint	120
Ruff	100-110

Longevity

Besides data on recoveries of banded birds (Table 1), over 5,500 records of recapture data covering both migrant and residents species have also been obtained. Table 2 summarizes the findings on the longevity of waders. Of particular interest the record of a Lesser Sandplover. This data will be used to determine (a) site fidelity in migrants, (b) longevity in migrants and residents, and (c) young/adult ratio and their dispersal patterns in given habitats, and will be invaluable to understand the life histories of the bird species.

Table 3 : Longevity Records of Waders

Species	Year	Month
Crab Plover	9	2
Grey Plover	8	11
Bar-tailed Godwit	8	6
Kentish Plover	9	0
Lesser Sandplover	20	3
Large Sandplover	10	0
Redshank	12	2
Marsh Sandpiper	6	2
Greenshank	11	0
Wood Sandpiper	12	4
Rednecked Stint	10	5
Little Stint	10	6
Curlew Sandpiper	11	0
Broad-billed Sandpiper	10	2

Conservation Issues

This project is considered to be one of the strongest endeavors in the country to determine the trends in bird migration, to identify conservation issues and problems and identify possible action plans.

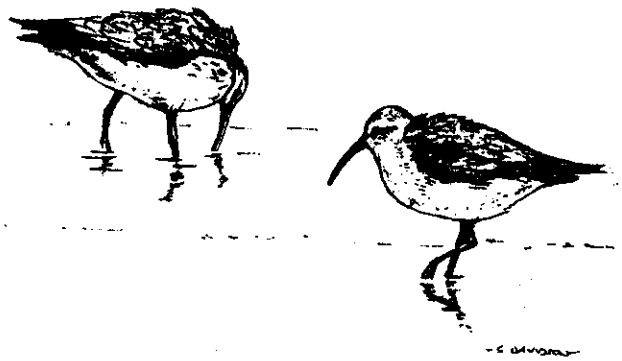
The major achievement of the project has been of highlighting the importance of certain key wetlands and forest areas in the subcontinent. This has resulted in a better under-

standing of the ecology of these habitats and thereby greater protection of the areas.

The Great Vedaranyam Swamp (now recognised as a Ramsar Site), Pulicat Lake and Khabertal (both Ramsar sites), Dihaila Jheel (newly discovered non-breeding site of the endangered Siberian Crane), Chari Dhand adjoining the Great Rann of Kachchh and Gulf of Mannar Marine National Park on the southeast coast, are some of the key wetlands which received attention due to the project activities. The respective state goverments have now included these sites in their future action plans.

Source:

Hussain, S.A. 1992. Bird Migration Project. Executive Summary 1987-1992. Unpublished Report, Bombay Natural History Society, Bombay, India



THE MIRANDA BANDERS, NEW ZEALAND. 1979-1992

Adrian Reigen and Stephen Davies *
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Under the leadership of Dick Veitch, the Miranda Banders made their first, modest catch of 1 Knot and 3 Bar-tailed Godwits on 29.01.79 at Miranda. the goal of the cannon-netting was to catch good samples of the main arctic migrant wader species on a regular basis in order to understand more about their overseas migration and movements within New Zealand. Though the group did have good catches, it proved to be difficult to trap birds on a regular basis. This was due partly to the birds' roosting habits. In the Auckland region they prefer open fields or large shellbanks, whereas, in other parts of the world, they favour beach settings. The last catch of Miranda Banders was on 11.07.82.

In 1986, Stephen Davies and Adrian Riegan were encouraged by the Australasian Wader Studies Group (AWSG), to once again undertake the banding of waders, so the group was re-formed. After two unsuccessful attempts, 4 Wrybills were caught at Jordan's Farm on the shore of the Kaipara Harbour, 80 km north of Auckland. Undeterred by its modest beginnings, the group persisted and on its next trip captured over 800 Knot and Pied Oystercatchers. Since then banding has continued each summer.

Several long term studies of arctic and New Zealand migrant waders are now underway. The group uses two main sites - Miranda, on the firth of Thames, and Jordan's Farm, on the Kaipara. By catching on different harbours in the Auckland region it is possible to monitor local movements of birds.

The totals captured to date are given below.

	1979-1982			1987-1992		
	New	Retrap	Total	New	Retrap	Total
Knot	893	10	903	2636	45	2681
Bar-tailed Godwit	55	0	55	509	2	511
Curlew Sandpiper	4	0	4	15	1	16
Red-necked Stint	1	0	1	2	0	2
Terek Sandpiper	0	0	0	1	0	1
Turnstone	7	0	7	7	0	7
Pacific Golden Plover	0	0	0	1	0	1
New Zealand Dotterel	12	0	12	2	0	2
Banded Dotterel	26	0	26	9	0	9
Wrybill	1620	486	2106	1313	362	1675
Pied Oystercatcher	268	0	268	396	4	400
Pied Stilt	10	0	10	0	0	0
Caspian Tern	0	0	0	3	1	4
	2896	496	3392	4894	415	5309

TOTAL 29.01.79 - 31.12.92	NEW	RETRAP	TOTAL
	7790	911	8901

FLAGGED BIRDS

Knot	189
Bar-tailed Godwit	62
Pied Oystercatcher	63

OVERSEAS TO New Zealand

16 birds from overseas, all banded in Australia, have been captured by Miranda Banders. As proof that some Knot come through Victoria on their way to New Zealand are three birds which are captured on both sides of the Tasman during the same summer.

KNOT *Calidris canutus*

050-10307	Perth, Aust	31°50'S	115°40'E	30.10.73	U	Unknown
	Okaro Bay N'land	36°30'S	174°20'E	20.03.76		Unknown
	Dead	Direction	74°	5330 km	872 days	2+ years
061-31435	Werribee, Aust	38°00'S	144°30'E	27.01.79	Juv	VWSG
	Jordans-Kaipara	36°30'S	174°20'E	02.03.80		Miranda Banders
	Caught/released	Direction	75°	2613 Km	399 days	1+ years
051-02342	Queenscliff, Aust	38°10'S	144°40'E	31.10.82	Ad V	WSG
	Jordans-Kaipara	36°30'S	174°20'E	23.02.89		Miranda Banders
	Caught/released	Direction	75°	2613 Km	2307 days	9+ years
051-16176	Queenscliff, Aust	38°10'S	144°40'E	03.06.84	Juv	VWSG
	S. Manukau Harb	37°00'S	174°50'E	19.05.85		A. Riegen
	Found shot	Direction	75°	2652 Km	350days	1+ years
051-16166	Queenscliff, Aust	38°10'S	144°40'E	03.06.84	Juv	VWSG
	Jordans-Kaipara	36°30'S	174°20'E	28.02.87		Miranda Banders
	Caught/released	Direction	75°	2613 Km	1000 days	3+ years
051-18305	Queenscliff, Aust	38°10'S	144°40'E	19.10.85	Ad	VWSG
	Jordans-Kaipara	36°30'S	174°20E	28.02.87		Miranda Banders
	Caught/released	Direction	75°	2613 Km	497 days	4+ years
051-15386	Queenscliff, Aust	38°10'S	144°40'E	08.11.86	Ad	VWSG
	Jordans-Kaipara	36°30'S	174°20'E	28.02.87		Miranda Banders
	Caught/released	Direction	75°	2613 Km	112 days	3+ years
051-15251	Queenscliff, Aust	38°10'S	144°40'E	08.11.86	Juv	VWSG
(C-45327)	Jordans-Kaipara	36°30'S	174°20'E	23.02.89		Miranda Banders
	Caught/released	Direction	75°	2613 Km	838 days	2+ years
	Miranda FoT	37°10'S	175°10'E	03.11.90		Miranda Bandrs
	Caught/released	Direction	105°	105 Km	1456 days	4+ years
051-15556	Queenscliff, Aust	38°10'S	144°40'E	01.10.88	Ad	VWSG
	Jordans-Kaipara	36°30'S	174°20'E	23.02.89		Miranda Banders
	Caught/released	Direction	75°	2613 Km		145 days 3+ years
051-56741	Moreton Bay, Aust	27°22'S	153°09'E	17.11.90	Juv	P. Driscoll
	Taramaire FoT	37°09'S	175°19'E	04.07.92		Miranda Banders
	Caught/released	Direction	123°	2342 Km	595 days	2+ years
051-42655	Yallock Crk, Aust	145°13'S	145°28'E	12.01.91	Juv	VWSG
	Taramaire FoT	37°09'S	175°19'E	04.07.92		Miranda Banders
	Caught/released	Direction	97°	2617 Km	540 days	2+ years
051-28849	Albany, Aust	35°05'S	117°53'E	16.03.91	2+	V. Smith
	Taramaire FoT	37°09'S	175°19E	04.07.92		Miranda Banders
	Caught/released	Direction	110°	5082 Km	474 days	3+ years
051-28862	Albury, Aust	35°05'S	117°53'E	16.03.91	2+	V Smith
	Taramaire FoT	37°09'S	175°19'E	04.07.92		Miranda Banders
	Caught/released	Direction	110°	5082 Km	474 days	3+ years
051-42981	Stockyard Pt, Aust	38° 22'S	145°32'E	11.08.91	2nd	VWSG
	Taramaire FoT	37°09'S	175°19'E	04.07.92		Miranda Banders
	Caught/released	Direction	96°	2610Km	328 days	3 years

051-53018	Stockyard Pt, Aust	38°22'S	145°32'E	11.08.91	2nd	VWSG
	Taramaire FoT	37°09'S	175° 19'E	04.07.92		Miranda Banders
	Caught/released	Direction	96°	2610 Km	328 days	3 years

BAR-TAILED GODWIT ***Limmosa lapponica***

081-35229	Kooragang I, Aust	32°50'S	151°50'E	04.12.88	U	J.W. Hardy
	Miranda FoT	37°10'S	175°10'E	03.11.90		Miranda Banders
	Caught/released	Direction	109°	2191 Km	815 days	2+ years

NEW ZEALAND TO OVERSEAS AND OTHER SITES IN N.Z.

14 Knot banded by Miranda Banders have been recovered since 1980 - 2 from within New Zealand, 1 from the coast of Queensland, 2 from the wetlands of southern Irian Jaya, 4 from near Shanghai in China, and 5 from Russia. In the region of the Sea of Okhotsk. The northerly recoveries were about 10,600 km from the site of banding. The fastest of the recoveries was of a bird to Chongming Island (9,450 km) within three months of banding.

KNOT ***Calidris canutus***

C-20879	Jordans-Kaipara	36°30'S	174°20'E	02.03.80	U	Miranda Banders
	Karamea, S. Island	41°20'S	172°10'E	23.10.83		R. Woodfield
	Alive/injured	Direction	204°	556 Km	1330 days	4+ years
C-29643	Jordans-Kaipara	36°30'S	174°20'E	28.02.87	Ad	Miranda Banders
	Parengarenga, N.I.	34° 30'S	172°50'E	03.11.90		R. Taafe
	Found dead	Direction	329°	260 Km	274 days	3+ years
C-17481	Jordans-Kaipara	36°30'S	174°20'E	02.03.80	U	Miranda Banders
	Tugurski, Russia	53°40'N	136°40'E	00.00.85		Unknown
	Shot	Direction	341°	10690 Km	1765+ days	5+ years
C-22312	Miranda FoT	37°10'S	175°10'E	08.06.80	Ad	C R Veitch M/B
	Kamchatskaya Russia?		01.07.81	E. Fritze		
	Shot	?		?	?	?
C-22369	Miranda FoT	37°10'S	175°10'E	08.06.80	Ad	C R Veitch M/B
	N. Sakhalin, Russia	53° 40'N	142°40'E	00.08.83		E. Fritze
	Found dead	Direction	341°	10490 Km		5+ years
C-22521	Miranda FoT	37°10'S	175°10'E	08.06.80	Ad	Miranda Banders
	Merauke, Irian Jaya	8°40'S	140°50'E	04.04.82		A. Mahusa
	Alive/well	Direction	302°	4579 Km	665 days	4+ years
C-31629	Miranda FoT	37°10'S	175°10'E	17.08.80	Ad	Miranda Banders
	Bunderberg, Aust	25°30'S	152°40'E	31.03.81		Unknown
	Unknown	Direction	295°	2491 Km	226 days	3+ years
C-31141	Jordans-Kaipara	36°30'S	174°20'E	28.02.87	Ad	Miranda Banders
	Chongming Is, China	31°40'N	121°50'E	00.05.87		China N.B.B.C.
	Caught/released	Direction	315°	9313 Km	92 days	2+ years
C-30036	Jordans-Kaipara	36°30'S	174°20'E	28.02.87	Ad	Miranda Banders
	N. Sakhalin, Russia	53° 40'N	142°40'E	24.08.90		P.S. Tomkovitch
	Shot	Direction	341°	10490 Km	908 days	5+ years
C-31115	Jordans-Kaipara	36°30'S	174°20'E	28.02.87	Ad	Miranda Banders
	Tugurski, Russia	54°00'N	173°20'E	10.07.90		P.S. Tomkovitch
	Shot	Direction	341°	10690 Km	873 days	5+ years
C-31498	Jordans-Kaipara	36°30'S	174°20'E	23.02.90	Ad	Miranda Banders
	Shanghai, China	30°40'N	121°20'E	16.04.90		Tian Hou & Sixian
	Kiled	Direction	315°	9259 Km	417 days	3+ year
C-45844	Miranda FoT	37°10'S	175°10'E	03.11.90	2-	Miranda Banders
	Yangtze R., China	30°50'N	121°50'E	14.04.91		E China W Group
	Taken for food	Direction	315°	9390 Km	162 days	2+ years

C-45972	Miranda FoT	37°10'S	175°10'E	03.11.90	?	Miranda Banders
	Wasur, Irian Jaya	8°12'S	140°20'E	14.04.92		I. Craven
	Alive/well	Direction	302°	4770 Km	530 days	3+ years
C-45638	Miranda FoT	37°10'S	175°10'E	03.11.90	Ad	Miranda Banders
	Miaogang, China	30°25'N	121°52'E	16.04.92		Waterbird & Flyway
	Taken for food	Direction	315°	9350 Km	540 days	3+ years

BAR-TAILED GODWIT *Limmosa lapponica*

Y-3844	Jordans-Kaipara	36°30'S	174°20'E	27.12.88	Ad	Miranda Banders
	Bering Is., USSR	56°00'N	167°00'E	12.05.91		P.S. Tomkovitch
	Shot for sport	Direction	356°	10320 Km	867 days	5+ years

FLAGGED BIRD SIGHTED OUTSIDE N.Z.

BAR-TAILED GODWIT *Limmosa lapponica*

Jordan's, Kaipara	22.12.91
sighted Kyushu, Japan, 28.04.92	9000 Km

BANDING ROUND-UP

Compiled by E. Belinda Dettmann, Australian Bird and Bat Banding Schemes, Australian National Parks and Wildlife Service, GPO Box 8, Canberra, ACT 2601.

The following is a selected list of recoveries found after the last date reported in *Stilt 20* and up to 28 February 1993. Permission must be sought from the banders and clearance given by the 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;
25	=	bird sick or injured;
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;
09	=	rehabilitation attempted but bird died, band status unknown;
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.

140 DOUBLE-BANDED PLOVER — CHARADRIUS BICINCTUS

041-61917 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 920307 +2 U VICTORIAN WADER STUDY GROUP
04 13 1F,AHURIRI RIVER STH ISLAND NEW ZEALAND 44d27m S 169d57mE 920921 U U TOFIELD
Distance: 2136 km Direction: 116 degs. Time elapsed: 0 yrs 6 mnths 14 days

141 LARGE SAND PLOVER — CHARADRIUS LESCHENAULTII

051-53130 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900329 1 U AUSTRALASIAN WADER STUDY GROUP
68 03 1F,XUAN THUY RESRVE RED RIVER DELTA VIET 20d10m N 106d20mE 920922 3 U VAN DOAN C/O DR LE DIEN DUC
Distance: 4589 km Direction: 337 degs. Time elapsed: 2 yrs 5 mnths 24 days

153 BAR-TAILED GODWIT — LIMOSA LAPPONICA

071-85111 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880326 1 U AUSTRALASIAN WADER STUDY GROUP
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920412 U U MUNDKAR
Distance: 5474 km Direction: 359 degs. Time elapsed: 4 yrs 0 mnths 17 days

071-85486 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880406 1 U AUSTRALASIAN WADER STUDY GROUP
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920408 U U MUNDKAR
Distance: 5474 km Direction: 359 degs. Time elapsed: 4 yrs 0 mnths 2 days

071-86417 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 900402 1 M AUSTRALASIAN WADER STUDY GROUP
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920412 U U MUNDKAR
Distance: 5612 km Direction: 0 degs. Time elapsed: 2 yrs 0 mnths 10 days

071-86578 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 900404 +2 F AUSTRALASIAN WADER STUDY GROUP
92 03 8F,ZHELING HANGZHOU BAY CHINA 30d40m N 121d10mE 920415 U U MUNDKAR
Distance: 5564 km Direction: 0 degs. Time elapsed: 2 yrs 0 mnths 11 days

071-86596 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 900404 +2 M AUSTRALASIAN WADER STUDY GROUP
68 03 7F,OCHA, SAKHALIN, RUSSIA 53d34m N 142d56mE 920000 U U MITAMURA
Distance: 8356 km Direction: 13 degs. Time elapsed: -96 yrs 0 mnths 0 days

071-87118 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900409 +2 F AUSTRALASIAN WADER STUDY GROUP
67 03 8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI 37d9m N 119d0m E 920500 U U MUNDKUR
Distance: 6141 km Direction: 357 degs. Time elapsed: -96 yrs 0 mnths 0 days

160 TEREK SANDPIPER — TRINGA TEREK

051-25352 N4,BUFFALO CREEK DARWINNT 12d20m S 130d54mE 890918 +1 U GEERING
03 13 04,TA-TU-HSI TAICHUNG TAIWAN 24d11m N 120d29mE 920418 U U TAIWAN BIRD BANDING CENTRE
Distance: 4214 km Direction: 344 degs. Time elapsed: 2 yrs 7 mnths 0 days

164 RED KNOT — CALIDRIS CANUTUS

050-48030 K1,KOORAGANG ISLAND AREA NEWCASTLENSW 32d52m S 151d46mE 881204 +1 U HARDY
03 14 0F,JORDAN'S FARM SE KAIPARA HARBOUR NZ 36d34m S 174d26mE 911222 U U RIEGEN
Distance: 2106 km Direction: 108 degs. Time elapsed: 3 yrs 0 mnths 18 days

051-26798 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 850325 +2 U AUSTRALASIAN WADER STUDY GROUP
92 03 8F,ZHELING HANGZHOU BAY CHINA 30d40m N 121d10mE 920501 U U MUNDKAR
Distance: 5426 km Direction: 359 degs. Time elapsed: 7 yrs 1 mnths 6 days

051-28849 PR,SOUTH SIDE PRINCESS ROYAL HARBOUR ALB 35d5m S 117d53mE 910316 +2 U SMITH
05 13 8F,TARAMAIRE FIRTH OF THAMES NZ 37d9m S 175d19mE 920704 U U RIEGEN
Distance: 5082 km Direction: 110 degs. Time elapsed: 1 yrs 3 mnths 18 days

051-28862 PR,SOUTH SIDE PRINCESS ROYAL HARBOUR ALB 35d5m S 117d53mE 910316 +2 U SMITH
05 13 8F,TARAMAIRE FIRTH OF THAMES NZ 37d9m S 175d19mE 920704 U U RIEGEN
Distance: 5082 km Direction: 110 degs. Time elapsed: 1 yrs 3 mnths 18 days

051-42655 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 910112 1 U VICTORIAN WADER STUDY GROUP
05 13 8F,TARAMAIRE FIRTH OF THAMES NZ 37d9m S 175d19mE 920704 U U RIEGEN
Distance: 2617 km Direction: 97 degs. Time elapsed: 1 yrs 5 mnths 22 days

051-42981 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 910811 2 U VICTORIAN WADER STUDY GROUP
05 13 8F,TARAMAIRE FIRTH OF THAMES NZ 37d9m S 175d19mE 920704 U U RIEGEN
Distance: 2610 km Direction: 96 degs. Time elapsed: 0 yrs 10 mnths 23 days

051-42994 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 910811 2 U VICTORIAN WADER STUDY GROUP
03 13 0F,JORDAN'S FARM SE KAIPARA HARBOUR NZ 36d34m S 174d26mE 911222 U U RIEGEN
Distance: 2547 km Direction: 95 degs. Time elapsed: 0 yrs 4 mnths 11 days

051-53018 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 910811 2 U VICTORIAN WADER STUDY GROUP
05 13 RF,TARAMAIRE FIRTH OF THAMES NZ 37d9m S 175d19mE 920704 U U RIEGEN
Distance: 2610 km Direction: 96 degs. Time elapsed: 0 yrs 10 mnths 23 days

051-54415 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900409 +2 U AUSTRALASIAN WADER STUDY GROUP
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920416 U U MUNDKAR
Distance: 5474 km Direction: 359 degs. Time elapsed: 2 yrs 0 mnths 7 days

051-56741 LP,LUGGAGE POINT MORETON BAYQLD 27d22m S 153d9m E 901117 1 U DRISCOLL
05 13 8F,TARAMAIRE FIRTH OF THAMES NZ 37d9m S 175d19mE 920704 U U RIEGEN
Distance: 2342 km Direction: 123 degs. Time elapsed: 1 yrs 7 mnths 17 days

165 GREAT KNOT — CALIDRIS TENUIROSTRIS

061-39475 09,6K SW OF BROOMEWA 17d58m S 122d16mE 820330 U U WA WADER STUDY GROUP
92 03 8F,ZHELING HANGZHOU BAY CHINA 30d40m N 121d10mE 920416 U U MUNDKAR
Distance: 5422 km Direction: 359 degs. Time elapsed: 10 yrs 0 mnths 17 days

061-41245 X1,ROEBUCK BAY NORTHWA 17d59m S 122d18mE 831028 2 U WA WADER STUDY GROUP
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920412 U U MUNDKAR
Distance: 5472 km Direction: 359 degs. Time elapsed: 8 yrs 5 mnths 15 days

061-41629 X4,80 MILE BEACH ANNA PLAINSWA 19d15m S 121d23mE 831031 +3 U WA WADER STUDY GROUP
68 03 7F,OCHA, SAKHALIN, RUSSIA 53d34m N 142d56mE 920000 U U MITAMURA
Distance: 8355 km Direction: 13 degs. Time elapsed: -96 yrs 0 mnths 0 days

161	CURLEW SANDPIPER	CALIDRIS FERRUGINEA			
040-71967	KI,KOORAGANG ISLAND AREA NEWCASTLENSW	32d52m S 151d46mE 901230	+1	F	VAN GESSEL
92 03	9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH	30d58m N 121d53mE 920504	U	U	MUNDKAR
Distance: 7804 km	Direction: 333 degs.	Time elapsed: 1 yrs 4 mnths 4 days			
040-95316	01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS	38d5m S 144d31mE 790310	+1	U	VICTORIAN WADER STUDY GROUP
67 03	8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI	37d9m N 119d0m E 920500	U	U	MUNDKUR
Distance: 8764 km	Direction: 340 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
041-15629	04,SWAN ISLAND QUEENSCLIFFVIC	38d15m S 144d40mE 851019	+3	U	VICTORIAN WADER STUDY GROUP
61 03	13,TANGGU NEAR TIANJIN CHINA	38d54m N 117d37mE 920500	U	U	BIRD BANDING CENTRE OF CHINA
Distance: 9010 km	Direction: 339 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
041-46154	03,SHORES OF THE 80 MILE BEACHWA	19d15m S 121d20mE 880331	+2	U	AUSTRALASIAN WADER STUDY GROUP
67 03	8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI	37d9m N 119d0m E 920500	U	U	MUNDKUR
Distance: 6275 km	Direction: 358 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
041-58325	01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS	38d5m S 144d31mE 891230	+2	U	VICTORIAN WADER STUDY GROUP
67 03	8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI	37d9m N 119d0m E 920500	U	U	MUNDKUR
Distance: 8764 km	Direction: 340 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
041-60099	05,YALLOCK CREEK NEAR KOOWEERUPVIC	38d13m S 145d28mE 910112	+2	U	VICTORIAN WADER STUDY GROUP
67 03	8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI	37d9m N 119d0m E 920500	U	U	MUNDKUR
Distance: 8807 km	Direction: 339 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
041-60308	05,YALLOCK CREEK NEAR KOOWEERUPVIC	38d13m S 145d28mE 910112	+2	U	VICTORIAN WADER STUDY GROUP
68 03	1F,TANGGU NEAR TIANJIN CHINA	38d54m N 117d36mE 920500	U	U	FAWEN
Distance: 9033 km	Direction: 338 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
041-61748	01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS	38d5m S 144d31mE 920229	+2	U	VICTORIAN WADER STUDY GROUP
03 13	03,MAI PO MARSHES HONG KONG	22d29m N 114d2m E 920414	U	U	MELVILLE
Distance: 7447 km	Direction: 329 degs.	Time elapsed: 0 yrs 1 mnths 16 days			
HB0-7767	06,SZU-TSAO, TAI NAN, TAIWAN	23d1m N 120d7m E 900505	U	U	TAIWAN BIRD BANDING CENTRE
05 13	BI,BISHOP IS MOUTH OF BRISBANE RIVEROLD	27d21m S 153d10mE 930110	U	U	DRISCOLL
Distance: 6629 km	Direction: 146 degs.	Time elapsed: 2 yrs 8 mnths 5 days			
HC0-7558	07,KANGNAN COASTAL AREA, HSIN CHU, TAIWA	24d48m N 120d54mE 920502	+2	U	TAIWAN BIRD BANDING CENTRE
05 13	08,STOCKYARD PT, LANG LANG, WESTERNPORTV	38d22m S 145d32mE 930103	U	U	VICTORIAN WADER STUDY GROUP
Distance: 7477 km	Direction: 159 degs.	Time elapsed: 0 yrs 8 mnths 1 days			

162	RED-NECKED STINT	CALIDRIS RUFICOLLIS			
032-12556	BB,BOTANY BAY NORTHNSW	33d57m S 151d11mE 840309	+1	U	SMEDLEY
67 03	8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI	37d9m N 119d0m E 920500	U	U	MUNDKUR
Distance: 8577 km	Direction: 334 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
033-66642	01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS	38d5m S 144d31mE 881231	+2	U	VICTORIAN WADER STUDY GROUP
67 03	9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH	30d58m N 121d53mE 920300	U	U	MUNDKAR
Distance: 8068 km	Direction: 339 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
033-69442	07,OFF MANNS BEACH CORNER INLETVIC	38d41m S 146d50mE 890129	1	U	VICTORIAN WADER STUDY GROUP
67 03	8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI	37d9m N 119d0m E 920500	U	U	MUNDKUR
Distance: 8899 km	Direction: 338 degs.	Time elapsed: -96 yrs 0 mnths 0 days			
HA0-4696	05,TATU RIVERMOUTH TAIWAN	24d48m N 120d54mE 890902	+3	U	TAIWAN BIRD BANDING CENTRE
05 13	05,SALTWORKS, PORT HEDLANDWA	20d15m S 118d55mE 920929	U	U	AUSTRALASIAN WADER STUDY GROUP
Distance: 5013 km	Direction: 183 degs.	Time elapsed: 3 yrs 0 mnths 27 days			

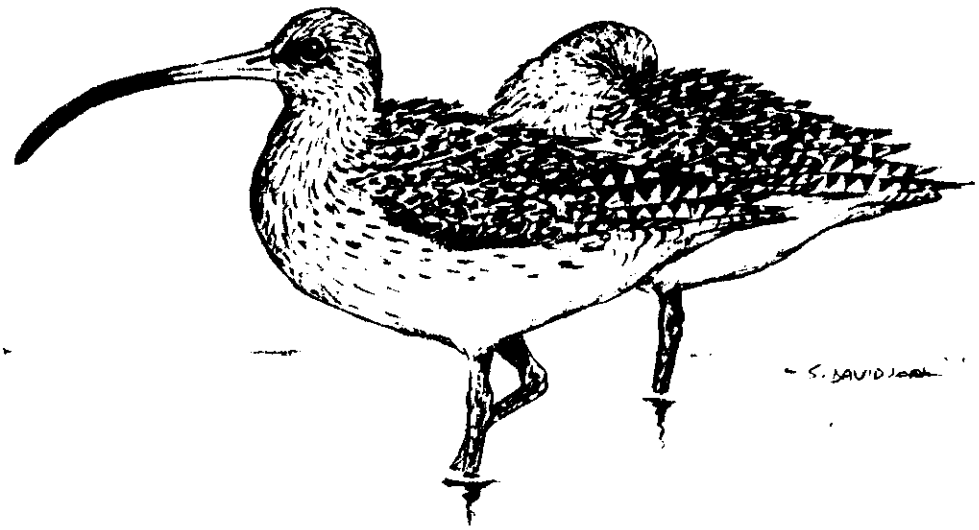
061-43122 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 881001 +3 U VICTORIAN WADER STUDY GROUP
92 03 8F,ZHELING HANGZHOU BAY CHINA 30d40m N 121d10mE 920410 U U MUNDKAR
Distance: 8045 km Direction: 339 degs. Time elapsed: 3 yrs 6 mnths 9 days

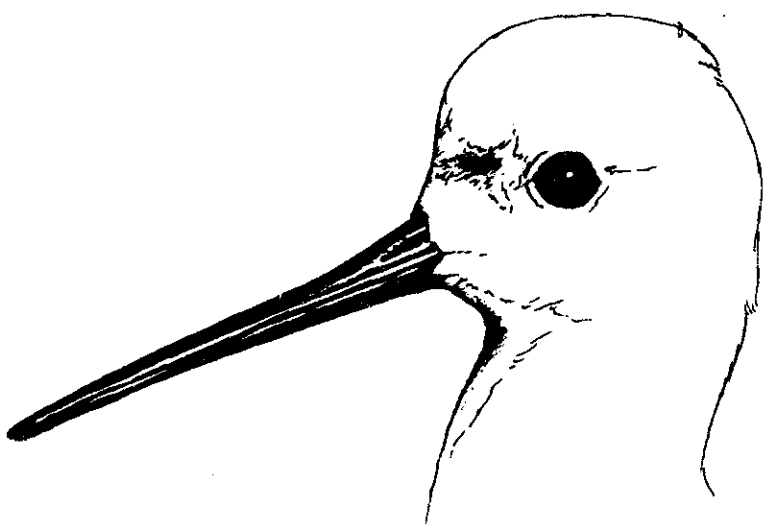
061-69864 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 880329 +2 U AUSTRALASIAN WADER STUDY GROUP
68 03 6F,VILLAGE CHUMIKAN KHABAROVSKY KRAJ RUS 54d40m N 135d15mE 910810 U U FRITZ
Distance: 8323 km Direction: 8 degs. Time elapsed: 3 yrs 4 mnths 12 days

061-69906 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880326 1 U AUSTRALASIAN WADER STUDY GROUP
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920422 U U MUNDKAR
Distance: 5474 km Direction: 359 degs. Time elapsed: 4 yrs 0 mnths 27 days

061-71415 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900331 +2 U AUSTRALASIAN WADER STUDY GROUP
92 03 8F,ZHELING HANGZHOU BAY CHINA 30d40m N 121d10mE 920412 U U MUNDKAR
Distance: 5426 km Direction: 359 degs. Time elapsed: 2 yrs 0 mnths 12 days

061-71604 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 900406 +1 U AUSTRALASIAN WADER STUDY GROUP
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920424 U U MUNDKAR
Distance: 5612 km Direction: 0 degs. Time elapsed: 2 yrs 0 mnths 18 days





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