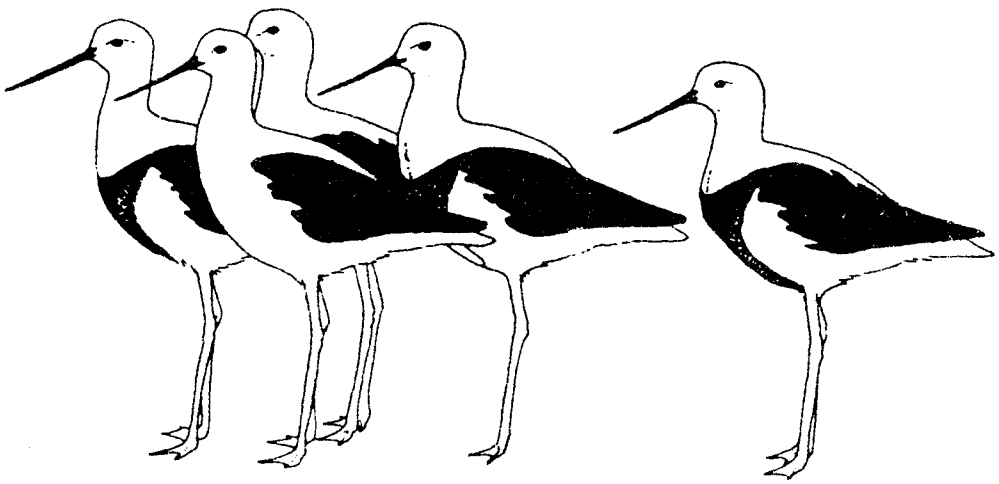
The Stilt



ISSN 0726-1888

BULLETIN OF THE AUSTRALASIAN WADER STUDIES GROUP

OF THE

ROYAL AUSTRALASIAN ORNITHOLOGISTS UNION

Number 25 **OCTOBER 1994**

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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Australasia	AUS $15
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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.
Stilt No. 25 the Index for Nos. 19-24

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

NEWS VIEWS REVIEWS NEWS VIEWS REVIEWS

EDITORIAL

This issue of *The Stilt* not only contains, as usual, material from many areas in the Australasian/East Asian flyway, but also on divers and varied wader species. These include Pied and Sooty Oystercatchers, with a major paper on the feeding techniques of the latter; Bristle-thighed Curlew, with a report of a record of the species in the Solomon Islands; and Latham's Snipe, with a paper on the breeding distribution of this bird in the Russian Far East.

It would be appreciated if prospective contributors to *The Stilt* would take note of the style used herein, particularly as it applies to lists of references (see "Advice to Contributors").

It would make my task a deal simpler if I did not have to rewrite reference lists so that they conform to the style used in *The Stilt*.

Jeff Campbell

NEW WADER GROUP FORMED

A new wader group has been established in Townsville, Queensland.

The group was formed as a result of interest generated by a series of wader workshops in the area. To be known as "The Townsville Mudskippers" the group has a study site at the mouth of the Ross River, the only known area between Mackay and Cairns to hold overwintering Red Knot.

For information on the group contact Frank Harrison, 4/6 Albert Street, Cranbrook, Queensland 4814.

A NEW AWSG PROJECT REPORT - "WADER MOVEMENTS IN AUSTRALIA"

This 135 page report, authored by Richard and Margaret Alcorn and Mike Fleming, presents the analysis of regular count data collected from 1981 to 1990, in the earlier years under the Wader Study Project of the RAOU and, latterly, by the Regular Counts Project of the AWSG (co-ordinated by Richard).

During the ten years of the study, 36804 observations were received on 56 wader species entailing 7680 hours of observation. Sites were located all over Australia and the analysis is based on 105 of them.

The report contains information on the timing of arrival and departure of all migratory wader species commonly found in southern and eastern Australia, and on the annual variation in timing. The timing and flocking of many resident species has also been determined, as has the response to drought and flood of inland species.

The report provides much fascinating information, some unexpected, and poses many interesting questions for future study. It can be obtained from:

Brenda Murlis
34 Centre Road
VERMONT VIC 3133
AUSTRALIA
for A$25 (including packaging and posting)

NATIONAL PLAN FOR SHOREBIRD CONSERVATION IN AUSTRALIA

Copies of this landmark document, published in August 1993, are still available from Brenda Murlis at a cost of A$10 to AWSG members in Australia, A$15 to overseas members and A$25 to non-members.

The 162 page report is now being widely used as an essential resource document by land managers and conservationists, here and overseas, and all members should seriously consider having their own copy.

RECENT LITERATURE

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

Blaber, S.J.M. 1993. Waders at Suva Point, Fiji, during a cyclone. Notornis 40:225-226. (33 Waduru Rd., Cornubia, Qld., 4130, Australia). *Heteroscelus incanus, Numenius phaeopus.*

Catley, G.P., R.A. Hume & the Rarities Committee. 1994. A golden plover: but which one? British Birds 87:16-21. (13 West Acridge, Barton-on-Humber, North Lincolnshire DN18 5AJ, UK). Discussion on races of golden plover identification (*Pluvialis fulva/aprica/dominica*).

Colwell, M.A. & R.J. Cooper. 1993. Estimates of coastal shorebird abundance: the importance of multiple counts. Journal of Field Ornithology 64:293-301. (Biol. Dept., Univ. North Dakota, Grand Forks, ND 58201, USA).

Connors, P.G., B.J. McCaffery & J.L. Maron. 1993. Speciation in Golden Plovers, *Pluvialis dominica* and *P.fulva*: evidence from the breeding grounds. Auk 110:9-20. (Univ. California, Davis, Bodega Mar. Lab., PO Box 247, Bodega Bay, CA 94923, USA).

Dekinga, A.& T. Piersma. 1993. Reconstructing diet composition on the basis of faeces in a mollusc-eating wader, the Knot *Calidris canutus*. Bird Study 40:144-156. (T.Piersma: NIOZ, PO Box 59, 1790 AB Den Burg, Texel, Netherlands).

Dowding, J.E. & E.S. Kennedy. 1993. Size, age structure and morphometrics of the Shore Plover population on South East Island. Notornis 40:213-222. (PO Box 36559, Northcote, Auckland, New Zealand). *Thinornis novaeseelandiae.*

Dowding, J.E. & E.C.Murphy. 1993. Distribution and breeding of the Spur-winged Plover on Stewart Island. Notornis 40:227-229. *Vanellus miles novaehollandiae.*

Johnson, O.W. 1993. The Pacific Golden Plover (*Pluvialis fulva*): discovery of the species and other historical notes. Auk 110:136141. (Dept.Biol., Montana State Univ., Bozeman, MT 59717, USA).

Lane, S.G. 1994. Feeding association between Comb-crested Jacana *Irediparra gallinacea* and Australasian Grebe *Tachybaptus novaehollandiae*. Australian Bird Watcher 15:324. (Lot 6 Fairview Road, Moonee via Coffs Harbour, NSW 2450, Australia).

Lindstrom, A. & T. Piersma. 1993. Mass changes in migrating birds: the evidence for fat and protein storage re-examined. Ibis 135:70-78. (Zool. Lab., Univ. Groningen, PO Box 14, 9750 AA Haren, The Netherlands).

Minton, C. 1994. Greenshank with Deformed Bill. Australian Bird Watcher 15:323. (165 Dalgetty Road, Beaumaris, Vic. 3193, Aust.). *Tringa nebularia* with bill 27.9 mm long.

Patterson, R.M., W.C.Wakefield & M.Wakefield. 1994. A Hudsonian Godwit *Limosa haemastica* in South-eastern Tasmania. Australian Bird Watcher 15:283-286. (Patterson. 89 Summerleas Road, Fern Tree, Tas. 7054, Australia).

Piersma, T., Goeij, P.de & I. Tulp. 1993. An evaluation of intertidal feeding habitats from a shorebird perspective: towards relevant comparisons between temperate and tropical mudflats. Netherlands Journal of Sea Research 31:503-512. (Neth. Inst. Sea Res. NIOZ, PO Box 59, 1790 AD Den Burg, Texel, Netherlands).

Piersma, T., R.Hoekstra, A. Dekinga, A. Koolhaas, P.Wolf, P. Battley & P.Wiersma. 1993. Scale and intensity of intertidal habitat use by Knots *Calidris canutus* in the Western Wadden Sea in relation to food, friends and foes. Netherlands Journal of Sea Research 31:331-357.

Piersma, T.& M. Poot. 1993. Where waders may parallel penguins: spontaneous increase in locomotor activity triggered by fat depletion in a voluntary fasting Knot. Ardea 81:1-8. *Calidris canutus.*

Poot, M.J.M.& B.A.J. Rocien. 1993. Feeding ecology of Knots at Schiermonnikoog during autumn 1990: deep Macoma force Knots' foraging effort to great heights. Den Burg: Netherlands Inst. for Sea Research (NIOZ), NIOZ Report No.1993-7. (NIOZ, P.O.Box 59, 1790 AB Den Burg, Texel, Netherlands). *Calidris canutus.*

Reed, C.E.M., R.J. Nilsson & D.P.Murray. 1993. Cross-fostering New Zealand's Black Stilt. Journal of Wildlife Management 57:608611. (Dept. Conserv., Private Bag, Twizel, New Zealand). *Himantopus novaezelandiae* and *H.himantopus.*

Rose, P. & D. Stroud. 1994. Estimating international waterfowl populations: current activity and future directions. Wader Study Group Bulletin 73:19-26. (IWRB, Slimbridge, Gloucester GL2 7BX, UK).

Tulp, I.& P.de Goeij. 1994. Evaluating wader habitats in Roebuck Bay (North-western Australia) as a springboard for northward migration in waders, with a focus on Great Knots. Emu 94:7895. (NIOZ, P.O.Box 59, 1790 AB Den Burg, Texel, Netherlands). *Calidris tenuirostris.*

Tulp, I.& Y.Verkuil. 1993. Premigratory fattening in Knots: food conditions ,feeding time and intake rates. Den Burg: Netherlands Inst. for Sea Research (NIOZ), NIOZ Report No.1993-6. (NIOZ, P.O.Box 59, 1790 AB Den Burg, Texel, Netherlands). *Calidris canutus.*

Zwarts, L. & J.H. Wanink. 1993. How the food supply harvestable by waders in the Wadden Sea depends on the variation in energy density, body weight, biomass, burying depth and behaviour of tidal-flat invertebrates. Netherlands Journal of Sea Research 31:441-476. (Rijkswaterstaat Flevoland, PO Box 600, 8200 AP Lelystad, Netherlands).

Jeff Campbell

CONSERVATION OFFICER UPDATE

I would like to inform readers that, as Conservation Officer for AWSG, I am happy for people to share their wader conservation issues with me. I am able to be contacted on:

Phone: (07) 237 1750 (work)
(07) 390 2179 (home)

Address 336 Prout Road
Burbank QLD 4156

A matter of particular interest to me is the restoration of high tide wader roost sites, as this is an issue at present in Moreton Bay, Queensland. Should anyone have ideas or know of research relating to specifications, I would appreciate their sharing this information with me.

I have set out a range of objectives for the AWSG over the coming year. This will form the conservation agenda unless other more important issues arise.

Conservation Priorities for the AWSG August, 1994

Maintenance of the East Asia/Australasia Flyway

1. Conservation Priorities

   On a Flyway-wide scale, the Asian Wetland Bureau and AWSG to prepare a paper on the critical wader sites for presentation to the Ramsar Bureau. The hope is that this will be endorsed by them and circulated to Ramsar signatories in the Flyway as a recommendation for sites to be nominated.

   To input and assist where possible the action plan for migratory waders of the East Asian-Australasian Flyway, formulation to be initiated to the Hokkaido workshop help during November 1994.

2. Conventions

   To monitor the Migratory Bird Agreements with Japan and China and to support the conservation programs conducted under these agreements.

   To encourage the Commonwealth Government to seek to develop additional multilateral or bilateral agreements within the Flyway.

Protection of habitat on a national scale

1. 1996 Ramsar Conference

   To promote and support the conference through a wetland awareness campaign.

   To seek additional funding through ADIAB for wetland conservation projects in Oceania including for delegates to attend the Ramsar conference.

2. Research

   To encourage funding by the Commonwealth Government of the national shorebird monitoring program, University research and other shorebird research programs.

3. Government Policy

   To promote the use of the "National Plan for Shorebird Conservation in Australia" when determining conservation policy.

   To encourage the listing of significant sites in the national inventory of wetlands, "A Directory of Important Wetlands in Australia" and promote the translation of this information into land use decision making.

4. Community Awareness

   To support other non-government organisations to build awareness of the public on wetland protection.

   To promote and support the Australian Wetland Alliance.

Management Planning for Ramsar sites and other Wetlands

1. Multiple use of Wetlands

   To recommend the development of land use plans which integrate the activities of all the involved authorities. In the case of a regional plan, it should have to be observed by both the state and local governments in their activities. It will need to state the objectives and parameters regarding future development and define the natural areas of critical importance. The constraints which will limit development will need to include the natural environmental values and these should be mapped. The level of information needed should be related to the scale of planning whether regional, local or a specific development proposal.

To collaborate with the Asian Wetland Bureau to create training opportunities on conservation or to share ideas about planning for wetlands.

2. Habitat conservation

To recommend that any development proposal should recognise the value of habitat for waders. It should be recognised that habitat loss is the prime cause of special endangerment, therefore the protection of habitat is a priority.

In relation to **State Government**: (using Queensland as an example):

1. Promote the action plan recommendations in the "National Plan for Shorebird Conservation in Australia" with regard to Queensland.

2. Request that the Department of Environment and Heritage (DEH), release results of the QLD wetland inventory program.

3. Raise the priority of coastal catchment management issues.

   * DEH to prepare conservation management plans for waders and to fund wader population monitoring.
   * Regional coastal management plans under the Coastal Protection Act be prepared.
   * Greater levels of funding be provided for regulation of the Moreton Bay Zoning Plan, in particular for the control of bait digging.
   * Regional planning outcomes to recognise the use of retention and detention basins, use of wetlands (natural or artificial) for storm water purification purposes.

4. Support rural catchment management programs.

   * Greater priority be given to the problem of blue-green algae.

5. DEH should prepare a policy on wetlands which integrates the activities of other government departments.

6. DEH should recognise the need for investigation into the restoration of roosts sites in Moreton Bay - processes, funding and techniques.

In relation to **Local Government**
(again using Queensland as an example):

1. The Lord Mayor's (BCC) environmental vision includes no net loss of wetlands and protection of our forested foothill and waterways vegetation. Encourage similar visions in other Local Governments but the statement should include both quality and area of wetland.

2. Promote importance of the 1996 Ramsar convention and conference and inform Local Government.

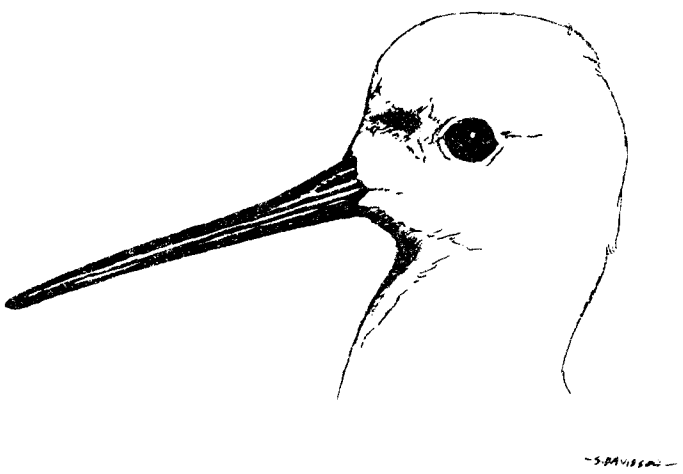
3. Urban planning to recognise multiple use of wetlands in accordance with the principles of "Wise Use". An EIS to be required where wetlands will be impacted upon and the EIS to incorporate a monitoring process.

In relation to other **Non Government Organisations:**

1. Support the QOSI to help to build awareness of the public on wetland protection.

2. Promote and support the Australian Wetland Alliance

Sandra Harding.



AUSTRALIAN WETLAND ALLIANCE

In recognition of the great extent and diversity of Australian wetlands, and the critical role that they play in water supply, flood control, fishery support, nature conservation, recreation, and sensitive and appropriate tourism, a number of Australian non-government organisations have agreed to form the **Australian Wetland Alliance** (AWA)

The AWA aims to conserve Australia's wetlands by promoting communication between interested parties and by enhancing cooperation for wetland conservation activities through Australia.

There has been, since European settlement, a significant loss of wetland especially in the southeast and southwest of Australia and there are continuing pressures on wetland resources especially in rapidly developing areas.

The Ramsar Convention on Wetlands of International Importance - the first modern global treaty on the conservation and wise use of natural resources and habitat - was adopted in Ramsar, Iran in 1971 and has provided the framework for international cooperation on wetlands between the governments of signatory countries.

In 1974 Australia was the first country to ratify the Ramsar convention, and now there are more than 80 parties to the convention. At the 1993 conference at Kushiro, Japan, over 1200 delegates from 72 countries attended. In 1996, the 25th anniversary of its adoption, the Ramsar convention's triannual conference is to be held in Australia, and the AWA congratulates the City of Brisbane on being selected as the venue.

In Australia, the Federal and State governments have established a list of over 42 sites under the Ramsar convention and have begun to develop wetland policies, programs and committees.

Many Ramsar wetlands are now at risk through a lack of proper management.

The non-government organisations forming the AWA are concerned about the potential impacts of development projects planned in, or adjacent to, or within catchments of, several wetland sites that have been listed under the Ramsar convention, for example Port Phillip Bay and the Bellarine Peninsula (Armaments complex at Point Wilson & Chemical Storage at Point Lilias), Western Port (Crib Point Oil Terminal), Creery wetlands within the Peel-Yalgorup system in WA, and the Orielton Lagoon in Tasmania.

The AWA urges the Australian and State governments, government agencies and non government organisations to place greater emphasis on wetland conservation and to allocate sufficient resources for this purpose. In particular the AWA urges each appropriate government agency.

- to work to ensure that Australia fully meets its obligations under the Ramsar convention.
- to implement in particular the "wise use" guidelines adopted at the 1993 Ramsar conference in Japan.
- to establish appropriate wetland policies and committees
- to properly manage existing Ramsar sites
- to nominate additional Ramsar sites.

The AWA urges all parties involved to ensure that the 1996 Ramsar conference to be held in Brisbane is successful. To this end the AWA recommends the establishment of an **Australian Ramsar Committee** with representatives from both government and non-government organisations to engage in promotion and support of the convention and to facilitate wetland conservation.

FOUNDATION NGO's of the AWA:

Asian Wetland Bureau-Oceania program
Australasian Wader Studies Group
Australian Littoral Society
Birdlife International (Aust.)
Conservation Council of Western Australia
Friends of the Earth (Aust.)
Royal Australasian Ornithologists Union
Shortland Wetlands Centre, NSW
Victorian Wetlands Trust

FURTHER INFORMATION - Please contact

Alistair Mailer -	Conservation Committee Royal Australasian Ornithologists Union, Melbourne Ph. (h) 03 850 5338 or c/o RAOU 03 882 2622 or fax: 03 882 2677
Roger Jaensch -	Asian Wetland Bureau (Oceania) Darwin Ph: 089 221759 or Fax: 09 220 0653
Joan Payne -	Wetlands Spokesperson Conservation Council of Western Australia Inc., Perth Ph: 09 220 0652 or Fax: 09 220 0653
Diane Tarte -	Executive Officer Australian Littoral Society, Brisbane Ph: 07 848 5235 or fax: 07 892 5814

Alistair Mailer

BIRDS & BEACHCAST SEAWEEDS AND SEAGRASS

The Bird Observers Club of Australia is registered with the Australian Nature Conservation Agency to comment on the harvesting of native species under the Wildlife Protection (Regulation of Imports & Exports) Act 1982. The BOCA has recently commented on proposals to harvest beachcast seagrass in South Australia.

During our investigation into seaweed harvesting the major inadequacy we found was the apparent lack of available information and research on bird species using beachcast seaweeds. Information found related only to the growing vegetation in its marine environment. This lack of research raises the question: **what effect does commercial and domestic harvesting of beachcast seaweeds have on habitat and birds?** Before we can answer this we need to know **which birds use this resource, how they use it and how dependent on it they are for survival.**

To help answer these questions the BOCA has initiated a project asking members to collect existing data and to encourage further observation of birds using beachcast seaweed. Initial responses show a varied degree of use by a range of birds seeking food, including waders such as Red-necked Stints, Ruddy Turnstones, Pied Oystercatchers and several Plovers - Hooded, Red-capped, and Double-banded - as well as White-faced Heron and various small bushbirds. **In addition to its food source value, birds use piles of beachcast material when roosting, to shelter behind during strong winds and as protection for nest-sites and from predators, particularly during the breeding season when there are vulnerable young birds unable to fly.**

Coastlines are dynamic and ever-changing, but to think that there is an unlimited supply of beachcast seaweed available for harvesting by the tonne, and that this would make no difference to the ecology of a particular beach, is unproven, to say the least. **Applications for commercial harvesting of beachcast material must take into account the proximity of parks and reserves, management plans, breeding sites for rare species such as Little Tern or Hooded Plover (and other species in decline locally), and the roosts and feeding-sites of waders.** What role does beached material have in providing littoral habitat for the range of known terrestrial and marine fauna? Is it significant in ameliorating wave action? Does it contribute to stability and fertility of nearby sub-strates e.g. litter layers behind the foredunes? **Will the licence fees or royalties for commercial harvesting provide for the necessary administration, research, enforcement and management works?**

To extend the information base we are asking AWSG members to participate in the program to complement our research so that we can all gain a better understanding of the importance to birds of beachcast marine vegetation. This can then be used as a basis for future submissions regarding harvesting or in other conservation matters.

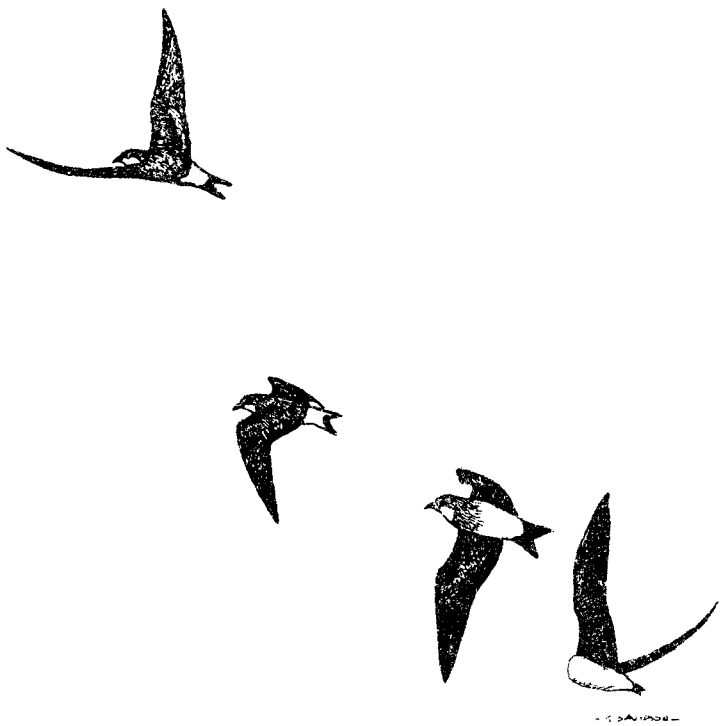
The enclosed table is a format which could be used to record bird use of beachcast seaweed.

Please photocopy or reproduce it for additional records.

In conjunction with the table, bird observers might like to keep a photographic record on a regular basis over a yearly period to illustrate the changes in seaweed occurrence and bird usage.

We encourage your participation. Should you require further information please contact

David McDonald
BOCA Conservation Officer
PO Box 185
Nunawading, Vic. 3131.



BROOME BIRD OBSERVATORY REPORT

They're back .....

Yes, the waders are arriving back to Broome in their thousands. First to be spotted were the Eastern Curlew. From our regular counts, and during tours we have been seeing groups of ten to twenty. On 14 August we saw 50 in the Bay, this climbed to 80, then 140 were seen. On 18 August, which was a bright moonlit night, we heard curlew calling as we lay in our beds. The next wader to be noted returning were Grey Plover, still with a great deal of black breeding plumage. These were seen on 19 August (total of 40), last year breeding plumaged birds were seen just two days later on August 21! Every day the beaches seem to be packed with more birds, hundreds of Great Knot and Curlew Sandpiper. The Sewerage Works suddenly erupted with Sharp-tailed Sandpipers, Marsh, Wood and one lonely Pectoral Sandpiper (spotted by sharp eyed volunteer, Mavis Russell).

We have had a good overwintering population in Roebuck Bay here to study, as last year was a moderately good breeding year. During June, we carried out our annual winter count. Luckily we had ten counters and we finished up with just under 10,000 birds in the bay. A highlight of our first course, "Wave the Waders Goodbye" were two Painted Snipe on Roebuck Plains. These were spotted by course member Jack Hunt on 10 April.

Thank you to all who participated in the North-West Wader Expedition '94. We felt privileged to be host to such a wonderful group of people and to see the Observatory being fully utilised as a research base. It was invaluable to have experts from both Australia and abroad, who were more than generous with their time, and a lot of fun too. Daily, we would drive to town to pick up another keen expeditioner from the airport or bus. They would be whisked back to the Observatory and usually straight down to the beach to join in the day's cannon netting. Those coming from the Northern Hemisphere winter found the 40 degrees taxing, especially when digging cannon holes, twinkling birds along the beach and the long stints banding during the afternoon. For them the sight of Great Knot in full breeding plumage and lots of watermelon, made up for the trying conditions. Much useful data was generated during the two months. Most importantly for the Observatory was that we both gained our banding licences, to continue fortnightly wader catches here throughout the year. We are very appreciative of the time and effort spent on training us, especially to expedition leaders, Roz Jessop and Clive Minton. The Observatory is now well set to meet its ANCA (Australian Nature Conservation Agency) grant commitment of counting and catching waders, as Peter Collins, Assistant Warden, has also gained his "A" Class licence.

The colour leg-flagging of waders is proving to be very useful. On the last AWSG cannon net in April, we caught an orange leg flagged Red-necked Stint. A few days before we had spotted two Victorian stints at Anna Plains on an inland marsh. Danny Rogers spotted a yellow leg flagged Bar-tailed Godwit near the Indigirka Delta, whilst on the "Tundra Ecology '94 expedition in Russia.. This is the furthest north recovery from Australia for this species.

The Observatory was very quiet following the expedition and we were faced with the real world of a busy tourist season ahead. We have purchased a second hand twelve seater commuter bus, to transport birdwatchers to and fro. Considering the nature of Crab Creek Road, it is coping well and also sports a new two way radio. This radio was purchased completely by "Friends of Broome" donations, for which we are very grateful.

Our first catch was very nerve-racking. Where were all those experts, those twinklers, those runners? Seventeen Black-winged Stilt managed to get in front of the net and subsequently caught. Our next few catches were small though not complete fresh air shots. We finally started to make headway with a catch of 53, predominantly Large Sand Plovers. Our next catch was perfect. We had spent hours with the camouflage, down to the last sprinkle of shellgrit and wad of spinifex in the cannon. When we reached the firing position, two hours later, a large flock of Bar-tailed Godwits were snoozing in the catching area, oblivious to the net or our presence. the tide rose, they wandered up, and we fired and caught 162 waders. 24% of the 147 godwit were juveniles (caught 16 July). All were at least halfway through their primary moult.

Good news is that soon we will have all North-West Wader catch data on computer disk at the Observatory. Mark Barter is promising us all the '88-'94 data which we will hopefully be able to squeeze on to our hard disk. This will be invaluable for us and we appreciate Mark's efforts.

We have heard tantalising rumours of a possible '96 AWSG Expedition? BBQ is already planning a warm reception for all migrants to Broome.

Jon Fallaw and Becky Hayward.

STOP PRESS

One of Pavel Tomkovich's leg-flagged Great Knot was sighted on September 9 at Roebuck Bay, near the RAOU's Broome Bird Observatory.

The bird, a female, was caught on the nest on 22 June 1994 at Pavel's study site in the Anadyr Mountains, in eastern Siberia. It had layed its first egg on June 4 and its last, of 4, on June 8. Unfortunately, the nest was predated on June 23.

The flagged bird was last seen on June 28, in a flock some 7km from the nest. It's not often that we can get such detailed information from a leg-flag sighting!

VIDEO REVIEW

An Identification Guide to the World's Calidris Sandpipers. Andy Butlers Video guides for Birdwatchers.[17.50 pounds plus 3.00 pounds postage outside UK and Europe. Available from Nature Vision,PO Box XG 55,Leeds,LS15 8XU,UK]

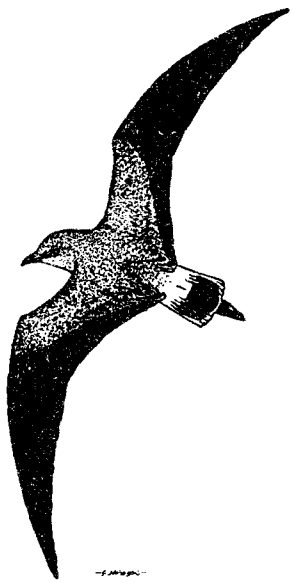
This video covers 23 species of the 25 *Calidris* waders (excluding just Surfbird and the somewhat problematical Cox's Sandpiper). For the majority of species a variety of age and season related plumages is shown, including adult breeding and non-breeding and juvenile.

Unfortunately for Australian viewers seven or eight of the 23 species illustrated on this video do not occur here (there being some doubts about previous records of Dunlin in Australia it is not possible to be definite on this figure), four are vagrants, three could be said to be rare and just eight classified as common. In this respect the video is probably of more interest to the European birdwatcher than the Australian, but nevertheless will be of some value, particularly to the twitchers amongst us.

It is unfortunate that for two of the more commonly encountered species in Australia, Great Knot and (at least in northern Australia) Broad-billed Sandpiper, the non-breeding plumage, in which the birds spend most of their time here, is not shown. In addition some species, e.g. Red Knot, are illustrated by races which do not occur here and are significantly different in some respects from those that do.

In all, the purchase of this video cannot be recommended except by the most avid Australian wader watchers. Whilst it is useful in some respects, especially for picking up the 'jizz' of the species illustrated, its shortcomings outweigh its strengths as far as Australia is concerned.

Jeff Campbell



THE 1994 NORTHWEST AUSTRALIA WADER EXPEDITION

Clive Minton* and Rosalind Jessop,
Joint Expedition Leaders
* 165 Dalgetty Road, Beaumaris, Vic 3193, Australia

Introduction

This was the fifteenth special visit to northwest Australia since 1981 to study the regions waders (and terns) by counting, banding, colour flagging, photographing and recording migration (visible and/or by radar). It was the first to cover the complete period of northern migration and was double the length of any previous expedition.

The majority of the specific objectives of this expedition was achieved. These are summarised below.

The Team

An average of 16 people (range 12-20) was in the field for 61 days (March 1 to April 30 inclusive). Seven individuals were present throughout the expedition. Participants came from Australia (18), United Kingdom (7), Canada (2), Germany (2), South Korea (2), Japan (1), New Zealand (1) and USA (1). Twelve people had been on previous n.w. Australia expeditions.

The team size was smaller than the 20-25 persons on previous major expeditions. This was partly because of logistical considerations (including lack of finance to hire vehicles to transport a larger team) but also because of the extended nature of the fieldwork programme. On occasions the lower number of experienced extractors of birds from cannon-nets and mist-nets was a limitation on activities.

The wardens of Broome Bird Observatory (BBO), Jon Fallaw and Becky Haywood, were actively involved throughout the expedition and are now fully qualified for both cannon-net and mist-net banding. This will enable them to continue wader, tern and passerine studies on an ongoing basis.

Counting

Counts were made at Roebuck Bay, Broome (Crab Creek to Dampier Creek and Bush Point/Sandy Point) and 80 Mile Beach (0-15 km south from Anna Plains Station) before migration commenced. Bush Point was also counted after migration had virtually ceased. Port Hedland Saltworks was counted in mid-April (Table 1).

Table 1 Wader and Tern Counts, N.W. Australia, February / April 1994

	Roebuck Bay, Broome				
	Crab Ck - Dampier Ck 25/2	**Bush Pt / Sandy Pt 2/3**	**Bush Pt 27/4**	**80 Mile Beach 0-15 km S 13/3**	**Port Hedland Saltworks 12/4**
WADERS					
Pied Oystercatcher	11	350	250	1	0
Sooty Oystercatcher	7	1	7	0	0
Grey Plover	124	120	10	249	0
Lesser Golden Plover	0	0	0	7	0
Mongolian Plover	42	0	0	12	*** 4
Large Sand Plover	745	5000	180	1517	0
Oriental Plover	0	0	0	10	0
Red-capped Plover	0	6	1970	10	229
Black-winged Stilt	14	2	2	16	647
Banded Stilt	0	0	0	0	9523
Red-necked Avocet	0	0	0	0	1208
Ruddy Turnstone	211	70	0	50	28
Eastern Curlew	19	2	350	36	3
Whimbrel	68	2	0	1	0
Little Curlew	0	0	0	1	0
Grey-tailed Tattler	761	15	400	196	0
Common Sandpiper	2	0	0	0	0
Greenshank	0	3	0	290	229
Marsh Sandpiper	0	0	0	20	10
Terek Sandpiper	163	90	0	490	0
Asian Dowitcher	0	0	0	0	*** 23
Black-tailed Godwit	13	8	10	10	1
Bar-tailed Godwit	12791	25000	8000	** 2991	17
Red Knot	1195	450	100	19	0
Great Knot	5780	*4000	6000	30750	3
Sharp-tailed Sandpiper	0	0	0	0	489
Red-necked Stint	51	3000	900	982	1108
Curlew Sandpiper	69	200	10	822	834
Sanderling	0	350	250	19	1
Broad-billed Sandpiper	3	0	2	0	*** 700
Unidentified	540	0	0	0	4750
TOTAL	**22609**	**38669**	**18441**	**38508**	**19870**
TERNS					
Gull-billed tern	Not	120	900	199	19
Lesser Crested Tern	Counted	130	18	1	1
Crested Tern		90	120	0	0
Caspian Tern		1	40	1	106
Little Tern		15	800	22	133
White-winged Tern		0	17	146	103
Whiskered Tern		0	20	3	234
Roseate Tern		0	0	0	1
Common Tern		20	20	0	30
TOTAL		**376**	**1935**	**372**	**627**

* Subsequently considered to be a significant underestimate (probably 8-10000 Great Knot present)

** Atypical. On previous/subsequent days usually 8-10000 Bar-tailed Godwit in this section of beach

***Significant migration occurred 10-12 April. Before this (am 10th) the following numbers were seen: 200 Mongolian Plover; 145 Asian Dowitchers and several hundred more Broad-billed Sandpiper.

Much useful information was collected. The most surprising results were:

(1) the lack of Oriental Plover at 80 Mile Beach (10) compared with the count for the same period in 1993 (14 073),

(2) an increase in Eastern Curlew at Bush Point from two on March 2 to 350 on April 27. This suggests an arrival of non breeding, overwintering, birds from elsewhere as this number far exceeds even the normal peak population in n.w.Australia,

(3) at least 145 Asian Dowitcher at Port Hedland Saltworks on April 10 before migration commenced. This is the largest number recorded there,

(4) 800 Little Tern at Bush Point on 27 April. This must be one of the largest flocks recorded in Australia.

Banding

Banding was carried out on most days except when the expedition was moving location. There were 39 cannon-net catches and 15 mist-net catches. A total of 6105 waders(and 151 terns) was caught (Table 2). These were caught at Broome/Roebuck Plains , 3646 waders (30 days); 80 Mile Beach/Anna Plains, 2141 waders (19 days); Port Hedland Saltworks, 318 waders (3 days). This included 36 species of waders (one in six of the world's species) - a record for n.w. Australia expeditions. Almost all birds caught were yellow leg-flagged.

Table 2 - Wader Banding, N.W. Australia, March/April 1994

	New	Retrap	Total
Pied Oystercatcher	35	2	37
Sooty Oystercatcher	1	0	1
Masked Lapwing	10	0	10
Grey Plover	30	1	31
Lesser Golden Plover	1	0	1
Red-kneed Dotterel	39	6	45
Mongolian Plover	53	12	65
Large Sand Plover	642	80	722
Oriental Plover	2	0	2
Red-capped Plover	138	12	150
Black-fronted Plover	16	1	17
Black-winged Stilt	48	0	48
Red-necked Avocet	29	0	29
Ruddy Turnstone	170	51	221
Eastern Curlew	10	1	11
Whimbrel	13	0	13
Wood Sandpiper	1	0	1
Grey-tailed Tattler	342	78	420
Greenshank	19	0	19
Redshank	1	0	1
Marsh Sandpiper	17	0	17
Terek Sandpiper	433	34	467
Pintail Snipe	1	0	1
Asian Dowitcher	10	3	13
Black-tailed Godwit	12	0	12
Bar-tailed Godwit	1134	62	1196
Red Knot	173	17	190
Great Knot	921	48	969
Sharp-tailed Sandpiper	178	2	180
Red-necked Stint	447	58	505
Long-toed Stint	11	1	12
Curlew Sandpiper	517	69	586
Sanderling	4	0	4
Broad-billed Sandpiper	93	9	102
Oriental Pratincole	3	0	3
Australian Pratincole	4	0	4
TOTAL	**5558**	**547**	**6105**

Most-caught species were Bar-tailed Godwit (1196), Great Knot (969) and Large Sand Plover (722). Samples of more than 100 birds were caught for 12 species. Pin-tailed Snipe (1) and Australian Pratincole (4) were the first banded by n.w. Australia expeditions.

A particularly valuable aspect was that samples were obtained at weekly intervals over the whole nine week period for most of the main study species. This enabled the pattern and rate of weight gain before and during migration to be determined. Rates of weight increase of up to 3% per day were recorded though 1-2% per day was more typical. Estimated departure weights were 40-80% above fat free weight, depending on species.

The proportion of juvenile birds in the population of the main species was measured before migration commenced. In most species the figure was 10-15%, but in Large Sand Plover it was twice this level. There was also an indication that the proportion of immature Bar-tailed Godwit at 80 Mile Beach was twice the level of those on the Crab Creek to Dampier Creek beaches at Broome. Overall 1993 would appear to have been a moderately good year for breeding success of waders in the northern hemisphere.

Nearly 10% of the birds caught were retraps (or controls)(547). Some of these dated back to the early 1980's but many were recaptures of birds banded earlier on the expedition and thus provided much useful data on weight/moult changes.

Two Curlew Sandpipers from Hong Kong were caught (Broome and Port Hedland Saltworks) as was an orange leg-flagged Red-necked Stint from Victoria (Broome). In addition two orange leg-flagged Red-necked Stint (ephemeral wetland, Anna Plains) and a Curlew Sandpiper (Port Hedland Saltworks) were seen providing the firmest evidence so far that some waders from south-east Australia return via n.w. Australia in mid/late April.

Disappointing aspects of the expedition were the inability to catch worthwhile samples of Eastern Curlew (no concentrations on Broome beaches prior to migration), Little Curlew (few birds seen and no concentration on pools on Roebuck Plains or Anna Plains) and Oriental Plover/Oriental Pratincole (only moderate numbers with no big concentrations on 80 Mile Beach). It appears that a 'good wet' in January/February 1994 allowed birds to disperse widely over northern (and central?) Australia.

Visible Migration

Watches for birds departing on northward migration were made throughout the period at Broome and whenever an opportunity arose at 80 Mile Beach and Port Hedland Saltworks. Observations at Broome were made by BBO staff (particularly Volunteer Warden, Mary Vaughan) when the expedition was away at other locations.

Overall 19 326 birds were seen departing in 285 flocks from Broome, 12 674 in 122 flocks from 80 Mile Beach and 207 in eight flocks from Port Hedland Saltworks. The peak of departures from Broome occurred in the first two weeks of April. The main departure of Great Knot however occurred on March 21-24, many Large Sand Plover left in the last week of March, whilst Grey-tailed Tattler, Terek Sandpiper and Red-necked Stint migration continued almost until the end of April.

The expedition was successful in observing, for the first time, birds departing from 80 Mile Beach and Port Hedland Saltworks even though the geography is less suitable than Roebuck Bay for concentrating flight lines. The first flock seen to depart from 80 Mile Beach was a massive 1 600 Great Knot on March 24. 114 Asian Dowitchers were seen leaving Port Hedland Saltworks in three flocks on April 10 and 12 as were several parties of Broad-billed Sandpipers.

It is particularly exciting that following the large migration of Great Knot on March 21-24, three birds with yellow leg-flags were seen in Hong Kong on March 26-27. These birds would normally have been expected to reach Shanghai in China in the one flight (5 500 km) but were presumed to have been forced to land prematurely in Hong Kong by an unseasonal north-east monsoon. In addition two yellow leg-

flagged Bar-tailed Godwit were seen in South Korea on April 26 (our first in that country).

Knowledge of when each species was leaving enabled catches of several species to be timed to coincide so that departure weights could be estimated. On three occasions the team was actually sitting on the beach processing a good sample of a species as flocks of that same species (once Red Knot, once Bar-tailed Godwit and once Grey-tailed Tattler) were taking off and migrating.

A separate paper covering observations of migratory departures from n.w. Australia in 1993 and 1994 is now in preparation.

The Future

Although there has been a huge generation of information since wader studies commenced in n.w. Australia 13 years ago there is still a vast amount further to be learned. In particular it is the only place in Australia where many of the species of waders being studied occur.

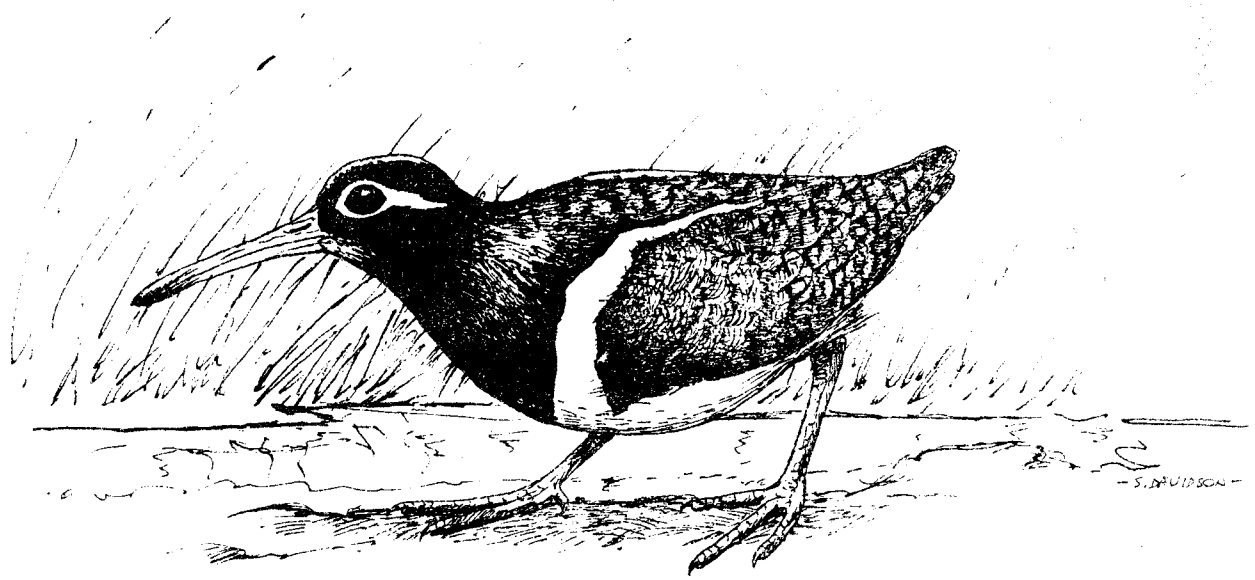
It is intended that monitoring by counting (twice per annum) and banding (twice per month) be continued by the BBO wardens under the grant/contract from the Australian Nature Conservation Agency which is now in its second year of operation. There will always be a need however for this to be supplemented by periodic visits of larger teams, during which much larger goals can be set and the important 80 Mile Beach/Port Hedland Saltworks habitats adequately covered.

Recently generated data will have to be analysed before scientific priorities can be assessed. For this and other logistical and financial reasons a major expedition in 1995 seems unlikely at this stage. The most probable time for the next major expedition to n.w. Australia therefore seems to be March/April 1996. Aims could well be to fill in gaps in this years data and in particular to target the banding of the less frequently caught species (e.g. Black-tailed Godwit, Whimbrel, Greenshank as well as the ever sought Little Curlew, Oriental Plover, Oriental Pratincole and Eastern Curlew).

Table 3 - Banding, Terns and Other Species, N.W. Australia, March/April 1994

Species	New	Retrap	Total
TERNS			
Whiskered Tern	57	0	57
Gull-billed Tern	37	2	39
Common Tern	7	0	7
White-winged Tern	4	0	4
Crested Tern	8	0	8
Little Tern	35	0	35
Roseate Tern	1	0	1
TOTAL	**149**	**2**	**151**
OTHER SPECIES			
Glossy Ibis	1	0	1
Grey Teal	10	0	10
Pink-eared Duck	1	0	1
Hardhead	1	0	1
Baillon's Crake	1	0	1
Silver Gull	1	0	1
TOTAL	**15**	**0**	**15**

In addition 764 passerines of 44 species were mist-netted at Broome and Anna Plains (BBO bands).



AUSTRALIAN SECTION

POPULATION MONITORING COUNTS

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The last edition was to have included updated tables from Summer 91 onwards as further data had been added since they were last printed. Fortunately, since still further data has been provided, these did not appear. Since there is little likelihood of any further updates, these back tables have now been included. My thanks especially to Peter Driscoll and Bob Swindley for their efforts in filling in some of the gaps. The Summer 1994 Count was completed around the weekend of 5 & 6 February. A total of 116 count sheets were supplied for 21 sites. Analysis of the data is complicated by the irregularity of counting at some sites and by the recent addition of Broome and Eighty Mile Beach. The coverage of Moreton Bay has also increased considerably in recent counts. Consistency of counting is vital to us establishing trends and hopefully we can establish that across all 25 sites in the future.

In examining the 94 Summer data there were no particular figures that stood out except possibly the low count for Lesser Golden Plover. Further investigation showed a definite downward trend over the last eight years. The table and chart below show summer count data from 1986 for the 14 sites which have been counted regularly and have recorded Lesser Golden Plovers. The sites included are -

NSW : Clarence, Parramatta and Botany Bay

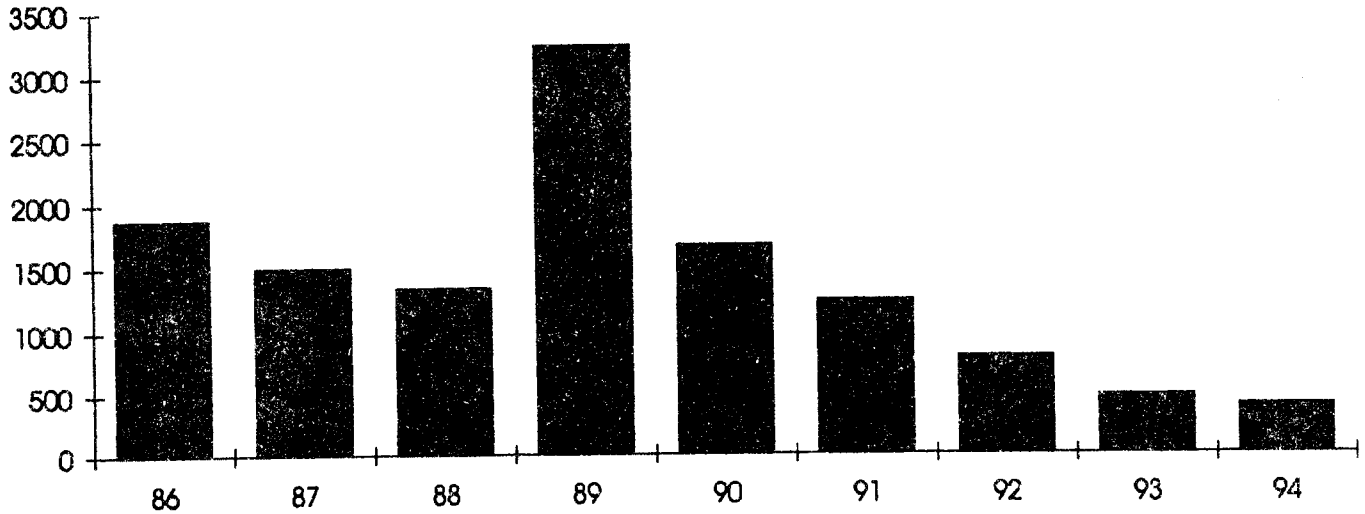
Vic : Corner Inlet, Westernport, Altona, Werribee/Avalon, Bellarine Peninsula/Mud Island, SE Coast

Qld : Cairns, Mackay, Moreton Bay

Tas : East Derwent/Pittwater, Cape Portland

Years 89 and 90 have broken the trend because of abnormally high counts in Moreton Bay. The trend appears to be general rather than confined to particular sites. Apart from 89 and 90 Moreton Bay fits the pattern.

Summer Golden Plover Counts 1986 to 1994



Summer Golden Plover Counts 1986 to 1994

Year	Clar	Parr	BotB	Cor In	Wport	Alt	Werr	Bell	Cns	Mky	MorBy	SECst	EDPW	CpPt	Total Sites	Total Birds
86	191	54	73	250	44	1	64	248	5	4	287	319	175	151	14	1866
87	330		131	71	89	178	71	112		33	187	11	168	103	12	1484
88	149	10	102		39	5	64	128	3	18	151	113	319	223	13	1324
89	118	25	74	76	162	10	28	171	1	87	2163	28	93	184	14	3220
90	17	36	66		92		6	131	27	67	765	139	212	96	12	1654
91	3	60	112	49	136	114	22	107			166	128	206	120	12	1223
92	6	58	122	55	66		23	42		9	96	131	97	75	12	780
93		31		30	61		11	50	3	8	82	58	51	86	11	471
94	2	36	33		17		4	38		54	21	38	69	82	11	394

Table 1. Result of the Summer 1991 Wader Count	NSW					VIC						QLD			SA			WA		TAS			NT	
	Clar	Hunter	Parr	BotBay	Shoal	Cor/Sh	Wport	EPPBy	Altona	WerrA	BellMI	Cns	Mky	MoreBy	WestEP	SECst	StVnc	Albany	Swan	EDPitt	MarBy	CpPort	Dwin	TOTAL
Bush Thick-knee																								
Beach Thick-knee																								
Painted Snipe													4											
Pied Oystercatcher	11			17		874	157		13	17	44		47	2		5				626	77	44		1,934
Sooty Oystercatcher				7		132	1		1		2					3				14	2	28		190
Masked Lapwing	3		18			55	386	190	67	341	488	24	19	69		402				521		74		2,657
Banded Lapwing																								0
Grey Plover						460					355													815
Lesser Golden Plover	3		60	112		49	136		114	22	107			166		128				206		120		1,223
Red-kneed Dotterel								16	8	86	7													117
Hooded Plover						9					2													47
Mongolian Plover	23			21		60	3				3	105	372	82						4	16	16		669
Double-banded Plover				7			9			1				1										44
Large Sand Plover				2		21	1					46								1	1	24		70
Oriental Plover																								0
Red-capped Plover	3			39		13	99		70	32	281		10	51		47				132	2	145		924
Black-fronted Plover			2					13	3	27	17													62
Black-winged Stilt			9					221	226	490	491		5	4										1,446
Banded Stilt											88													88
Red-necked Avocet										400	106													506
Ruddy Turnstone				51		160	108			8	76		52	40		432				2		62		991
Eastern Curlew	128			228		1,252	964			4	119	5	86	222		2				106	3	2		3,121
Whimbrel	93			1			30					6	34	195		1				1		1		352
Little Curlew																								0
Wood Sandpiper										2														2
Grey-tailed Tattler	2			4		6	29				21	2	5	12		5						4		90
Wandering Tattler																								0
Tattler sp.													17	10										27
Common Sandpiper							2	3	1	3	2													11
Greenshank	1					468	281	6	36	75	219	16	9	54		17				64				1,246
Marsh Sandpiper								5	10	27	57			10										109
Terek Sandpiper	4			3								5	2	131										145
Latham's Snipe								8	2		118													128
Snipe sp.																								0
Black-tailed Godwit	230												15											245
Bar-tailed Godwit	338		189	600		10,693	557				1,001	130	1,012	664						83		1		15,268
Red Knot	38					5,750	10				600									3				6,401
Great Knot	92			1		50					400	103	428	146										1,220
Sharp-tailed Sandpiper			20	9		60	260	113	1,233	3,459	2,554			47		76				16		2		7,849
Pectoral Sandpiper			1																	2				3
Red-necked Stint	7		2	143		9,270	4,829	1	1,949	4,353	5,330	249	284	20		1,627				1,263	100	844		30,271
Long-toed Stint																								0
Curlew Sandpiper			83	63		2,620	3,284		1,506	3,763	1,377	30	4	92		205				455		13		13,495
Sanderling						280																		280
Ruff/Reeve										1														1
Broad-billed Sandpiper												6												6
Oriental Pratincole																								0
Australian Pratincole																								0
Unidentified small											100													100
Unidentified medium																								0
Unidentified large	6																							6
Stilt Sandpiper										1														1
Total Number	972	0	384	1,308	0	32,282	11,146	576	5,239	13,112	13,965	727	2,405	2,018	0	2,950	0	0	0	3,499	201	1,380	0	92,164
Total Species	16	0	9	17	0	21	19	10	15	20	27	13	18	20	0	13	0	0	0	17	7	15	0	

Table 2 Result of the Winter 1991 Wader Count	NSW					VIC						QLD			SA				WA		TAS			NT	
	Clar	Hunter	Parr	BotBay	Shoal	Cor/Sh	Wport	EPPBy	Altona	WerrA	BellMl	Cns	Mky	MoreBy	WestEP	SECst	StVnc	Albany	Swan	EDPitt	MarBy	CpPort	Dwin	TOTAL
Bush Thick-knee																								
Beach Thick-knee	3																							
Painted Snipe																								
Pied Oystercatcher	16					868	255		3	39	59	1		20		7				428	37	30		1,763
Sooty Oystercatcher	7					141	5		3							4				42	1	35	2	240
Masked Lapwing	4		25			9	257	13	41	20	253	19		13		26				172		49	5	806
Banded Lapwing																								0
Grey Plover						22					15													37
Lesser Golden Plover														15										15
Red-kneed Dotterel			6					1		40	7													54
Hooded Plover						16					13					10					25	35		99
Mongolian Plover	2					8																1		11
Double-banded Plover						402	923		23	246	486					41				338	36	184		2,679
Large Sand Plover						4																		4
Oriental Plover																								0
Red-capped Plover	5					22	87		225	63	471			47		36				170	9	126		1,261
Black-fronted Plover			16					6		74	13									2		1		112
Black-winged Stilt	348		34				5	1	325	199	318	7		186										1,423
Banded Stilt									1		1													2
Red-necked Avocet	4						7		141	65	117			15										349
Ruddy Turnstone						79	24				20			3		22						43		191
Eastern Curlew	26					100	149				10	8		277						2				572
Whimbrel	25					1	2				2	13		110										153
Little Curlew																								0
Wood Sandpiper																								0
Grey-tailed Tattler						4					1	26		111								2		144
Wandering Tattler																								0
Tattler sp.																								0
Common Sandpiper																							1	1
Greenshank							52		5	20	39			10						1				127
Marsh Sandpiper									2		2													4
Terek Sandpiper							1							21									2	24
Latham's Snipe																								0
Snipe sp.																								0
Black-tailed Godwit																								0
Bar-tailed Godwit	293		31			1,535	158				82	82		596						33		3		2,813
Red Knot	25					3,101	50							4										3,180
Great Knot	47											35		16									2	100
Sharp-tailed Sandpiper											1													1
Pectoral Sandpiper																								0
Red-necked Stint	6					564	2,195		311	414	631	70		15		130				136		57		4,529
Long-toed Stint																								0
Curlew Sandpiper	3					30	572		57	573	115			42		20				5		4		1,421
Sanderling						1																		1
Ruff/Reeve																								0
Broad-billed Sandpiper																								0
Oriental Pratincole																								0
Australian Pratincole																								0
Unidentified small																								0
Unidentified medium																								0
Unidentified large																								0
Stilt Sandpiper																								0
Total Number	814	0	112	0	0	6,907	4,742	21	1,137	1,753	2,656	261	0	1,501	0	296	0	0	0	1,329	108	570	12	22,219
Total Species	15	0	5	0	0	18	16	4	12	11	21	9	0	17	0	9	0	0	0	11	5	13	5	171

Table 3 Result of the Summer 1992 Wader Count	NSW					VIC						QLD			SA			WA		TAS			NT	
	Clar	Hunter	Parr	BotBay	Shoal	Cor/Sh	Wport	EPPBy	Altona	WerrA	BellMI	Cns	Mky	MoreBy	WestEP	SECst	StVnc	Albany	Swan	EDPitt	MarBy	CpPort	Dwin	TOTAL
Bush Thick-knee																								
Beach Thick-knee	2																						1	
Painted Snipe																								
Pied Oystercatcher	5			23	2	742	280			94	57	2	94	41		10				554	117	30		2,051
Sooty Oystercatcher	1				16	123	4				3					3				20		31		201
Masked Lapwing	2	15	14	2	43	26	293	234	211	162	399	24	2	19		403				592	22	6		2,469
Banded Lapwing																								0
Grey Plover						1,070					58		2			2				3		2		1,137
Lesser Golden Plover	6	148	58	122	170	55	66			23	42		9	96		131				97		75		1,098
Red-kneed Dotterel								41	2	121	10													174
Hooded Plover						2	2				7									10	28	10		59
Mongolian Plover	90	42		38	50	243	6				18	54	631	25								1	25	1,223
Double-banded Plover				2	32		85	3	2		6			3							1	13		147
Large Sand Plover						13	2					12		4									25	56
Oriental Plover																								0
Red-capped Plover	9			47	60	5	147	17	39	81	364		7	4		53				79	33	101		1,046
Black-fronted Plover		2	4	8			4	14		10	7													49
Black-winged Stilt		70		61				287	178	308	389		9	4										1,306
Banded Stilt										1	730													731
Red-necked Avocet		190						14	20	379	390													993
Ruddy Turnstone	2	5		100	1	160	91			9	133		11	21		603						80	7	1,223
Eastern Curlew	16	58		129	30	1,175	892			11	27	2	157	299		4				118		2		2,920
Whimbrel	21	4		40	2	29	40						92	182		1				3			6	420
Little Curlew																								0
Wood Sandpiper								8		3														11
Grey-tailed Tattler	1	12		81			28					7		151		10						4	11	305
Wandering Tattler																								0
Tattler sp.													5	27										32
Common Sandpiper							2	2		1	2			5		1							2	15
Greenshank		58		2	12	272	184	4	35	125	519		6	37		29				81		1	1	1,366
Marsh Sandpiper		2						26	66	28	61			6										189
Terek Sandpiper				3		4	1					9	8							1			4	30
Latham's Snipe								7			78													85
Snipe sp.																								0
Black-tailed Godwit		52								2			12	6										72
Bar-tailed Godwit	240	970	259	746	432	11,380	505			2	284	45	524	1,780		2				104	1		50	17,324
Red Knot	9	5		79		6,100	264			131	735			63						22		12	2	7,422
Great Knot				2		490					101	94	341	253										1,281
Sharp-tailed Sandpiper			9	91		100	290	670	1,296	3,078	2,165	2	4	7		112				69		51	10	7,954
Pectoral Sandpiper																				2				2
Red-necked Stint	74		21	101	250	11,110	8,029	4	2,422	5,429	6,705	56	105	97		1,113				1,767	386	1,899	2	39,570
Long-toed Stint																								0
Curlew Sandpiper	1	450	47	180		10,540	4,390	37	2,204	6,975	3,620	33	6	524		351				1,162		683		31,205
Sanderling				1		300					1					739								1,041
Ruff/Reeve																				2				2
Broad-billed Sandpiper												3												3
Oriental Pratincole																								0
Australian Pratincole																								0
Unidentified small						300				828	200													1,328
Unidentified medium																								0
Unidentified large						150																		150
Little Stint																				1				1
Hudsonian Godwit																				1				
Total Number	479	2,083	412	1,858	1,100	44,389	15,605	1,368	6,475	17,801	17,111	343	2,027	3,654	0	3,567	0	0	0	4,686	588	3,001	146	126,693
Total Species	16	16	7	21	13	23	23	16	12	22	29	13	19	23	0	17	0	0	0	18	7	18	0	313

Table 4 Result of the Winter 1992 Wader Count	NSW					VIC						QLD			SA			WA		TAS			NT	
	Clar	Hunter	Parr	BotBay	Shoal	Cor/Sh	Wport	EPPBy	Altona	WerrA	BellMI	Cns	Mky	MoreBy	WestEP	SECst	StVnc	Albany	Swan	EDPitt	MarBy	CpPort	Dwin	TOTAL
Bush Thick-knee																								0
Beach Thick-knee	2																							2
Painted Snipe																								0
Pied Oystercatcher	9			21	2		318		17	51	52		4	197		7				630	69	24		1,401
Sooty Oystercatcher				4	6		5				1			1		6				48	2	34		107
Masked Lapwing	3	8	10	9	126		108	18	27	185	277	39		2		21				344	4	24		1,205
Banded Lapwing									2		4													6
Grey Plover							4			4	14		10	20						3				55
Lesser Golden Plover			6								1	15	20	24						11		1		72
Red-kneed Dotterel								18	17	135	74			36										286
Hooded Plover											5													33
Mongolian Plover											17		60	363						2		26		449
Double-banded Plover	1			126	224		550		632	275	481			384		41						9		3,453
Large Sand Plover													120	1						340	49	350		121
Oriental Plover																								0
Red-capped Plover	14			39	81		126		125	108	411	1		237		36				276	25	94		1,573
Black-fronted Plover			9					87		17	19			4						1		2		139
Black-winged Stilt		105	27	5				216	137	257	226	12		497										1,482
Banded Stilt																								0
Red-necked Avocet		480					120	52	363	779	376			265										2,435
Ruddy Turnstone	3			15	2		35			6	75			60		228								547
Eastern Curlew	34	65		43	10		121				2	8	20	310								123		613
Whimbrel	12	2		24	2		2				6	5	10	212		2				1				278
Little Curlew																								0
Wood Sandpiper											4		20	968										0
Grey-tailed Tattler	17	1		16	6																	2		1,034
Wandering Tattler														35										0
Tattler sp.																								35
Common Sandpiper		8			1		7	1	7	31	110		6	29										0
Greenshank									3		14			10						9	1			210
Marsh Sandpiper													10	21										27
Terek Sandpiper																								31
Latham's Snipe	10	5									1	4		181										0
Snipe sp.	228	170	69	74	162		121				83	38	20	1,174										0
Black-tailed Godwit	9			1			581			2	471			4						29				201
Bar-tailed Godwit	98			3							2	44	1	254						20				2,170
Red Knot										5	9	7		20										1,086
Great Knot	44			68	32		3,101	2	477	982	981		30	2,290		42				416		191		402
Sharp-tailed Sandpiper																								41
Pectoral Sandpiper	16	1		6			2,241	10	352	774	426	18	10	1,882		7				23		79		0
Red-necked Stint																2								8,656
Long-toed Stint										1														0
Curlew Sandpiper														1										5,845
Sanderling																								2
Ruff/Reeve																								0
Broad-billed Sandpiper																								2
Oriental Pratincole										100														0
Australian Pratincole											25													0
Unidentified small																								100
Unidentified medium																								25
Unidentified large																								0
Spotted Redshank																								0
Total Number	500	845	121	454	654	0	7,440	404	2,159	3,712	4,167	191	341	9,482	0	392	0	0	0	2,153	150	959	0	34,124
Total Species	16	10	5	15	12	0	15	8	12	17	29	12	14	29	0	10	0	0	0	16	7	13	0	

Table 5 Result of the Summer 1993 Wader Count	NSW					VIC						QLD			SA			WA		TAS					NT	
	Clar	Hunter	Parr	BotBay	Shoal	Cor/Sh	Wport	EPPBy	Altona	WerrA	BeliMI	Cns	Mky	MoreBy	WestEP	SECst	StVnc	Albany	Swan	EDPitt	MarBy	CpPort	Broome	80 Mile	Dwin	TOTAL
Bush Thick-knee																										
Beach Thick-knee																										
Painted Snipe																										
Pied Oystercatcher	11					753	152			58	42	3	174	548		11		8	38	435	114	34	13	9		2,403
Sooty Oystercatcher					18	160	2				1					2				2	1	23	18			227
Masked Lapwing	6		16		26	17	373	232	34	237	384	6	6	31		131				460	21	49				2,029
Banded Lapwing																										0
Grey Plover						705	1				43			191				82	98	2			128	14		1,264
Lesser Golden Plover			31		103	30	61			11	50	3	8	82		58				51		86	3			577
Red-kneed Dotterel								3																		3
Hooded Plover						3														7	22					32
Mongolian Plover					11	100	18			4	37	75	120	1,392									23	3		1,783
Double-banded Plover					3	3	5													1						12
Large Sand Plover						30						42		300				45					2,437	1,842		4,696
Oriental Plover																							54	14,073		14,127
Red-capped Plover					10	25	55	6	42	37	233		4	107		51		6	103	65	34	87		55		920
Black-fronted Plover			4					31		3	7											1				51
Black-winged Stilt	18		4					128	209	109	134			132					41							775
Banded Stilt														33					3							0
Red-necked Avocet						163	65			4	62		14	152		873		3				33	538	134		36
Ruddy Turnstone					76	1,544	1,282		1	11	13	2	108	2,180		2		1		117	2	2	100	47		2,041
Eastern Curlew	131				1	50	28					3	43	315		2		1		4			199	7		5,619
Whimbrel	89																							385		742
Little Curlew										3																385
Wood Sandpiper						1	14			3		10		1,324		5				3		5	2,852	598		3
Grey-tailed Tattler	13																									4,828
Wandering Tattler																		14								0
Tattler sp.																		4								14
Common Sandpiper							2			1	1															8
Greenshank	11					391	137	1	65	80	453	2	14	70		5		111	24	67				5		1,436
Marsh Sandpiper	10							1	53	34				10												108
Terek Sandpiper	10					1	1					12	6	11									422	795		1,258
Latham's Snipe	1		1						1	1	19															23
Snipe sp.																										0
Black-tailed Godwit	258					1					2			239									1			501
Bar-tailed Godwit	396		310		564	9,190	479			1	307	49	530	11,464				65		45			15,971	8,871		48,242
Red Knot	50					3,950	35				615			5				395					4,581			9,631
Great Knot	150					110					102	51	517	1,608				450	79				10,599	3,889		17,555
Sharp-tailed Sandpiper	21		120			60	105	73	339	1,281	2,532		3	195		1,733		7				33				6,502
Pectoral Sandpiper										2																2
Red-necked Stint					20	9,319	8,598		6,354	4,841	5,902	180	42	687		1,017		1,390	129	1,163	134	552	200	696		41,214
Long-toed Stint																										0
Curlew Sandpiper			225			2,531	3,776		4,292	1,376	1,122	15		2,934		131		65		640		37	21	115		17,280
Sanderling						120										805								2		927
Ruff/Reeve																										0
Broad-billed Sandpiper																										0
Oriental Pratincole																								7		7
Australian Pratincole																										0
Unidentified small											571															571
Unidentified medium																			15				2,000	1,232		3,247
Unidentified large																										0
Asiatic Dowitcher																							1			1
Total Number	1,175	0	711	0	832	29,257	15,189	475	11,390	8,102	12,632	453	1,589	24,010	0	4,626	0	2,647	530	3,062	328	942	40,161	32,769	0	191,080
Total Species	15	0	10	0	10	24	20	8	10	21	22	18	14	23	0	14	0	16	9	15	7	12	20	21	0	309

Table 6 Result of the Winter 1993 Wader Count	NSW					VIC						QLD			SA			WA		TAS					NT		
	Clar	Hunter	Parr	BotBay	Shoal	Cor/Sh	Wport	EPPBy	Altona	WerrA	BellMi	Cns	Mky	MoreBy	WestEP	SECst	StVnc	Albany	Swan	EDPitt	MarBy	CpPort	Broome	80 Mile	Dwin	TOTAL
Bush Thick-knee												2	1													0
Beach Thick-knee	2																									5
Painted Snipe																										0
Pied Oystercatcher	13			4		860	227		17	40	42	2	40	322		3				522	149		30			2271
Sooty Oystercatcher				1		237	4				1					2				40	8					293
Masked Lapwing	8		11			43	71	56	48	96	164	25	7	16		46				443	11					1045
Banded Lapwing																										0
Grey Plover						14					3												4			21
Lesser Golden Plover												5														5
Red-kneed Dotterel			9					4		263	97															373
Hooded Plover						7					6					2				12	18					45
Mongolian Plover											4	14		34									2	70		124
Double-banded Plover	17			37		307	558		325	211	545			97		29				358	65					2549
Large Sand Plover																								621		621
Oriental Plover																										0
Red-capped Plover				10		91	96	6	184	100	553	2	56	101		15		2		251	76			101		1634
Black-fronted Plover								120		65	26			2				6			1					220
Black-winged Stilt	15		20	57				151	137	350	351	2	2	434				49					112			1680
Banded Stilt								1		53	230															284
Red-necked Avocet	77						250	48	209	575	415			146												1720
Ruddy Turnstone				4							8	1		18						7			58	43		132
Eastern Curlew	89			64		112	186				20	20	52	485									71	28		1134
Whimbrel	19											10	29	388									109	35		590
Little Curlew																										0
Wood Sandpiper																										0
Grey-tailed Tattler	8											4		473									259			744
Wandering Tattler																										0
Tattler sp.													13													13
Common Sandpiper																										0
Greenshank	7					29	11		13	6	20	6		12									150	42		296
Marsh Sandpiper										3	4															7
Terek Sandpiper												5	6	2									90	406		509
Latham's Snipe																										0
Snipe sp.																										0
Black-tailed Godwit	22									1				54									314	185		576
Bar-tailed Godwit	279		31	74		91	62				40	20	169	1,388						15			3,912	5,154		11235
Red Knot	3					6	130							132										20		291
Great Knot	100											10	68	607						1			943	1,120		2849
Sharp-tailed Sandpiper										3	1			1												5
Pectoral Sandpiper																										0
Red-necked Stint				22		210	266		2	186	86	12		43						3				137		967
Long-toed Stint								2		69				5												0
Curlew Sandpiper						1																				76
Sandering																										1
Ruff/Reeve																										0
Broad-billed Sandpiper																										0
Oriental Pratincole																										0
Australian Pratincole																										13
Unidentified small										12	1															0
Unidentified medium																										0
Unidentified large																							39			39
Asiatic Dowitcher																										0
Total Number	659	0	71	273	0	1,998	1,863	386	935	2,033	2,617	140	443	4,760	0	97	0	0	57	1,652	328	0	6,093	7,962		32367
Total Species	14	0	4	9	0	13	12	7	8	17	21	17	11	21	0	6	0	0	3	14	7	0	15	16	0	215

Table 7 Result of the Summer 1994 Wader Count	NSW					VIC						QLD			SA			WA		TAS					NT	
	Clar	Hunter	Parr	BotBay	Shoal	Cor/Sh	Wport	EPPBy	Altona	WerrA	BellMI	Cns	Mky	MoreBy	WestER	SECst	StVnc	Albany	Swan	EDPitt	MarBy	CpPort	Broome	80 Mile	Dwin	TOTAL
Bush Thick-knee																										0
Beach Thick-knee	2												3													5
Painted Snipe																										0
Pied Oystercatcher	6		3	51		720	276		48	58	43	2	75	650		5		61	22	689	24	31	11	1	1	2,777
Sooty Oystercatcher				8		194	1				4					2				19		21	7			256
Masked Lapwing	4		118			25	238	188	30	249	381	36	22	25		46				344	18	33				1,757
Banded Lapwing																						31				31
Grey Plover						538				2	7		92	42				133	87				124	249	1	1,275
Lesser Golden Plover	2		36	33			17			4	38		54	21		38		22		69		82		7	1	424
Red-kneed Dotterel								26		25	15															66
Hooded Plover				15		2														4	35	3				59
Mongolian Plover	60					100				1	11	15	676	1,155								9	42	12	7	2,088
Double-banded Plover			5			6	2	1		6	2			1		1				3	59	14				100
Large Sand Plover						40					2		2	298				60					745	1,517	45	2,707
Oriental Plover																								10		10
Red-capped Plover	9		23	18		35	70	25	36	68	181		18	62		60		228	303	104	35	92		19		1,384
Black-fronted Plover								23	2	18	18									5						66
Black-winged Stilt	10		210	60				291	113	314	531		17	301				72	46				14	16		1,995
Banded Stilt									477	156	831							700	1	1						2,166
Red-necked Avocet			2				12	54	58	1,331	244							2,000	52							3,753
Ruddy Turnstone			46	21		83	83			11	13	4	70	29		1,198		14		1		120	211	50		1,954
Eastern Curlew	173			66		1,278	970			13	155	8	77	1,767		2		1		117	1	2	19	36	6	4,691
Whimbrel	51			1		152	53				11	4	38	340		1		1		6			68	1	179	906
Little Curlew																								1		1
Wood Sandpiper								2		3																5
Grey-tailed Tattler	14		10	23		11	4			5		16		617		3						5	761	196		1,665
Wandering Tattler																										0
Tattler sp.													17													17
Common Sandpiper								1		2	1								1				2		80	87
Greenshank	21		72			220	121	17	41	103	452	14	6	100		30		85	14	28				290	10	1,624
Marsh Sandpiper	3							30	24	66	61			62										20		266
Terek Sandpiper				2		1							10					1					163	490	6	673
Latham's Snipe	1							2			166															169
Snipe sp.																										0
Black-tailed Godwit	200					2				3			4	323									13	10	640	1,195
Bar-tailed Godwit	645		322	302		11,351	355				28	152	648	5,610		10		74	27	83			12,791	2,991	404	35,793
Red Knot	84					1,470	12			24	49							245		4			1,195	19	200	3,302
Great Knot	166					30					7	140	105	904				510	88				5,780	30,750	2,700	41,180
Sharp-tailed Sandpiper	242		114	15		178	411	2,690	1,063	3,898	4,767			153		173		242	21			12				13,979
Pectoral Sandpiper								1		4																5
Red-necked Stint	104		373	100		17,563	4,081	16	2,763	7,063	6,758	12	312	354		829		1,625	1,559	1,470		281	51	982		48,296
Long-toed Stint																										0
Curlew Sandpiper	3		296	32		4,942	4,111	61	1,962	4,163	3,129	22		410		193		489	191	1,000		23	69	822		21,916
Sanderling						119										91								19		229
Ruff/Reeve																										0
Broad-billed Sandpiper																							3			3
Oriental Pratincole																										0
Australian Pratincole																										0
Unidentified small																							270			270
Unidentified medium											5												270			275
Unidentified large																										0
Total Number	1,800	0	1,630	747	0	39,060	10,817	3,428	6,617	17,590	19,910	425	2,244	13,222	0	2,682	0	6,563	2,412	3,947	172	759	22,609	38,508	4,280	199,422
Total Species	20	0	14	16	0	23	17	16	12	25	28	12	19	21	0	16	0	19	13	17	6	15	21	23	14	367

WADERS ON CAT ISLAND, BASS STRAIT

Dave King, 8 Traum Street, Portarlington, Vic.3223, Australia

A period of some eight weeks, 18 November 1993 to 16 January 1994, was spent on Cat Island (148° 22'E 39° 57'S) in Bass Strait as an honorary Warden. During this time observations were made of a number of waders. These included Pied Oystercatcher, Sooty Oystercatcher, Hooded Plover and Red-capped Plover.

Cat Island is 40 ha in area, composed of granite and covered in granitic sand except for a perimeter of bare rock and two small beaches, each approximately 100 m long. The island was, in previous times, a thriving gannetry of the Australasian Gannet. The attempted re-establishment of this gannetry was the reason for our stay on the island. It is also extensively covered in burrows of the Little Penguin and Short-tailed Shearwater.

By far the most numerous wader was the Sooty Oystercatcher with an estimated population of some 50 to 60 individuals, whilst the Pied Oystercatcher numbered just three. A single pair of Hooded Plovers made the island their home and a pair of Red-capped Plovers were transient.

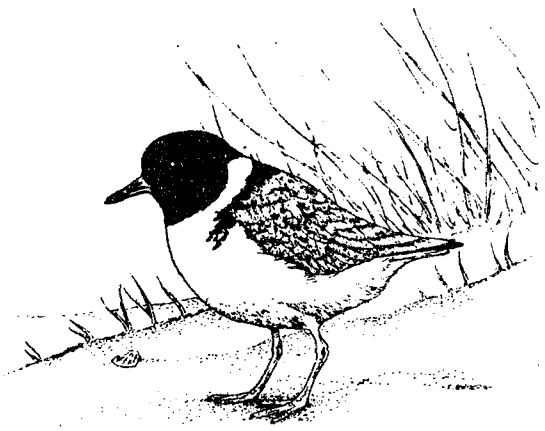
Numerous nests of the Sooty Oystercatcher were found on a bare promontory, well above the high water mark. Some nests were in crevices or between rocks, others on top of extensive areas of bare rock. From one to three eggs were observed in respective nests, which had little material in them other than a sparse amount of vegetation growing at that point. One adult Sooty Oystercatcher was seen with colour-bands* on 10 January 1994. This bird had a distinctly paler bill than its mate which had the typical red of the species.

The three Pied Oystercatchers, two adults and a juvenile, spent most of their time divided between the two beaches feeding on sandworms. It is believed the youngster would have hatched around early November, as it was fully fledged by late December. At this time it was indistinguishable from the adults except when in a begging attitude, bill pointing vertically to the sand and with a hunched appearance. The parents were rarely seen to provide any food. When they did a sandworm would be pulled up from the beach and laid down for the juvenile to take. In all cases when catching worms, the bill was sunk, vertically into the sand, for its full length before retrieving the prey by gently pulling it up. It was then placed down, picked up again, and devoured in a manner that appeared as if it was sucking it up.

The pair of Hooded Plovers spent roughly equal amounts of time feeding on each beach. Their nest containing three eggs, was noted on our arrival on the island, situated on the dune immediately at the top of the beach. All the eggs were missing after a Forest Raven was observed around the nest site.

A pair of Red-capped Plovers were observed on only two occasions several weeks apart. In the first instance they were in company with the Hooded Plovers, the second time they were on their own.

(* This bird was captured and colour-banded at Corner Inlet, Victoria. Ed.)



LAKE FINNISS: AN INTERNATIONALLY SIGNIFICANT SITE FOR LITTLE CURLEW

Roger Jaensch, c/- Conservation Commission of the Northern Territory, PO Box 496 Palmerston NT 0831, Australia.

Lake Finniss is situated 70 km ENE of Darwin, Northern Territory, at co-ordinates 12 degrees 22' South, 131 degrees 29' East and covers about 500 ha when full. It is at the NE edge of the Adelaide River floodplain (area: 135,000 ha) and only 7 km inland of Van Diemen Gulf. Fresh water, mainly from local run-off, fills the lake in the Wet season. The lake is relatively shallow but in most years some water persists through the Dry season. In recent years, dense growth of the aquatic grass *Hymenachne acutigluma* has occupied much of the lake but bare areas persist, especially at the wetland margins. The lake and surrounds are used for pastoral grazing of cattle.

During September-December 1993, large numbers of Little Curlew *Numenius minutus* were observed using the lake in the middle of the day as a loafing, bathing and/or drinking site. In September-October, there were few other areas of shallow open water remaining on the Adelaide River floodplain or adjacent parts of the Mary River floodplain. The highest number of Little curlew counted at any instant was 12,000 on 1 October 1993, though due to high flux of birds, the number of individuals using the lake that day probably was much higher. Numbers were lower in November-December, probably due to gradual increase in availability of water on the floodplains following early Wet season rains. It is assumed that most if not all Little Curlew left the area soon after widespread and heavy monsoonal rain at the end of December 1993, which caused complete inundation of the coastal floodplains.

On 15 September 1994, an estimated 4000 Little Curlew were present at Lake Finniss though by that stage of southward migration few had been recorded elsewhere in the Darwin region (a single bird near Darwin on 14/9). At mid-morning, most of the 4000 were on bare dry mud or in flocks of many hundreds flying restlessly low overhead. At around 1100 h the flocks rose on thermals until lost to sight high above the lake and were thought to have moved inland (south) because a steady (northerly) sea-breeze came in at 1115 h. Only a few hundred birds, comprising small groups moving to and fro, remained in the lake area through the middle of that day. A possible interpretation of the events of 15 September is that several thousand migrating Little Curlew arrived at the lake overnight or within the previous few days and, after resting, dispersed to other parts of the coastal floodplain system.

Wetland conditions were near average in the Darwin region late in the Dry season of 1993 and 1994. Therefore the abovementioned observations probably were typical rather than unusual.

Few other discrete wetlands in Australia of comparable significance for Little Curlew have so far been documented. Watkins (1993) lists the Alligator Rivers area (maximum number of birds 180,000), a large composite site including numerous well-studied wetlands, and Roebuck Plains (50,000) as supporting higher numbers and Anna Plains as supporting similar numbers. The latter sites, both large floodplains in NW Australia, are not regularly inundated. The Boggy Plains wetland (South Alligator River floodplain) is one of the few discrete wetlands comparable to Lake Finniss in that it usually holds water late in the Dry season and is regularly used by large numbers of Little Curlew (10,000 on 19 October 1988: Bamford 1990). The record of around 100,000 at Fogg Dam on 22 October 1966 may have been exceptional (Bamford 1990) and this site is now overgrown and thus no longer ideal habitat.

Given that the estimated flyway (world) population of Little Curlew is 180,000 (Watkins 1993), Lake Finniss clearly supports at least 1% of that population and thus may be regarded as internationally important for the species. In view of the lake's strategic location and permanence, the scarcity of similar water bodies and the species' dependence on wetlands in its daily routine (Bamford 1990), it may also be concluded that Lake Finniss is possibly among the most important sites for Little Curlew in the NT during southward migration.

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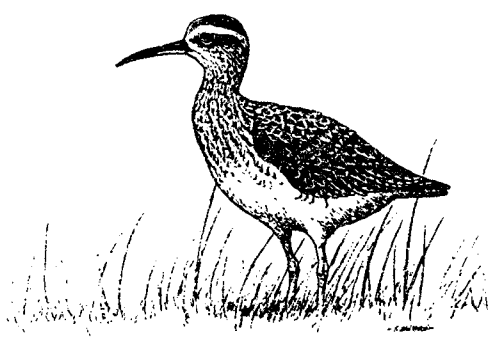

HOODED PLOVERS AND MARRAM GRASS

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Has the introduction of the introduced grass Marram, *Ammophila arenaria*, which has been extensively used to control the natural movement of coastal sand dunes adversely affected some Hooded Plover *Thinornis rubricollis* nesting habitat?

Marram, a native grass of Europe and North Africa, found between the latitudes of 30° and 63° North, (Heyligers 1985) is a strong upright plant able to grow faster and hold more sand than native coastal plants e.g. *Spinifex sericeus* and *Austrofestuca littoralis*.

It has been planted around Tasmania to prevent dune erosion, sand from drifting onto agricultural land, into built up areas and from being blown into rivers causing unwanted siltation (Thorp 1994). Marram is able to propagate by vegetative means, rhizomes being torn off in storms and deposited further along the beach thus spreading far from the original plantings. On some beaches it has outcompeted the native species which grow closest to the tidal area.

As each coastal plant species has its characteristic method of forming dunes, whatever size, due to their individual capacity to trap blowing sand, (Heyligers 1985), so Marram, because of its strong vertical growth and capacity to hold a lot of sand, has changed the foredune systems to one of higher dunes with steeper sides, as compared to the lower terrace shaped foredunes which are formed by Spinifex and *A. littoralis*. These terrace shaped foredunes offer good nesting habitat for Hooded Plovers and Pied Oystercatchers *Haematopus longirostris* as the native grasses growth is more sparse, thus allowing incubating birds to see all around ".....it is likely that before the arrival of the introduced species most foredunes in south-eastern Australia were broad ridges or terraces with gentle to moderate slopes, as their formation would have been dominated by *S. sericeus*, whether or not they were initiated by *A. littoralis* ...." (Heyligers 1985).

Once Marram is well established it tends to form a long line of foredune, and by virtue of its thick growth precludes shore birds from nesting. "Blow-outs" are seldom found, these being ideal sheltering and nesting habitat if large enough.

At Calverts Beach in southern Tasmania, Hooded Plovers were known to be nesting in the foredunes in the mid 70's (A. Fletcher pers. comm.). Today this is almost impossible as the whole dune system has been stabilised with Marram, forming "a sea of grass".

For centuries Hooded Plovers have adapted to the rigours of the coastal environment. But, could this factor of an insidious change to some of their nesting habitat, added to the problems of vehicles, horses, dogs, cats, foxes and the sheer number of people using beaches today, be one more reason as to why the Hooded Plover has been included on the list of threatened birds of Australia (Garnett 1992)?

How successful is the reproductive rate of Hooded Plovers from beaches with unaltered foredune systems (excluding creek mouth areas and given that food availability is the same) as compared with Marram covered foredunes where the birds next on the upper beaches?

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ADDENDUM TO "TWELVE YEARS OF COUNTING THE HOODED PLOVER IN VICTORIA, AUSTRALIA".

Michael Weston, 28 Craig Road., Donvale, Vic., 3111

Weston (1993) mentions that the data for the 1980 Hooded Plover and Pied Oystercatcher count was unavailable for analysis. In fact, the folder containing the data had been misplaced some years ago. During the move of RAOU HQ in August 1994 the folder was found and it is now stored at the new RAOU HQ.

Reference

Weston, M. 1993 Twelve Years of Counting the Hooded Plover in Victoria, Australia. Stilt 23: 15-19.

PREY-SPECIFIC FORAGING TECHNIQUES OF THE SOOTY OYSTERCATCHER *Haematopus fuliginosus*

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Summary

The foraging ecology and diet of the Sooty Oystercatcher *Haematopus fuliginosus* is poorly known with only one unpublished study from Victoria having being completed. This study examined methods used by Sooty Oystercatcher to forage on intertidal rocky shores from southeastern Australia. At least fourteen prey-specific foraging techniques are used to hunt individuals from at least 49 prey species. Prey items consist of eleven mophologically different taxa from five phyla and ten classes; Mollusca (chitons, limpets, snails, whelks, bivalves), Annelida (polychaetes), Arthropoda (crabs, barnacles, insect larvae), Echinodermata (sea urchins), and Urochordata (ascidians). Five basic methods (the "tool-kit") are employed by oystercatchers in various combinations to allow the procurement of such a diverse range of prey taxa. A significant relationship was found between the amount of time taken to complete consumption of a prey taxon and the increasing physical size of prey taxa. Most oystercatcher prey are largely sessile and are only available during periods of low tide. Assuming that energy value increases in proportion to size, optimal foraging theory suggests larger prey taxa will dominate a predators diet with smaller prey taken less frequently. The reverse of this trend occurred throughout regional oystercatcher populations. This suggests that energy value *per se* of a prey individual may not be as important as the overall availability of smaller commonly taken prey. These data are supportive of the view that optimal diet choice in predators with foraging time constraints consume a more catholic diet than would otherwise be expected.

Introduction

The ecology of the Sooty Oystercatcher *Haematopus fuliginosus* is poorly understood, with few published data available other than for aspects of the oystercatchers distribution and basic biology (Hewish 1992, Marchant & Higgins 1993). I studied various aspects of the ecology of Sooty Oystercatcher in southeastern Australia over a two year period 1992-1993, examining diet, energetics, behaviour, parental care, dispersion of offspring, ecological impact on rocky intertidal invertebrate communities and population structure. Some basic data on the diet of Sooty Oystercatcher from this study area appears in Marchant & Higgins (1993) and will be discussed in detail elsewhere. Here I present data on the foraging techniques used in obtaining a variety of invertebrate taxa from the coastal intertidal zone of southeastern Australia.

Although descriptions of some foraging techniques appear in Considine (1979) and Marchant & Higgins (1993) the former work (an unpublished thesis) is not widely available, while the latter work only provides a synoptic view. Here I present data pertaining to four specific aims;

- a detailed description of foraging techniques used by Sooty Oystercatcher in southeastern Australia.
- a comparison of these techniques with published accounts for other rocky-shore inhabiting oystercatchers.
- exploration of the relationship between consumption time and prey size.
- examination of the potential transfer of prey-specific hunting techniques between oystercatcher populations on a geographic scale.

Methods

Observations of foraging techniques were made on twenty three rocky shores along the southern coast of New South Wales, Australia between Long Reef (33°45'S, 151°19'E) and Ulladulla (35°21'S, 150°29'E). Detailed observation periods dedicated to hunting strategies were undertaken on seven shores in the Illawarra region of NSW (34°26'S, 150°53'E) during 1992 (north to south; Wombarra, Brickyard Point, Bellambi Point, three shores at Port Kembla, Barrack Point). Direct observation of foraging oystercatchers was made using 10 x 30 Helios binoculars and a x20 Focal spotting scope. All prey species were identified by direct observation during the foraging process. Foraging behaviour, including time taken to attack, apprehend and consume prey were verbally described into a compact cassette recorder (REALISTIC Minisette-9) and later replayed to record foraging times to the nearest second using a digital stop watch. Quantities of discarded prey remains (shells, tests, carapaces etc.) of each prey taxa were collected from a number of shores, sorted to species level and measured using a suitable metric; shell length for molluscs, test diameter for urchins, carapace width for crabs and test diameter (sensu Paine & Suchanek 1983) for ascidians (Figure 1). This was done to examine whether there is a relationship between prey taxon size and time taken to remove and consume individuals from their protective adaptation (shell, test, carapace etc.).

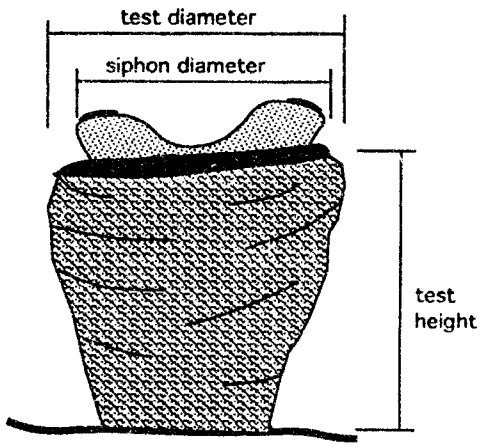

Figure 1 The ascidian *Pyura stolonifera* showing the variables; siphon diameter, test diameter and test height used in this study to analyse the ascidians biometry

Some taxa that are taken by the Victorian oystercatcher population (cf. Considine 1979) were not incorporated in the NSW diet during this study. For these taxa I include Considine's (1979) descriptions of foraging techniques for convenience. Differences between techniques used in this study and that of Considine (1979) are discussed where appropriate.

In April 1992, birds were observed foraging on insect larvae within *Ecklonia radiata* wrack. Subsequent investigation found that only one larvae was present in the area being foraged. To identify the species concerned I collected a sample of algae, sand and larvae and placed them in a 180 x 80 x 30mm plastic container. The container was covered and left in a greenhouse, periodically dampened with rainwater. I added fresh wrack (without larvae) on day 16 of the experiment to coincide with a similar deposition on the sea shore. The container was checked every second day for larval activity, pupation and eclosion.

To examine regional trends in oystercatcher foraging techniques, a comparison of available diet data is presented (Table 1). This review is designed to highlight preferred prey taxa at a Class level, allowing comparison of the following techniques used to obtain prey on a geographic scale. Detailed dietary analysis will appear elsewhere.

Table 1. Simplified diet analysis for Sooty Oystercatcher in southeastern Australia. Data are from this study, Considine (1979) and Parry (1977). Basic data used can be found in Marchant & Higgins (1993). Data are expressed as the mean frequency (%) occurrence in diets from four regional populations. A "P" indicates taxa consumed but quantification inadequate for use in this analysis. Ill = Illawarra region (7 shores); Ull = Ulladulla region (3 shores); WPr = Wilsons Promontary (several shores); CVic = Central Victoria (5 shores).

	New South Wales		Victoria	
Taxa	Ill %	Ull %	WPr[1] %	CVic[2] %
Molluscs				
Castropods	66.8	54.4	1.0	76.1
Chitons	6.8	17.8	-	4.5
Bivalves	8.5	5.0	26.0	1.0
Crustaceans				
Barnacles	1.3	0.7	17.0	-
Crabs	0.5	-	-	0.9
Amphipods	-	-	57.0	-
Echinoderms				
Sea urchins	4.7	11.3	-	-
Polychaetes				
marine worms	P	-	-	14.1
Ascidians	14.6	13.1	-	-
Insects				
fly larvae	P	-	-	-
Unknown	-	-	-	3.6

1 Data for Wilsons Promontory (Considine 1979) separated from other Victorian shores.

2 Data from Considine (1979) plus Parry (1977) without Wilsons Promontory data.

Results

Fourteen prey-specific foraging techniques were observed being used by Sooty Oystercatcher during the study period. Prey items came from eleven morphologically different taxa from five phyla and ten classes; molluscs (chitons, gastropods, bivalves); arthropods (barnacles, crabs, amphipods, insects); annelids (polychaetes); echinoderms (sea urchins); urochordates (ascidians).

Foraging techniques for molluscs

A detailed descrpition of each technique follows with *italic* numbers refering to the prey-specific technique being described in each taxon entry. Illustrations of most prey types can be found in Bennett (1987).

Limpets (*Gastropoda; Patellacea & Fissurellacea*)

The commonly taken limpets *Cellana tramoserica, Patella peroni* together with the less frequently taken limpets *Patelloida latistrigata, P. alticostata* and the siphonarid *Siphonaria denticulata* are all cap shaped and found in the mid to low intertidal zone (Bennett 1987). Two methods are used to dislodge limpets from substrate;

(i) one or a few stabbing strikes at the interface of the shell and the substratum at an angle of 20 - 40°. The number of strikes delivered is probably related to shell size and tenacity of the individual limpet (cf. Hockey 1981, Hahn & Denny 1989). Once removed, the shell is inverted and moved to a handling site, usually a crack in the substratum or a patch of coralline algal turf, where purchase can be obtained. These sites are subsequently referred to as anvils. Viscera is removed by a singular scooping motion, usually directed from the anterior of the animal, or by scissoring around the adductor mussel until viscera is loose enough to carry out scooping motion. Viscera swallowed whole. In many locations successively captured prey are subsequently transported to the same anvil sites, where small piles of prey remains congregate through a foraging bout.

(ii) With some larger individual limpets (> 30mm length), a downward hammering strike perpendicular to the shell at the vicinity of the internal attachment site of the adductor mussel is affected. Two or three strikes are usually sufficient to break the shell cap in an oval shape, synonymous with the internal attachment site of the adductor mussel. The viscera and shell cap is then removed and swallowed whole.

The smaller false limpet *Clypidina rugosa*, usually found in the low intertidal zone (Bennett 1987), is simply picked off the substratum, carried to a handling site, inverted and the viscera removed using a scissoring, then scoop motion similar to (i).

Analysis of handling times for *Clypidina* when compared to other limpets, clearly shows that despite *Clypidina* being significantly smaller in size class taken, it takes a similar amount of time to remove the viscera from the shell than in either *Cellana* or *Patella* (Table 2).

Table 2. Comparative analysis for the mean size and mean foraging time of 16 prey taxa consumed by Sooty Oystercatcher from seven rocky shores in the Illawarra region of New South Wales ± 1 standard error (SE). Number (n) analysed in parentheses. Size of each taxa determined using an appropriate field measure (see text for details).

Taxa	size taken in mm	SE	(n)	foraging time in seconds	SE	(n)
Ischnochiton australis	41.9	0.94	(88)	87.5	1.85	(18)
other chitons [1]	34.3	1.17	(60)	92.5	1.86	(26)
Cellana tramoserica	26.7	0.19	(847)	12.1	0.68	(124)
Patella peroni	32.2	0.77	(56)	15.9	1.80	(18)
Clypidina rugosa	18.1	0.18	(385)	12.3	0.75	(88)
Thais orbita	32.1	0.88	(50)	41.7	3.50	(20)
Cabestana spengleri	40.0	3.03	(12)	47.5	7.30	(4)
Turbo undulatus	23.7	0.30	(130)	89.3	4.12	(38)
Nerita atramentosa	16.2	0.03	(84)	14.6	1.22	(42)
Trichomya hirsuta	41.8	0.54	(159)	93.4	5.16	(17)
crabs [2]	22.1	0.64	(7)	51.0	9.32	(9)
Tesseropora rosea	12.8	0.45	(24)	9.2	1.61	(6)
Heliocidaris	47.4	0.78	(82)	127.1	0.67	(19)
Holopneustes pycnotilus	37.4	0.1.5	(20)	42.3	1.63	(3)
Pyura stolonifera (intertidal)	47.3	1.08	(84)	166.9	11.03	(41)
Pyura stolonifera (beach-cast)	59.8	1.74	(64)	207.4	18.64	(8)

1 species determined after predation event; 31 *Plaxiphora albida*, 26 *Chiton pelliserpentis*, 3 *Onithochiton quercinus*

2 species determined after predation event; 5 *Plagusia chabrus*, 2 *Leptograptus variegatus*

Chitons (*Polyplacophora; Chitonida*)

Chitons are removed in a similar manner to (ii) except that the number of blows required to initially dislodge an individual is greater than for limpets, often six to twelve blows being required. From 83% of chitons examined after predation (n=105), all blows had been directed at the anterior half of the shell. Once dislodged, the individual is carried to a handling site, inverted and a scissoring motion is conducted right around the inside of the shell plates. Some female oystercatchers, having longer more pointed bills, can remove the entire animal using this technique. However males, with shorter chissel-shaped bills, have difficulty in scissoring the adductor mussel from chitons completely. Thus for some birds, usually males, the oystercatcher grabs the loosened viscera between its mandibles and shake the chiton vigorously until the shell is removed. The viscera is then swallowed whole.

Snails (*Gastropoda; Trochacea & Neritacea*)

Snails, *Turbo undulatus* and *Nerita atramentosa*, are picked from the substratum with open mandibles and carried to an anvil. For *Turbo* two methods are used;

(iii) the animal is positioned so the operculum is parallel to the substratum. A U-shaped portion of the shell above the operculum is removed with one to three hammering strikes, the operculum is grabbed in the oystercatcher mandibles and torn off the snails foot. The foot is then grabbed (the animal is unable to retreat further into the shell) and the viscera pulled out of the shell and swallowed whole.

(iv) The snail is positioned in a crack with the opercular parallel to the substratum and a singular hammer strike perpendicular to the substratum is delivered. This splits the entire shell symmetrically in half and the viscera is picked out of the shell, placed on the ground, the operculum removed with a scissor motion and viscera is then picked up and swallowed whole. For *Nerita*, method (iv) is used, except that the shell usually splits at right angles to the symmetry of the snail. The viscera is picked out of the shell remains and swallowed without the operculum being removed.

Whelks (Gastropoda; Muricidae)

When foraging for whelks *Thais orbita* and *Cabestana spengleri* two methods are employed;

(v) for *Thais*, the animal is removed from the substratum with a single hammer at the base of the aperture. The whelk is carried to a handling site, inverted so the operculum is facing upward, and numerous short hammering blows are directed at the opercula until it is loosened. The operculum is then cut off with a scissoring motion. A combination of stabbing/scissoring motions are then employed to removed portions of viscera piecemeal. Usually in this species, only the head and foot of the animal are removed and up 40% of the organs are left within the whorl of the whelk. Occasionally additional hammering blows are directed at the first whorl above the aperture until it breaks. Additional viscera is then removed, however on no animal I examined (n=52) was all the viscera consumed.

(vi) *Cabestana* do not have a robust shell when young. All individuals of this taxon taken during the study period were less than 50mm in length and can be regarded as juveniles (W.Ponder Australian Museum, personal communication). This whelk is removed as in (v) then simply placed on the substratum and hammered two to four times (n=16 observations), the impact smashing the shell into several parts. The viscera is then removed and consumed piecemeal.

other gastropods

Three other gastropod taxa were taken in small numbers during this study; *abalone Haliotus ruber, H.cocoradiata* (Gastropoda; Pleurotomariacea), the ear shell *Granata imbricata* (Gastropoda; Trochacea) and the elephant snail *Scutus antipodes* (Gastropoda; Fissurellacea). All were taken in a similar fashion;

(vii) two or three stabbing strikes similar to technique (i) were applied by the oystercatcher. The bill with closed mandibles was then placed under the shell of an individual so the bill and head were sideways relative to the substratum. A prising motion consisting of levering with the legs and body is then applied until the animal is dislodged. The posture of the bird during this endeavour gave the impression of using considerable force. Once inverted the animals were carried (dragged for *H.ruber*) to a handling site and viscera removed piecemeal with a scissoring action.

Foraging techniques for bivalves

Two bivalves (both Bivalvia; Mytiloida) were consumed by Sooty Oystercatcher during the study period, the mussel *Trichomya hirsuta* and the rock oyster *Saccostrea cucullata*. All individual mussels consumed in this study were acquired after rough sea conditions as beach-cast individuals attached to the holdfasts of the subtidal kelp *Ecklonia radiata*. The cyclic deposition of *Ecklonia* wrack on New South Wales shores is discussed by Blanche (1992). The technique used by Sooty Oystercatcher to consume *Trichomya* was similar on all the study shores with one minor exception. When searching through wrack deposits on adjacent sandy beaches, Sooty Oystercatchers use a scissoring, twisting and pulling motion to detach a mussel from the holdfasts. The mussel, or on some occasions a small group of mussels, were then taken to a rocky anvil where they were dispatched as described below. For mussels found in wrack deposited on rocky shores the mussel is attacked where found in the following manner;

(viii) if the mussel valves are slightly agape, the closed mandibles are inserted into the mussel with a quick stab, presumably cutting the adductor mussel of the mollusc. The valves are forced apart by opening the mandibles, or on some occasions turning the bill sideways and prising the valves apart. If the mussel valves are closed, oystercatchers hammer at the valve join until one valve is punctured. The bill is then inserted into the mussel and the valves prised apart, the viscera removed by a combined scissoring and scooping motion.

Although the rock oyster is relatively common on all shores in the study area, predation by Sooty Oystercatchers was only observed at Bellambi Point, Barrack Point and Ulladulla. These bivalves are nearly always closed at low tide and oystercatchers hammer at the valve join until the shell is breeched, a technique not distinctly different from method (viii). The viscera is then scooped out and swallowed. During 1993 oyster predation was observed on commercial oyster leases along the Crookhaven River at Greenwell Point (35°55'S, 150°45'E) on several casual visits. This site is 2-3 km from the coast and appears to represent the furthest inland movement reported for Sooty Oystercatcher (Marchant & Higgins 1993).

In Victoria, two mussel species were incorporated into the regional diet (Considine 1979), the larger *Austromytilus rostratus* ($\bar{x}$ = 26.5mm) and the smaller *Xenostrobus pulex* ($\bar{x}$ = 15.6mm). *Austromytilus* is foraged for in low intertidal zone mussel beds and consumed using method (viii) depending on whether individuals were gapping or closed. *Xenostrobus* form mussel beds in the mid intertidal zone (Considine 1979, Bennett 1987) and are consumed as follows;

(ix) Sooty Oystercatchers walk through a mussel bed, select an individual, which is removed by either tearing the mussel from the bed or by attacking the byssal threads until it is dislodged. The mussel is then consumed whole by adult oystercatchers, or placed on the ground and hammered lightly, then swallowed by juveniles (Considine 1979).

Foraging techniques for crustaceans

Two crabs (Decapoda; Grapsidae) *Leptograptus variegatus* and *Plagusia chabrus* and one barnacle (*Cirripedia; Thoracica*) *Tesseropora rosea* were consumed during this study. Crab hunting was the most unusual behaviour observed, with the same method used to obtain both species;

(x) all foraging was conducted in small rock pools situated in the low intertidal zone. In particular, these pools contain copious green and brown algae, especially *Hormosira banksii*. A systematic slow sewing machine-like stitching action is conducted through the algae by Sooty Oystercatchers, location of prey is entirely tactile. Once a crab is encountered it is quickly brought to the surface and juggled to grasp the the crab posteriorly so the claws face away from the oystercatcher. The crab is then taken to a handling site and smashed on the ground until the legs and claws were detached. The remaining carapace is then inverted on the substratum, the exoskeleton pierced using a hammering technique and the viscera removed piecemeal. On two occasions crabs escaped initial capture, dropping back into the pool. The oystercatchers dove into the pool, being two thirds submerged before surfacing with a crab.

The barnacle *Tesseropora* was taken in a manner similar to that used for limpets (i), the shell is then inverted in a crack and the animal picked out and swallowed. Several other barnacle species were included in the Victorian diet that were not taken in this study *Austromegabalanus nigrescens, Catmerus polymerus* and *Chamaesipho columna* (Considine 1979), though no specific methods were given it is presumed they are similar to that used for *Tesseropora*.

Foraging techniques for polychaetes

No attempt was made to identify marine worms (Annelida; Polychaeta) consumed by oystercatchers in this study, as their intertidal diversity is extensive (eg. Bennett 1987). All were taken in the same manner;

(xi) Sooty Oystercatchers forage for worms in coralline algal turfs in the mid to low intertidal zone in areas most recently exposed by the receding tide. A fast sewing machine-like stitching technique is used while the oystercatcher moves in a forward direction. Once located, the worm is grabbed and slowly dragged out of the turf, presumably to avoid breakage, then swallowed in a single motion. No observed capture consisted of individual worms longer than the bill length, circa 70 - 80mm.

Foraging techniques for small invertebrates

During this study I found, on two occasions, Sooty Oystercatchers foraging through seaweed wrack at Port Kembla (c.f. Blanche 1992). On these occasions, oystercatchers walked slowly through the extensive deposition of wrack using a slow sewing machine-like stitching, similar to that used to hunt for crabs (x). Clearly they were employing tactile probes, and every two to five seconds a prey individual (insect larvae) was located and swallowed. The larvae were subsequently identified from 36 eclosions in the laboratory as the dipteran *Chaetocoelopa sydneyensis* (Insecta; Coelopidae), one of several seaweed flies commonly occurring within such wrack deposits (McAlpine 1991; Blanche 1992).

Considine (1979) also recorded Sooty Oystercatcher foraging amongst seaweed wrack at Wilsons Promontory. Here, however, the oystercatchers were feeding on amphipods *Talorchestia* sp. (Arthropoda; Malacostraca). The methods described by Considine (1979) do not differ substantially from those described above except that on some instances oystercatchers pulled clumps of seaweed apart with their bills, catching amphipods as they jumped around the disturbed area.

The most likely reason that I did not find amphipods in the wrack deposits at Port Kembla, is that it was on a rocky bench, rather than on sand where amphipods are apparently common (Bennett 1987).

Foraging techniques for echinoderms

Three species of sea urchin (Echinodermata; Echinoidea) were preyed upon during the study period, *Holopneustes pycnotilus*, a small urchin which inhabits dense sublittoral algal growth at the lower margins of the intertidal zone. The intermediately sized *Heliocidaris erythrogramma*, a rock burrowing species most often encountered semi-encompassed in individual concave hemispherical hollows in the low intertidal zone, and the large *Centrostephanus rodgersii*, which is normally only available on spring tides, wedged in cracks at the lowest infralittoral zone (Dakin 1960, Bennett 1987). A similar method is used for foraging on all three urchins;

(xii) *Heliocidaris* and *Centrostephanus* are apparently assessed as suitable by a preliminary jab at the interface of the urchin and the substratum. Only urchins not within a burrow are tested. Following the preliminary jab, suitable urchins (my subjective opinion) are stabbed several more times before being grabbed by the tip of the mandibles held slightly apart. Individual urchins <30mm fit within the opened bill. Holopneustes is simply picked out of algal masses in which it is often found feeding. Once an urchin is captured, it is taken to a handling site, inverted to reveal the complex mouth parts and a series of short sharp jabs are made around the circumference of the peristomal membrane. The bill is then inserted, the Aristotle's lantern (mouth parts) is grabbed, twisted, levered and removed. The viscera is the removed piecemeal from inside the urchin test.

Foraging techniques for ascidians

The only ascidian (Urochordata; Ascidiacea) consumed during this study was the solitary ascidian *Pyura stolonifera*, commonly known as 'cunjivoi' (Underwood & Fairweather 1986). Another ascidian *Herdmania momus* was taken during a preliminary study on oystercatcher foraging and the technique used to forage on this ascidian is adequately described elsewhere (Chafer 1992). Pyura is available through the study area in two forms; (a) as intertidal in situ individuals inhabiting sections of rocky shore in often vast aggregations, or beds, in the lower intertidal zone (Dakin 1960, Underwood & Fairweather 1986, Bennett 1987); (b) as beach-cast 'clumps' containing aggregations of 3-12 individuals, with smaller individuals growing on sides larger older individuals. Originating from subtidal reef populations, these beach-cast ascidians are apparently dislodged by rough seas and are usually deposited on sandy beaches adjacent to rock platforms, though occasional deposition on rock platforms also occurs. The sac-like body of *Pyura* (see Bennett 1987) is entirely contained within a tough cylindrical or semi-conical test (also known as the tunic) made from tuinicine, a type of cellulose (Villee *et al.* 1984; Kott 1985). The two forms of *Pyura* taken by Sooty Oystercatcher are consumed using two basic methods of which a variation for intertidal forms is used on some shores;

(xiii) for intertidal ascidians, Sooty Oystercatchers move among a Pyura bed tapping the side of the columnar test twice in quick succession with a closed bill (hereafter referred to as "test-tapping"). This was later found, by imitating the oystercatcher behaviour with a stick, to vex the ascidian and provoke a violent retraction of the test, often followed by the expulsion of a water jet from the atrial siphon. One explanation for "test-tapping", is to verify the presence of an animal in the test. This is necessary, as tests that have had animals removed look superficially like intact organisms for up to two weeks after predation (personal observation, cf. Underwood & Fairweather 1986, Fairweather 1990). Conversely not all intact ascidians will react when "test-tapped" and this may facilitate some measure of protection against oystercatcher predation.

Once an individual *Pyura* had been selected as passing this "test", ie. an active response was obtained inferring the individual ascidian is alive, the oystercatcher positions itself so as the bill was directed vertical to the ascidian 'lid' (the dark area in Figure 1 below the siphons), ie. perpendicular to the substrate surface, and two or three vertical hammers directed at the membraneous interface of the 'lid' and the column of the tunic. Further attack was proceeded on 95% of individuals once this stage had been reached (n=93), even though entry through the test may take up to 125 seconds (n=31). Two variations of test entry from this point were affected. The common method, observed from all shores, consisted of hammering continuously at or about the same location on the 'lid'/ column interface, until entry through this point of the test was initiated. The bill is then inserted into the branchial basket, followed by much levering and twisting of the bill until the hole was large enough to extract internal tissue. Some secondary hammering may be used to enlarge the hole, however this varied considerably from bird to bird. A variation of this method was observed at three study sites centred around Port Kembla. This "can-opener" method involved the selection of *Pyura* with a test diameter less than 30mm (n=9 measured). With these individuals the 'lid' interface was hammered completely around its circumference with alternate heavy stabs followed by a series a short sharp jabs. Once the perforation around the 'lid' was complete the 'lid' was held in the bill and the oystercatcher would pull, twist and lever using its entire body, until the 'lid' and attached visceral mass (sac) of the animal were extracted. The animal (sac) was subsequently laid on the rocky substrate and large morsels of the ascidian removed, using a circular scissoring motion and swallowed piecemeal. All soft parts of the animal were consumed.

For beach-cast ascidians, the methodology differs to that described above. As all beach-cast ascidians are deposited laterally on the shore, the 'lid' is not directly available for penetration and predation is as follows;

(xiv) "Test-tapping" was still employed, as recently beach-cast individuals remain alive for at least the period of one complete tide after deposition (personal observation). These ascidians are only attacked by hammering a single hole through the column then removing the viscera piecemeal. This process takes considerably longer than for the intertidal form (Table 2). Once a clump is selected, one or more individuals within the clump are consumed. In some cases, smaller clumps with three or four individuals, are turned over if the exposed individuals are seemingly not suitable for attack. No beach-cast ascidian was entered through the 'lid', and similarly, no intertidal ascidian was attacked on the column (total examined n=537), probably because beach-cast individuals (which can weigh in excess of one kilogram) are deposited in a prone position.

Predation time

Prey size was analysed for 2143 individuals from 16 taxa and correlated against 499 observed foraging events (the time it takes from initialising an attack to consumption of the individual) for the 16 taxa (Table 2). Timed foraging events were obtained from 549 minutes of observation dedicated to studying hunting efficiency during oystercatcher foraging bouts. Foraging bouts lasted 30-50 minutes, followed by a rest period. Often two birds could be watched and described at the same time if feeding close to one another. Data were pooled from all shores and transformed to natural logarithms for analysis (Zar 1986, p311). A significant positive association was found between taxon size and time taken to consume individuals (Pearson's correlation coefficient $r = 0.803$, $p<0.001$). From the foraging bout data 36.73% ± 2.3 SE of hunting time was spent searching for prey while 63.27% ±2.3 SE of time was spent consuming prey. There was no statistical difference between shores in foraging behaviour; searching $G_4=1.743$, $P=0.75$; consuming $G_4=2.784$, $P=0.60$.

Comparison with other oystercatcher foraging techniques

Limpets

Techniques used to take limpets by Sooty Oystercatcher do not differ substantially from techniques used by other rocky shore oystercatcher species (Baker 1969, 1974; Dewar 1913; Feare 1971; Hartwick 1976; Hahn & Deny 1989; Hockey 1981; Levings et al 1986; Webster 1941).

Chitons

Chitons are taken by African Black Oystercatcher H.moquini on the south east coast of Africa (Hockey 1981, Hockey & Underhill 1984, P.A.R. Hockey personal communication) and by American Black Oystercatcher (*H.bachmani*) (Hartwick (1981), though methods of capture are not given. Baker (1969, 1974) discusses the method used by New Zealand oystercatcher species *H.unicolor*, *H.longirostris* and *H.chathamensis*. This method differs from the Sooty Oystercatcher in that if the first blow fails to dislodge the chiton the oystercatcher then attempts applying lateral pressure to the interface of the substratum and the chiton girdle, eventually pushing the bill under the chiton and flipping the chiton over. The viscera is then removed by scissoring (Baker 1974). This differs markedly from the repetitious hammering blows delivered in the this study. This difference may be related to the size of chitons taken, foot tenacity or behavioural differences. In Panama, Levings *et al.* (1986) found some chitons were swallowed hole, though further detail was not provided.

Snails

The methods described herein to obtain *Turbo* and *Nerita* are similar to those used by American Oystercatchers *H.palliatus* to take Panamanian Neritids (Levings *et al.* 1986)

Whelks

Whelks and Littorinids are consumed by some populations of *H.ostrelagus*, *H.palliatus* and *H.moquini* on rocky shores (Dewar 1910; Feare 1971; Boates & Goss-Custard 1992; Levings et al. 1986; Hockey 1981). The methods used in this study are the same as those used in Victorian populations of Sooty Oystercatcher (Considine 1979), differ only slightly from that used by *H.ostralegus* and *H.palliatus*, but are similar to that used by *H.moquini*. The often incomplete removal of all the viscera is apparently a common cosmopolitan phenomena when foraging on individuals of these taxa (Dewar 1913; Feare 1971; Hockey 1981).

Bivalves

Perhaps the most widely taken prey in the diets of oystercatchers are bivalve, in particular mussels on rocky shores and estuaries, and cockles and pipies on soft sediment shores (Baker 1974; Dewar 1908; Goss-Custard & Sutherland 1984; Hartwick 1976; Hartwick & Bylock 1979; Hockey & Underhill 1984; Marsh 1986a,b; Meire 1987; Morrell *et al.* 1979; Swennen 1990; Ward 1991). The only bivalves taken by Sooty Oystercatcher were mussels and rock oysters, and in frequencies much less than their congeners. This may be related to other facets concerning the apparent convergence of ecological processes between independently evolved competitive dominants in different parts of the globe (cf. Paine & Suchanek 1983). The methods used by Sooty Oystercatcher to prey on mussels are similar to those used by other oystercatcher species. The only difference is that small mussels are swallowed whole by Victorian populations of Sooty Oystercatcher, though some oystercatchers use this technique in New Zealand, *H.unicolor* and *H.chathamensis* when feeding on the small mussel *Xenostrobus pulux*, the same species consumed by Sooty Oystercatcher (Baker 1969, 1974).

Crustaceans

Similar techniques used to extract viscera from crabs have been described by Tinbergen & Norton-Griffiths (1964) and Baker (1974), however the hunting strategies described herein are apparently unique (cf. Morrell *et al.* 1979; Hartwick 1976; Levings et al. 1986).

Barnacle predation was rarely observed by Hockey (1981) for African Black Oystercatcher, and does not appear to be a feature of other oystercatcher diets (cf.Baker; Hartwick 1976; Levings *et al.* 1986; Safriel 1985; Wootton 1992).

Polychaetes

Although rocky shore polychaetes have been recorded from the diets of *H.bachmani, H.moquini* and *H.unicolor* (Baker 1969; Hartwick 1976; Hockey 1981; Morrell *et al.* 1979), these oystercatchers have been described as hunting polychaetes within mussel beds. H.ostralegus is known to take polychaetes and oligochaetes from estuarine and terrestrial environments respectively (Safriel 1985; Boates & Goss-Custard 1992), but not apparently from rocky shores. Levings et al. (1986) does not record polychaetes in the diet of *H.palliatus*. The method described herein of taking marine worms from coralline algal turf may therefore be unique. Considine (1979) notes polychaetes being taken from at least two of her study sites, but does not record methods used.

Marchant & Higgins (1993) incorrectly suggest that polychaete predation by Sooty Oystercatcher occurs from sandy substratum, apparently using Schultz (1989) and Chafer (1992) as the source of this statement. Whilst hunting for polychaetes in sandy substratum cannot be entirely ruled out, I doubt the record of Schulz (1989) because of other inaccuracies in this observation period (cf. Chafer 1992). Although Chafer (1992) suggested that polychaete foraging in sand may occur, subsequent research involving over 400 hours of field observation failed to detect any such hunting strategy. I therefore suggest that predation by Sooty Oystercatcher for polychaetes does not occur with any frequency in a sandy substratum from populations in south eastern Australia, and that polychaete predation is confined to coralline algal turfs as described herein.

Other invertebrates

Predation for dipteran larvae and sand hoppers within seaweed wrack, as described herein, has not been recorded for any other oystercatcher species. Although invertebrates such as isopods, amphipods and beetle larvae have been reported for *H.bachmani, H.moquini* and *H.unicolor* (Baker 1969; Hartwick 1976; Hockey 1981; Morrell *et al.* 1979) no specific methods of attainment were described.

Echinoderms

Sea-cucumbers (Echinodermata: Holothuroidea) have been recorded in the diets of *H.bachmani* and *H.moquini* (Hartwick 1976; Hockey 1981), however sea urchins do not appear to feature in the diet of any other oystercatcher species. Nor do they feature in Victorian diets of the Sooty Oystercatcher (Considine 1979), yet I have recorded them being taken from as far south as Congo Point (35°57'S 150°10'E) and are known to be taken well to the north of the study area at Boudi NP (33°27'S 151°21'E, A.K.Morris personal communication) and Newcastle (32°56'S 151°47'E, P.G.Fairweather personal communication).Future research may detect echinoderm predation outside the southern New South Wales coast, or determine if this is a locally restricted technique.

Ascidians

Beach-cast *Pyura stolonifera* is infrequently taken by *H.moquini* on the west coast of southern Africa (Hockey & Underhill 1981; P.A.R. Hockey personal communication). This is the only other known record of ascidian predation by other oystercatcher species. Although ascidians were mentioned in Considine's (1979) thesis, no quantified measure was provided. Apart from this record the only other published account of ascidian predation from Victoria is that of Schulz (1989) who incorrectly describes the predation as being instigated by Australian Ravens *Corvus coronoides* (cf. Chafer 1992; Marchant & Higgins 1993).

The basic "tool-kit"

The results from the above analysis of foraging techniques indicates that five basic techniques; stab, hammer, scissor, probe (including picking and stitching) and lever are used in various combinations with each other to obtain prey from a variety of morphologically different taxa (Table 3). These techniques are synonymous with Considine's (1979) "tool-kit" of basic adaptive foraging techniques.

Table 3. A comparison of different basic techniques used in combination to obtain prey from eleven morphologically different prey taxa discussed in this paper. The five basic techniques are synonymous with Considine's (1979) "tool-kit" of adaptive foraging techniques.

Techniques used	Stab	Hammer	Scissor	Probe (stitch) & pick)	Lever
Prey taxa					
Chitons	X	X	X		X
Limpets	X	X	X		
Snails	X	X			
Whelks	X	X	X		
Mussels	X	X	X		X
Crabs		X	X	X	
Barnacles	X			X	
Polychaetes				X	
Insect larvae				X	
Amphipods				X	
Sea urchins	X	X	X	X	X
Ascidians	X	X	X		X

Discussion

Variation in diet

This paper has described the foraging techniques used by the Sooty Oystercatcher to successfully consume eleven morphologically different intertidal taxa; chitons, limpets, snails, whelks, mussels, crabs, barnacles, small invertebrates, polychaetes, sea-urchins and ascidians. A search of the literature on the worlds oystercatchers suggests that some within population, temporal and geographic variation in diet selection is typical for the Family Haematopodidae (Baker 1969, 1974; Dewer 1913; Frank 1982; Feare 1971; Goss-Custard 1988; Hahn & Denny 1989; Hartwick 1976; Hockey 1981; Hockey & Underhill 1984; Hockey & Bosman 1988 Hockey & van Erkom Schurink 1992; Levings *et al.* 1986; Marsh 1986; Morrell *et al.* 1979; Norton-Griffiths 1968; O'Conner & Brown 1977; Safriel 1983; Siegal-Causey 1990; Swennen *et al.* 1983). The complex and diverse foraging behaviour displayed by Sooty Oystercatcher has presumably

evolved to facilitate the successful foraging on organisms with different energy values and different microenvironmental availability within the intertidal zone. This behavioural adaptation also appears typical of other rocky shore inhabiting oystercatcher populations (Dewar 1910, 1913; Baker 1974; Boates & Goss-Custard 1992; Feare 1971; Goss-Custard & Durell 1983; Hartwick 1976; Hartwick & Bylock 1979; Hockey 1981; Levings *et al.* 1986; Morrell *et al.* 1979; Norton-Griffiths 1968). Considering that tidal amplitudes are generally less than 2m in southeastern Australia (Bennett 1987) and rocky shores inhabitable by prey taxa are less than 15m in width, the diet breadth exhibited by Sooty Oystercatcher allows food resources from a limited spatial environment to be fully exploited. Extensive echinoderm and ascidian predation has not been reported for any other oystercatcher species, yet intertidal populations of *Pyura* are available for oystercatcher exploitation in South Africa and Chile (P.A.R. Hockey & C. Venegas pers. comm.). While the energy reward for ascidian predation is presumably high, the effort required to enter the tough protective test ($\bar{x} = 96$ secs, $n = 62$) represents 57% of the mean total consumption time of this taxon. This presumably affects profitability and may be one reason why ascidians do not dominate the NSW diet numerically.

The oystercatchers "tool-kit"

As Considine (1979) points out, the techniques involved in removing all prey taxa from their protective environment (shell, test, carapace, seaweed wrack) revolve around five basic techniques; stab, hammer, scissor, probe, lever. Components of this basic "tool-kit" (Considine 1979) are then combined, developing a suite of prey-specific predation techniques particularly suited to feeding on the prey currently within a given oystercatchers foraging territory. On each shore, the type of prey taken may be correlated with the relative availability of common taxa, while opportunism allows the consumption of beach-cast organisms that are periodically deposited. For example, seaweed wrack, and prey associated with it (mussels, sea urchins, dipteran larvae, sandhoppers), is not a sustainable food resource, dependant on cyclic depositions and suitable sea conditions (Blanche 1992). A similar scenario can be proposed for the displacement and subsequent deposition on the shore of subtidal ascidians, though this appears to slightly more regular on some shores than on others. Conversely the distribution and community organisation of intertidal prey on any given shore will be a function of a range of localised topographic, hydrological and climatic regimes (eg. Bennett 1987; Knox 1963; Fairweather & Underwood 1991). Therefore it should not be surprising that different prey feature as the dominant component of an oystercatchers diet on different shores over a geographic range (cf. Hockey 1983; Levings *et al.* 1986).

Cultural transmission of foraging techniques

Juvenile oystercatchers stay with their parents for up to nine months after fledging (Marchant & Higgins 1993; C.J.Chafer unpublished data) and subsequently disperse up to 270 km from the parental territory (Marchant & Higgins 1993). Any foraging technique learned from parent birds during dependency could be passed on to other birds during the three to four years prior to sexual maturity. During this time groups of non-breeding Sooty Oystercatchers gather at particular shores and forage collectively (C.J.Chafer unpublished data). Cultural transfer of prey-specific foraging techniques are known from H.ostralegus (Norton-Griffiths 1968; Goss-Custard & Durell 1983; discussed in Safriel 1985), and I suggest that the preference of two or three prey types illustrated by regional populations of Sooty Oystercatcher (Table 1), infers that cultural transfer of prey-specific foraging techniques also occurs within this oystercatcher species. There may however be limited transfer of Sooty Oystercatcher individuals between NSW and Victorian shores (Blakers *et al.* 1984), perhaps due to biogeographic barriers such as The Ninety Mile Beach (Bennett 1987). This may explain the lack of intertidal ascidian and echinoderm predation from Victorian populations, and the reciprocal preference for *Thais orbita* and mussels displayed by Victorian populations, both of which are minor prey components in southern NSW populations (Table 1). Clearly this facet of the Sooty Oystercatchers ecology warrants further investigation.

Size of prey and consumption time

The significant positive correlation of the time taken to consume organisms of increasing mean size has interesting implications for optimal diet models. Under the general rules of optimal foraging theory (Krebs 1978; Begon *et al.* 1990) a predator should select prey items of maximum energy value in order to satisfy its daily nutritional and energetic needs, adding smaller prey only when that taxons profitability is greater than the average daily expected rate of energy intake. If we make an assumption that net energy value increases with increasing taxon size, then the results of this study (Table 2) infer that ascidians and echinoderms and larger molluscs should dominate the diets of the Sooty Oystercatcher. This is clearly not the case (Table 1), and so it may be assumed that other factors such as the availability of prey, temporal and spatial variation in prey density, preference for a specific prey taxon, or nutritional constraints might play a role in diet selection. Lucas (1983) demonstrates that foraging bout length affects the general rules of optimal diet theory. He concludes that when foraging bout length is limited by some environmental or social constraint, the diet should become more catholic. The limitations of prey availability to periods of low tide might therefore explain the breadth of Sooty Oystercatcher diet. This subject cannot be examined thoroughly with the current data, however I suggest that studies on the energy values of common prey taxa may lead to elucidating information on how Sooty Oystercatchers utilise their environment to achieve an "energetic steady state" (Nagy 1987).

This study demonstrates that basic foraging techniques used by Sooty Oystercatcher to obtain food from rocky intertidal shores does not differ significantly from basic techniques used by other oystercatcher species. Although some of the taxa consumed by Sooty Oystercatcher are unique (eg. intertidal ascidians, sea urchins) the differential preferences from different regions is also similar to geographic variation in prey selection by congeners. The techniques used to hunt prey taxa resolve around five basic methods and are differentially used in combination with one another to affect sustainable energy acquisition between shores, and perhaps between oystercatcher populations in different biogeographic zones in south eastern Australia. Finally, during any given foraging bout, two thirds of hunting

time is dedicated to consuming food and one third to searching for suitable prey.

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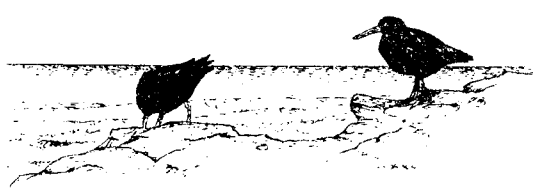

A TECHNIQUE FOR THE TREATMENT OF CAPTURE MYOPATHY

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The capture and banding of waders entails some risk to the birds. In the extreme this can mean mortality, however less dramatic but of equal concern is the predicament of birds that can not stand or fly off upon release. When these birds do not have broken bones or other obvious injuries they are thought to be suffering a condition called capture (or stress) myopathy. World-wide the capture and banding of waders has shown the incidence of capture myopathy to be as high as ten percent of some catches (Minton 1980). Certain species of waders have an increased propensity and susceptibility to developing capture myopathy. This condition has been reported in Bar-tailed Godwits *Limosa lapponica*, Red-necked Avocets *Recurvirostra novaehollandiae*, Whimbrels *Numenius phaeopus*, Red Knots *Calidris canutus*, Great Knots *Calidris tenuirostris* and Eastern Curlews *Numernius madagascariensis*.

The clinical signs of affected birds are graded from slight paresis with slight incoordination to paralysis of legs and wings. Affected birds make frequent attempts to stand and rise to their knees using their wings to brace themselves against the ground. During this initial paresis the birds attempt vigorously to escape humans who enter their flight zone.

In order to understand the condition in waders, post-mortems were carried out on affected birds caught by the Queensland Wader Study Group. In 1992, two Bar-tailed Godwits with paralysis of the legs were submitted to the Department of Pathology, University of Queensland, for post-mortem. The pallor of the leg muscles and the degeneration of fibres in these muscles was similar to that ascribed to capture myopathy in mammals. It is now assumed that birds which exhibit weakness in the legs upon release have some degree of muscle damage. Waders that die during capture and processing or thereafter undergo post mortem. This allows not only a better diagnosis and understanding of capture myopathy but gains information on other conditions including parasite burdens.

Several techniques were tested in order to determine the best method of rehabilitating birds with capture myopathy before a successful procedure was discerned. Five birds (3 Bar-tailed Godwits, 1 Whimbrel and 1 Great Knot) have been affected to the point they could not be released. Four of these birds were rehabilitated and released back into the wild. The fifth bird, a godwit, developed secondary complications and subsequently died.

Reducing the incidences of capture myopathy

In previous literature on capture myopathy minimising stress during all facets of capture and banding was implicated to reduce the incidence of capture myopathy (Stanyard 1979; Minton 1980). Though some degree of stress is unavoidable during capture, this can be attenuated by the method of capture, holding and processing. For example, any increase in the period of holding or processing will likely result in increased stress. Many stress factors can be interpreted by direct observation of the birds behaviour.

The technique for releasing waders is as important as the capture. It is essential that the birds are placed far enough away and out of sight of people. If a bird is unable to fly or stand it must be allowed to settle and relax. Many sedentary birds are stimulated into flight by the sight of other birds taking flight. If after half an hour the wader remains sitting it is recaptured and treatment commenced. Entering the flight zone and recapturing birds with capture myopathy is likely to increase the stress on the birds and thus make the condition worse. In any case, these flightless birds should never be allowed to enter the water. Once in the water the birds float with the tide and are considerably more difficult to recapture.

The Initial Treatment

Once a bird is unable to stand for half an hour and deemed to be unreleasable a saturated glucose water solution is administered (this treatment can also be applied to otherwise injured waders). The solution is administrated via a 15 cm long, 18 gauge crop needle at a rate of 1.5 ml/100 gm body weight of bird. This technique requires care and practice as birds are easily drowned. It is best to have one person holding the bird and another using the crop needle. The neck must be in total extension and the crop needle inserted over the tongue so that it runs parallel to the neck. When the crop needle is correctly positioned in the crop the bulbous end of the needle can be felt at the base of neck. The plunger on the syringe should then be slowly and steadily depressed whilst constantly watching the expanding crop. If the needle is not in the crop the oesophagus will quickly fill and fluid will be seen coming out of the bill. If this occurs, the crop needle must be immediately removed and the bird placed in a keeping cage. Care must also be taken not to over extend and rupture the crop. Crop needles can be ordered from any veterinary practice, but these are of insufficient length for large waders (contact the author for details on obtaining longer crop needles). The same amount of glucose solution is crop fed at 12 hourly intervals for the next three days or until the bird is eating well.

Literature suggests the administration of valium will alleviate the symptoms of capture myopathy (Piersma *et al.* 1991). However, our experience has been that the oral or intramuscular administration of valium at the recommended mammalian dose rates has proved unsuccessful in waders. Nevertheless, on a cannon netting trip to Morton Island in late 1993, three Godwits were given three times the recommended dose intramuscularly (0.02 ml/100 gm from 5mg/1 ml vial) at 12 hourly intervals for two days. This calmed the birds down but did not reduce the recovery time. It must be stressed that valium is an S8 drug and can only be administered under veterinary supervision. It is also recommended that valium should only be used when absolutely necessary, such as with long transportation times.

Once initial treatment is administered the bird is placed in a small enclosed box (50 x 100 and 50 cm high), with doors and air holes in the top so the bird can not look out. The addition of side doors will enable food and water to be changed without greatly disturbing the bird. Opening the box will cause the bird to panic however they will eventually calm down, and over a week they will habituate to the presence of a slow moving arm in the box. The floor can be covered with sand or any soft material including newspaper and towels. The box should be placed in a quiet area out of the sun prior to transportation.

Following-up Treatment

There are three key features to the continued treatment of waders with capture myopathy: warmth, quiet and diet.

When the wader arrives at the place of rehabilitation the box should be placed in the smallest, quietest and least disturbed room available. The temperature of the room should be maintained at 28-30°C with a reasonable humidity for at least three days. This can be achieved by the use of a fan heater blowing over a dish of water, not directly facing the bird.

Clean water with added glucose and sea salt should be provided at all times. The lip of the water dish should be flush with the level of sand on the floor as paralysed birds find raised dishes extra obstacles. The container size should correspond to the length of the birds bill i.e. the bottom of a 4 litre ice-cream container will enable the birds with long bills to drink, stand and sit in the water.

It usually takes three to four days for a bird to begin feeding. Until the bird is eating it is necessary to continue crop feeding a saturated glucose solution at 12 hourly intervals to maintain the birds energy levels. Stimulating the wader to eat is difficult and requires the presence of live food. Earthworms appear to be the most effective stimulus and mealworms can be added once the bird is eating. Once the wader is eating it is essential that there is sufficient food. This may be difficult as a godwit can eat through 1/2 to 1 cup of worms a day. Unfortunately, dead food such as meat strips will not be taken (except by Ruddy Turnstones).

In general the birds begin to stand on the 5th - 6th day post capture. Although they will initially revert back to sitting when stressed. At one week post capture the birds are released at or near the site of capture with other birds of the same species. Released birds should be observed for an hour to ensure flight and integration with the flock.

Although the above treatment of capture myopathy appears to be successful, refinements to the procedure are ongoing and any comments or queries would be welcomed by the author.

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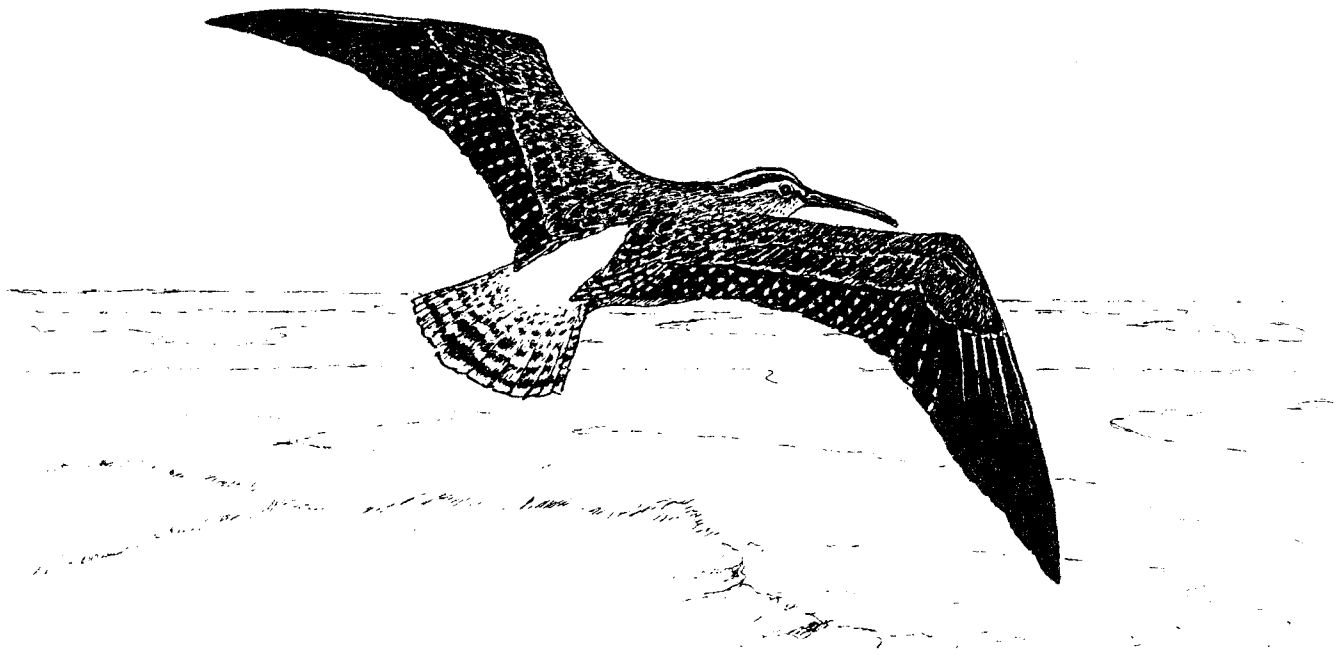

PACIFIC SECTION

BRISTLE-THIGHED CURLEW IN THE SOLOMON ISLANDS.

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The Bristle-thighed Curlew *Numenius tahitiensis* is a rare and little-known species, which breeds only in western Alaska and spends the non-breeding season on oceanic islands in the Pacific. Its normal non-breeding range extends from the north-western Hawaiian Is. and the Caroline Is. south and east to Fiji and through east Polynesia to Pitcairn and Ducie Is. (McCaffery & Gill 1992). It occurs on passage in the Aleutian Islands, (e.g. Tobish & Isleib 1992), in the main Hawaiian Islands (e.g. Pyle 1991) and in the Marquesas Is., where a small number may spend the non-breeding season (Holyoak & Thibault 1984). Vagrants have occurred in Siberia (one, Konyukhhov & McCaffery 1993); Japan (two, Ornithological Society of Japan 1974); Bonin Is. (one, Stickney 1943 *contra* Ornithological Society of Japan 1974); Santa Cruz Islands (three specimens, Stickney 1943); New Caledonia (two?, Gray 1859; H.B. Tristram *in* Layard & Layard 1882); Kermadec Is (three including one specimen; Veitch 1974); Easter Island (one sighted during two visits in 1992 and 1993, Vilina *et al* 1992); Washington State (three, U. Wilson *in* Widrig 1983; Widrig 1983; Paulson 1993); the Gulf of Alaska from Kodiak to Yakutat (many, e.g. Bent 1929; Allen 1948; Gibson 1978; Isleib and Kessel 1973); Vancouver I., British Columbia (one, Richardson 1970); and the Philippines (one specimen; Dickinson 1991). There are unconfirmed reports from Norfolk Island (Moore 1985) and north-eastern Australia (Britton 1991).

Here I report one specimen and one sight record of Bristle-thighed Curlew from the Solomon Islands. There are no previous published records of this species from the main Solomon Islands Archipelago.

SPECIMEN RECORD

Whilst examining specimens of Bristle-thighed Curlew and other *Numenius* species in the Auckland Institute and Museum, I located a specimen (B 3325) from the Solomon Islands. It had originally been labelled *N. variegatus* (now considered a sub-species of *N. phaeopus*) and had subsequently been re-labelled *N. tahitiensis*. The specimen is undoubtedly a Bristle-thighed Curlew as it possesses the bristle-like feathers on the thighs diagnostic of this species and also the distinctive uniform bright buff or cinnamon uppertail-coverts. It measured: exposed culmen 94.3 mm, wing 239 mm tarsus 58.0 mm, mid-toe and claw 50.3 mm and tail 119 mm. This makes it larger than most *N. phaeopus* and the bill measurement is outside the published range of female *N. p. variegatus* (Cramp & Simmons 1982). However these measurements fall well inside the range for female *N. tahitiensis* (RAOU; unpublished data). The data on the label state that the specimen was collected by R.W. Gosset and presented to the museum by F.J. Ohlsen. The collecting locality was simply recorded as the Solomon Islands. The accession card index could only add that the specimen was presented to the museum in October 1927. I was unable to find out anything else about the origin of this specimen. Whilst it is possible that this specimen is from the Santa Cruz Group, now geo-politically part of the Solomon Islands, the Santa Cruz Islands were generally not thought of as part of the Solomon Islands until after the Second World War (e.g. Mayr 1945).

SIGHT RECORD

On 9 January 1990 whilst walking along the foreshore of south-western Malaita island in the main Solomons archipelago, 2km north of Narioro village in the tribal land of the Are-Are people, I sighted a small *Numenius* curlew. It was about a hundred metres in front of me foraging amongst the coralline rubble. I initially thought and expected this to be a Whimbrel *N. phaeopus* which has previously been recorded from the Solomon Islands. However the combination of rather bright orange-buff upperparts and buffy underbody seemed odd for a Whimbrel and I therefore made a field description on the spot. After checking these notes against descriptions of *Numenius* species in Hayman *et al* (1986) I came to the conclusion that the bird I had been watching was a Bristle-thighed Curlew.

Description (based on field notes with some elaboration to make certain points clear but without the addition of any information from the literature): A small *Numenius* curlew, considerably larger and bulkier than nearby Wandering Tattlers *Tringa incanus* but smaller than adjacent Reef Egrets *Egretta sacra*. The bird had a distinctive downcurved, pinkish bill about 2.5-3 times length of head (i.e. considerably less than that of Far-eastern Curlew). It had a boldly striped head pattern with a distinctive dark crown with pale median crown-stripe and dark eye-stripes, setting off a pale supercilium. The upperparts were unusually orange-buff for a Whimbrel and this was caused by large buffy notches on the mantle, scapulars and tertials. The upperparts were seen well in flight. The rump and tail-coverts lacked the dark brown and buff barring of the race *hudsonicus* but were conspicuous orange-buff, almost cinnamon and formed an orange-buff squarish patch on the lower rump and upper-tail coverts; the tail was darker than the uppertail-coverts and there were buff markings on some outer feathers. The entire underparts had a diffuse buffy wash. The bird was not heard to call.

In combination of five points from this description are diagnostic of a Bristle-thighed Curlew in my opinion. I list these in decreasing order of importance:

1) the absence of alternating dark and buff barring on the rump and upper tail-coverts and this regions conspicuous orange-buff colouration.

2) the extensive diffuse buff wash of the underparts. Hudsonian Whimbrels *N. p. hudsonicus* do have some buff wash on the underparts but point one (above) excludes this subspecies from the list of likely contenders and anyway the buff wash of race *hudsonicus* is not usually all over the underparts (R.A.O.U., unpublished data).

3) the pinkish colour of the bill.

4) the buff markings on some of the outer rectrices.

5) the orange-buff upperparts caused by large buffy notches on the mantle, scapulars and tertials.

The diagnostic bristles on the thigh were not seen, however this feature is difficult to see except in the hand (Hayman *et al* 1986; R.A.O.U., unpublished data).

The extension of the range of Bristle-thighed Curlew is not surprising considering known records of vagrancy. These records are also interesting in light of the unconfirmed reports of this species on Norfolk Is. (Moore 1985) and from Cairns, north-east Queensland. (Britton 1991).

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ASIAN SECTION

LATHAM'S SNIPE IN THE RUSSIAN FAR EAST

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The present-day breeding range of Latham's Snipe *Gallinago hardwickii* embraces the islands of Japan: Hoddaido, Honshu, possibly Kyushu (Vaurie 1965; Ornithological Society of Japan, 1974, Howard & Moore 1980) as well as the South Kuril Islands, South Sakhalin and sea coast of Primorye territory (Nechaev 1969, 1973, Elsukov 1977, Elsukov & Labzuyk 1981, Stepanyan 1990). Recently this species has tended to expand its range. The snipe began to spread beyond the limits of Japanese Islands particularly over Sakhalin Island and continental coast of Primorye in the fifties and sixties and was a common nesting bird in several places of the regions mentioned. One of the probable reasons for successful colonization of new territories by this species lies in the presence of a free ecological niche in the anthropogenic landscape where such affined species as *Gallinago gallinago* and *Gallinago megala* are not observed in the breeding season.

Distribution

Latham's Snipe, was frequent in Kunashir Island (South Kuril Islands) even in the fourties: the species was noticed in the south of Kunashir in August-September of 1948 where it seems to nest (Portenko 1950). Breeding was established in 1962-1963 (Nechaev 1969). In 1982 this bird was widespread over the whole territory of Kunashir Island (Nechaev & Kurenkov 1986). In 1990 the snipe was found to nest in the south and central parts of Iturup Island (pers. obs.). Latham's Snipe may breed also on the Island Urup. During the breeding season it was observed on the Islands Shikotan (Nechaev 1969, V.M. Gudkov pers. comm.) and Zeleny (Small Kuril Islands).

The snipe was likely to appear on Sakhalin in the fifties. In 1962 and 1964 the species was common to the south part of the island in particular in the south-west coast of Krilion Peninsula (Korotkih 1965, G.I. Zakharchuk pers. comm.). Breeding was established in 1971 (Nechaev 1973). In the eighties Latham's Snipe was observed in all south parts of the island; the most northern place for nesting in the west coast was the valley of Uglegorka River and in the east - a coast of Terpenie Bay near the Isthmus Poyasok.

The first birds of *Gallinago hardwickii* were censused over Primorye territory in the early sixties; a male was obtained on 17 May 1964 on the Island Bolshoi Pelis situated in the Great Peter's Bay in the Sea of Japan (Labzuyk & Nazarov 1967). Breeding of Latham's Snipe was established in several points of Primorye: in the seventies it was observed in the north-east of the region in the lower reaches of the rivers Dzhigitovka and Serebryanka (Elsukov 1977), in the lower reaches of the Kema river, round the bays Taeszhnaya and Peschernaya (Elsukov & Labzuyk 1981), in the vicinity of Olga Bay and Serafimovka settlement (Elsukov & Labzuyk 1981). In the eighties this species was repeatedly noticed along the coast of the Great Peter's Bay (Glushchenko 1988a), where the bird undoubtedly bred (Glushchenko & Shibnev 1984). During the breeding season males performing courtship have been found in the south of Primorye in a basin of the lower stream of Razdolnaya River close to the settlement Kiparisovo (Nazarov 1986), round the bays Melkovodnaya and Kaplukova, near the village Glazkovka, in the lower reaches of Kievka River and the other places along the coast of Lazo nature reserve (Medvedev 1984, Kolomiitsev 1985, Nazarov 1986), whereas in the north-east coast of Primorye a pair of birds was observed in the Bay Udobnaya (Elsukov 1984). A valley of the lower steam of Edinka river in the north of Ternei region is the most northern occurrence of *G. hardwickii* in the north of Primorye (Nazarenko 1990).

1. Primorye territory
2. Razdolnaya River
3. Bolshoi Pelis Island
4. Great Peter's Bay
5. Lazo nature reserve
6. Olga Bay
7. Ternei Bay, Dzhigitovka River Serebryanke River
8. Edinka River
9. Sakhalin Island
10. Uglegorka River
11. Isthmus Poyasok
12. Krilion Peninsula
13. Kuril Islands
14. Kunashir Island
15. Zeleny Island
16. Shikotan Island
17. Iturup Island
18. Urup Island
19. Hokkaido Island
20. Honshu Island

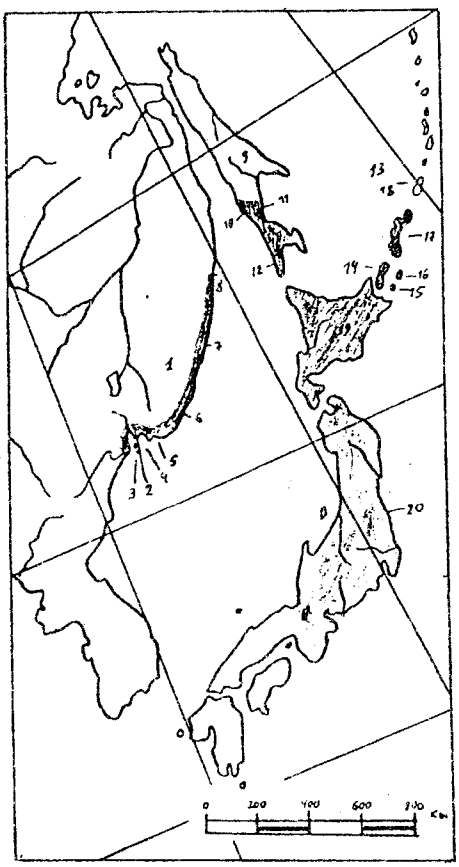

Fig. 1. The distribution of Latham's Snipe

Habitats

Unlike the Common Snipe and Swinhoe's Snipe, Latham's Snipe prefers the anthropogenic landscape, i.e. meadows, pastures, fallows, sowings or perennial grasses, firings and so on; the bird also nests on the grass moors. On Sakhalin Island this species is found in the open valleys of the lower river streams covered with sub-shrub herbaceous vegetation and sometimes hillock bogs and dry forb meadows with lots of shrubs, separate trees and pastures as well as stunted but thick bushes of *Sasa kurilensis*. Moreover this bird inhabits plains and gentle slopes of lower woodless hills both along the sea coast and 20-30 km from the shore.

On the South Kuril Islands (Kunashur, Iturup, Shikotan) Latham's Snipe occur most frequently in the gentle woodless or slightly afforested slopes of hills, volcanoes and mountain ridges as well as in the plains along the sea coast, lake and river banks. They inhabit herbaceous meadows, thickets of *Sasa kurilensis*, sub-shrub grass bogs and pastures. Birds dwell in the herbaceous meadows and low shrub grass formations on the Island Zelenyi.

Along Primorye coast during the breeding season Latham's Snipe were found on plains and slopes of hills near the sea shore (vicinities of Olga Bay not more than 40 km from the shore). Most frequently they occur in the anthropogenic landscape in herbaceous meadows without thick grasses, forests and bush vegetation, more rarely in the grass moors and moist meadows and very seldomly in the forest glades along the river valleys (Elsukov & Labzuyk. 1981).

Number

A total number is unknown in the territory of Russia. In 1971 and 1981 in the south-west coast of Krilion Peninsula (South Sakhalin) five to six courting males were censused in routes of 5 km long. In 1986 in a basin of Susuya River (near Yuzhno-Sakhalinsk) two to three males occurred along a census distance of 1 km. Along the coast of Aniva Bay (near Korsakov city) single birds were observed in the seventies while in 1988 about 10 males have been recorded in the route of 10 km long. In other parts of South Sakhalin (in the north as far as the Isthmus Poyasok) in the most suitable habitats (river valleys, seaside terraces, pastures and meadows) the number of Latham's Snipe amounted to one to two pairs along a census distance of 1 km. A total number of *Gallinago hardwickii* appeared to be not less than 500 pairs on Sakhalin in 1989 (pers. obs.).

In the south of Kunashir Island (South Kuril Islands) one pair of birds was observed in the area of 3 km^2 in 1962-1963 (Nechaev 1969), whereas in 1982 it was four to five courting males in the route of 4-5 km (pers. obs.). According to Yu. N. Glushchenko (1988 a) *Gallinago hardwickii* is a common bird of Kunashir Island. In the south of Iturup Island in 1990 the number of species for four to five courting males in a census route of 2 km (pers. obs.).

From 1973 to 1978 on a census route of 3 km along the Primorye coast (near Ternei Bay) the number of Latham's Snipe amounted to 0.7 - 3.3 individuals per km; in the vicinity of Dzhigit settlement the number of birds was 1.25 individuals per 4 km in 1970, while in 1974 it was 1.75 per 4 km. In 1978 in the vicinity of Olga Bay the average number of Latham's Snipe ranged from 0.6 to 0.8 per km throughout three census routes of 28 km (Elsukov & Labzuyk 1981).

Migrations

Spring migrations of *Gallinago hardwickii* take place in April-May. Along the coast of Aniva Bay (Sakhalin Island) the first birds were found on 22 April 1992. In Primorye (Ternei settlement) the snipe were censused on 24-30 April (1972-1977) and migrations continued up until middle of May (Elsukov & Labzuyk 1981). The post-breeding aggregations of birds were observed along Aniva Bay coast (Sakhalin) on 20-31 July and 1-15 August. The autumn departure was in September (pers. obs.). Along Primorye coast the snipes were found in autumn in late August to early October (Elsukov & Labzuyk 1981). The wintering grounds of Latham's Snipe are mostly located in the eastern regions of Australia (Hayman *et. al.* 1989).

Breeding

The nesting period is May-June. The breeding flights of males are recorded just after the first appearance of the birds at the nesting areas from 20 to 30 April and last until May or June. The most intensive courtship happens in the second half of May and into June. Some males display courtship behaviour till the middle of July.

During the courtship the snipe most commonly flies up, circling around the breeding territory. In this case the bird pronounces the measured sounds "chok-chok-..." uttering them faster while descending and then shifting, to the so-called wail-piping call. After that one can hear the buzzing sounds reminding one of boom of a jet aircraft. When around 30-40 m from the ground the bird pronounces the rapid and staccato sounds "chrek, chrek, ..." which are heard for several seconds as the bird takes off for its circling flight. Snipe are seldom observed in courtship display on the ground. During the breeding period they usually sit on top of lateral branches of trees and high stumps or posts. They perform courtship alone or in groups of four to seven individuals. The intensity of courtship depends upon the meteorological conditions and time of day; they are most active in the evening gloamings; sometimes birds do not fall silent at all during the whole night.

As a rule, the nest of Latham's Snipe is arranged on a dry site near a bog and rarely on a hillock close to water. It looks like a pit among grasses; a trough is covered with pieces of dry stems and leaves of herbaceous plants. Out of three nests found on Krillion Peninsula (South Sakhalin) one was located on the very brink of a moor in low bushes of *Sasa kurilensis* some 18-20 cm tall. The second nest was built on the dry field among perennial grasses 23-30 cm in height (*Phleum pratense, Trifolium* sp.). The third one was on a moist meadow among the herbaceous plants (*Phragmites* sp., *Carex* sp., *Veratrum* sp., *Cirsium* sp.). The sizes of two nests were (in mm): 130 x 140 wide (both), trough 105 x 110 and 110, depth of troughs 42 and 45.

The egg laying begins from 1 to 10 May on Sakhalin Island but most females lay eggs on 10-25 May and in the case of late breeding even in June. A clutch consists of four eggs. Sizes of eggs (in mm) from two clutches are as follows (Sakhalin, May 17 and 29 1981): 1) 43 x 33; 44.5 x 33; 45 x 32.5; 45 x 33.5, 2) 42 x 32; 42.5 x 31.5; 43 x 32; 43.8 x 31.5. Mass of unhatched eggs (4) was (in grams); 21.5; 21.7; 22.1; 22.8 (pers. obs).

A nest with three hatched eggs was found on Kunashir Island on 2 July 1983. The nest size was (in mm) diameter 141, trough 113, depth 54. Egg sizes (in mm) were: 43.3 x 31.2; 44.3 x 32.1 and 44.8 x 31.5 (Glushchenko 1988 b). A nest on South Primorye (near Olga Bay, 18 June 1978) contained two chicks of one to two days old and two eggs of the size 42.9 x 31.3 and 43.1 x 31.1 mm (Elsukov & Labzuyk, 1981).

On Sakhalin Island downy chicks were found on 30 May 1971; 5 June 1981 and 29 July 1978 (pers. obs), and on Primorye (vicinity of Dzhigit settlement) on 10 June 1974 (Elsukov 1977). The young of early broods are independent by July.

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A PRELIMINARY REPORT ON THE "TUNDRA ECOLOGY '94" EXPEDITION.

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Background

In February 1994 Australia was invited to send two ornithologists to participate in "Tundra Ecology '94" - a major multidiscipline scientific expedition to the Russian Arctic. Clive Minton took part in the first leg (St. Petersburg to Khatanga, 30 May to 5 July) and Danny Rogers in the first two legs (St. Petersburg to Chukotsk, 30 May to 5 August).

The Expedition

This was the largest scientific expedition ever mounted to the Russian Arctic. The Russian Antarctic Supply ship, Academic Fedorov, used for transport and as a base between each land visit was the first non-military vessel to traverse the complete length of the north Russian coast since the explorations of Nordenskiold 115 years ago. Passage was only possible by employing two (nuclear -powered) ice-breakers to create a passage through the heaviest ice which was still two to three metres thick for over 1000 km of the 7000 km coastline. A specially equipped ice-reconnaissance plane also carried out surveys every two weeks of the ice conditions ahead, transmitting complete pictures (including ice thickness estimates) through sophisticated equipment to the ice-pilots on board the ship.

Sixty scientists, half from Sweden and half from Russia, were present on each of the three legs of the expedition. The two Australians were part of the Russian team. About a third were ornithologists (and many others had good ornithological knowledge); the remainder were botanists, mammologists, icythyologists, geneticists, entomologists, meteorologists, etc.

The total cost of the expedition was $5 million, financed almost entirely by the Swedish Government through a special grant to their Polar Research Institute. This equates to a cost of around $30,000 per scientist for each leg of the expedition. However it was only by the use of expensive dedicated equipment in the form of specialist ships, aircraft and helicopters that it was possible to mount such a unique and extensive expedition to obtain access to arctic areas at the right time, i.e. to coincide with the breeding season in the short arctic summer.

Logistics

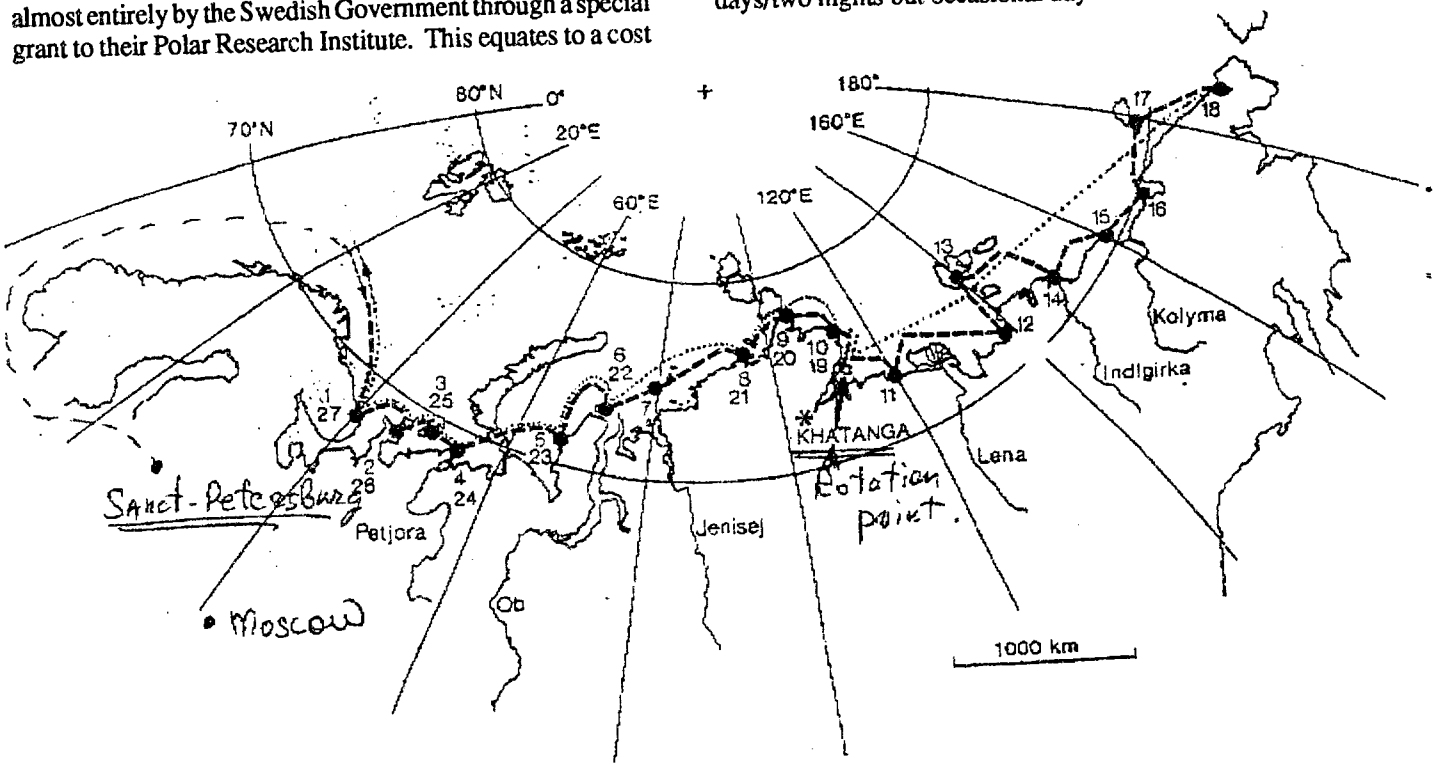
The team of scientists was taken ashore, from the ship, at nine locations between the Kola Peninsula and N.E. Taimyr on the first leg of the expedition and at eight locations between there and the Chukotsk Peninsula on the second leg. (Map 1). The third leg involved return visits, in August, to the same sites as visited in the first leg. Transport of people and their equipment (including special motorised transport and small boats) was via two large MI 8 helicopters based on the ship.

Scientists were divided into four main groups, with approximately fifteen people in each.

Wader studies/fish		
Bird census/mammals		
Botanists	)	But with two accompanying
Lemmings	)	ornithologist in each group.

The Australians were allocated to the second group but also spent some time with the first and third groups.

Four camps (sometimes more) were set up at each stopping point, with camps being three to 20 km apart and usually in slightly different habitats. The time spent in each location varied. Generally stops were for two days/one night or three days/two nights but occasional day visits were also made.



Team members fanned out over the tundra from each camp, with some individuals traversing 15 km or more. With such a large number of people deployed in this way the rate of data generation was immense and an extraordinarily comprehensive cover was obtained.

Climate

On the first leg the weather was better than expected/predicted with more sunny days and less wind than normal. Temperatures were generally about 1°C but fell below freezing quite often in the early part of the expedition. Snow fell only once and light rain on three occasions. Fog was, as usual, quite frequent. At most locations snow cover was 10-30%, but many lakes and rivers were still frozen, as was the sea. The season was said to be seven to 10 days later than average.

Results

A number of scientists had devised detailed experimental programs involving sophisticated techniques ranging, in the ornithological field for example, from a large mobile radar station for studying migration to heavy water injection into waders to study their metabolic energy consumption. The Australian participants assisted with a variety of programmes but were particularly involved in survey/census work, in nest finding/recording and in banding, especially of waders.

At each location between 20 and 50 species of birds were located. The diversity decreased as the expedition progressed northwards and eastwards. Passerines showed the most notable reduction with only the Snow Bunting being common at the highest latitude (though a stray Barn Swallow was seen at the most northerly point, Cape Chelyuskin, at 78°N!) On one 'memorable' day (because we were surrounded by breeding Red Knot, Sanderling, Ruddy Turnstone, Curlew Sandpiper, Grey Plover and Purple Sandpiper) we actually totalled only 12 species. Waders were the most widespread group, followed by geese, ducks, skuas, gulls, terns, birds of prey, gamebirds, divers and swans. Many species were found in areas where they were not previously known to be breeding. The extensive census data clearly illustrated the change in species and abundance with habitat/latitude/longitude.

The timing of the first leg of the expedition proved to be ideal. At each location visited virtually all the breeding birds had arrived. Territorial display was at its peak. Some species had just started to incubate complete clutches of eggs, others were in the process of laying, and a few (notably Little Stint and many of the ducks) had not yet started to nest. The rate of progress of the expedition coincided with the spread of the thaw thereby producing a similarly ideal situation at each location. A large number and variety of nests was found - 34 different species on the first leg by the Australian participants alone.

A good variety of breeding waders was caught at the nest with 'walk-in' or 'spring' traps. It was particularly valuable to be able to compare plumages of the different sexes in the hand, and also to obtain biometric data. Weights were particularly interesting (and valuable) as such information is rarely available for museum skins. Males tended to be close to their fat free weight, presumably because of high energy consumption/little time for feeding as a result of their intensive flight and territorial display activities and occasional incubation duties during the egg laying period. Females, in spite of laying eggs equivalent to more than 50% of their body weight over a four day period, were typically 15-35% above their lean weight - presumably a reserve laid down to carry the bird through the incubation period, when feeding time is severely limited in many species (those in which incubation is not shared by the sexes).

The good weights observed in breeding waders was an indication of the surprising abundance of food available to them on the arctic tundra so early in the season. Observations of birds, both waders and passerines, feeding on patches of melting snow and on ground very recently uncovered by the thaw indicated that most of the food taken had been preserved by the ice/snow from last summer. A Reed Bunting, for example, was seen to pick up and consume a three cm caterpillar from a patch of snow in dwarf willow scrub. Nature had thus cleverly stored, for some nine months, part of the bounteous invertebrate and berry crop left over from the previous season. Thus, so long as the waders are not confronted by significant new snowfalls after arriving on the first patches of clearing tundra, they would not seem to be short of the food resources necessary to initiate the breeding cycle; by the time the chicks hatch the new season's crop of insects and larvae should be available.

Another highlight associated with banding was the catching of two Dunlin wearing Swedish bands. One of the Australian participants also picked up a band on the tundra which had been put on a Bean Goose in Holland 15 years before. A Curlew Sandpiper with a coloured leg flag (orange) from Victoria was seen on N.E. Taimyur, some 12,000 km from Melbourne. Later, on the second leg of the expedition, further colour marked waders from Australia were observed - a Sanderling, from S.E. Australia, was found breeding on the New Siberian Isles (off the north coast of Russia, and due north of the banding area), and a Bar-tailed Godwit from N.W. Australia (yellow flag) in a post breeding congregation near the Indigirka Delta. The last two records are the furthest north recoveries of these species from Australia (in fact the Sanderling is the first to be recovered on the breeding grounds). The Curlew Sandpiper is the second from the Taimyr and indicates the probable western limit of the breeding areas from which waders regularly migrate to Australia. It also confirms that there is a considerable overlap in the breeding areas of Curlew Sandpipers which migrate to Africa and to Australia.

Another surprising discovery by the Expedition was the prolonged duration of the 'spring' migration. Extensive movements of geese, waders, skuas and some passerines towards the northern-most breeding grounds continued until June 26 (by which time some of the birds at the first site visited, on the Kola Peninsula, in early June would have already hatched eggs).

Whilst this report has concentrated on ornithological matters it is relevant to also mention the main findings in relation to lemmings, since their cycles of abundance are closely linked to the breeding success of waders (via associ-

ated predation pattern variations). Lemmings were totally absent at the first four locations visited. However from West Yamal onwards they were common and on parts of the Taimyr they were abundant. As predicted therefore 1994 looks likely to be a 'lemming year' in the parts of the arctic in which waders visiting Australia breed. This should lead to good chick production as the predators will be concentrating on the easy food source of lemmings. It was very noticeable that the density of predators, particularly the three species of skuas, was highest in areas where most lemmings were present.

Overall the Expedition was considered by everyone to have far exceeded expectations in terms of results as well as being a memorable, unique and extremely enjoyable experience.

Benefits to Australian participants/Australia.

1. The participants benefited greatly from the new perspective they now have on waders as a result of seeing first hand and for the first time the breeding phase of the annual cycle and the different habitats utilised by each species.
2. Plumage differences observed in breeding birds confirmed suspicions emanating from wader studies in N.W. Australia that it is possible to distinguish between the sexes of some species when they are in breeding plumage. This will assist in refining information generated on biometrics and the timing of migration in Australia.
3. A variety of research techniques was learned which will, in due course, be of use in Australia. The simplest and most immediate of these were spring traps and walk-in traps for catching waders at the nest. These will be applied in Hooded Plover and Pied Oystercatcher studies in Victoria.
4. A wide range of good relationships in the ornithological field was established with Russian and Swedish scientists. This will have mutual benefits in the future in a number of ways:

   a. exchange of knowledge/information/research papers etc. on an ongoing basis.

   b. widespread awareness in Russia, for the first time, of the importance of Australia as a wintering area for waders breeding in Russia (two million birds, out of the total three million waders in Australia).

   c. awareness in Russia of the extent of the Australian wader banding and colour leg-flagging programme. This should lead to more reports of our birds from Russia.

   d. increased desire and opportunity for exchange visits and participation in future joint fieldwork programmes in both countries.

   e. more widespread understanding and support for (in Russia) the proposed joint agreement on the protection of migratory birds and their habitats.

Statement of intent

A document outlining views and intentions in relation to proposed future collaboration in the ornithological field was drawn up and signed by the leader of the Russian team, Professor E. Syroechkovsky, and by one of the Australian scientists, Dr. C.D.T. Minton. It is hoped, *inter alia*, that means can be found to enable Russians to participate in the next wader study expedition to N.W. Australia, scheduled for March/April 1996.

Acknowledgements

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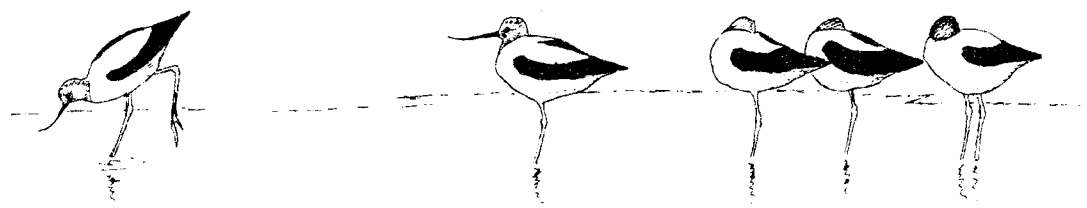

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PECTORAL SANDPIPER	20.34, 21.7, 21.34, 22.10, 23.37

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RED-CAPPED PLOVER	19.44, 20.8, 20.13, 20.14, 20.34, 21.7, 21.9, 21.13, 21.17, 22.7, 22.10, 22.18, 23.7, 23.8, 23.24, 23.27, 24.7, 24.26
RED-KNEED DOTTEREL	19.19, 20.8, 20.10, 20.30, 20.34, 21.2, 21.7, 22.10
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RED-NECKED AVOCET	19.19, 20.8, 20.13, 20.14, 20.34, 21.5, 21.7, 21.9, 21.28, 22.10, 22.18, 23.8, 24.26
RED-NECKED PHALAROPE	20.8, 20.45, 20.48, 20.50, 21.9, 22.10, 22.52, 23.37
RED-NECKED STINT	19.2, 19.39, 19.42, 19.44, 20.8, 20.11, 20.13, 20.14, 20.34, 20.38, 20.42, 20.43, 20.45, 20.65, 20.50, 21.7, 21.13, 21.17, 21.34, 22.5, 22.7, 22.10, 22.16, 22.18, 22.24, 22.47, 22.52, 22.53, 22.60, 23.7, 23.8, 23.10, 23.24, 23.27, 24.5, 24.7, 24.11, 24.18, 24.26, 24,28, 24.38
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RIVER LAPWING	22.52
RUDDY TURNSTONE	19.42, 19.44, 19.61, 20.8, 20.14, 20.34, 20.38, 20.45, 20.50, 20.52, 21.7, 21.9, 21.13, 21.36, 22.5, 22.10, 22.18, 22.24, 22.47, 22.52, 22.53, 23.24, 23.27, 24.5, 24.7, 24.11, 24.26, 24.36
RUFF/REEVE	19.50, 20.34, 21.7, 22.52, 23.37
SANDERLING	19.2, 19.42, 19.44, 20.8, 20.13, 20.34, 20.45, 20.50, 21.7, 21.22, 21.34, 22.7, 22.10, 22.18, 22.24, 22.47, 22.52, 23.24, 24.11, 24.19, 24.38
SHARP-TAILED SANDPIPER	19.2, 19.44, 20.8, 20.11, 20.13, 20.14, 20.34, 20.45, 20.50, 20.68, 21.7, 21.9, 21.13, 21.17, 21.36, 22.5, 22.7, 22.10, 22.16, 22.18, 22.24, 22.47, 22.52, 23.8, 23.37, 24.5, 24.7, 24.11, 24.18, 24.26
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TATTLER SPECIES	20.34, 21.7, 21.34, 24.11
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WHITE-TAILED LAPWING	22.52
WILSON'S PHALAROPE	19.1
WOOD SANDPIPER	19.42, 19.50, 20.8, 20.14, 20.34, 20.45, 20.50, 21.7, 22.10, 22.52
WRYBILL	19.26, 21.36, 22.53
YELLOW-WATTLED LAPWING	22.52

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.

130 Pied Oystercatcher *Haematopus longirostris*

100-96839 06.BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 890806 +3 U VICTORIAN WADER STUDY GROUP
48 26 1F.LAKES ENTRANCEVIC 37d52m S 148d0m E 940427 U U DOWLING
Distance: 169 km Direction: 57 degs. Time elapsed: 4 yrs 8 mnths 21 days

100-96841 06.BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 890806 2 U VICTORIAN WADER STUDY GROUP
48 26 7F.WOOLOOWARE BAY (BOTANY BAY)NSW 34d1m S 151d9m E 940108 U U STRAW
Distance: 673 km Direction: 41 degs. Time elapsed: 4 yrs 5 mnths 2 days

100-99508 07.UFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920321 1 U VICTORIAN WADER STUDY GROUP
05 13 16.THE GURDIES WESTERNPORT BAYVIC 38d22m S 145d33mE 931017 +3 U VICTORIAN WADER STUDY GROUP
Distance: 117 km Direction: 287 degs. Time elapsed: 1 yrs 6 mnths 26 days

131 Sooty Oystercatcher *Haematopus fuliginosus*

101-01656 FI.FLINDERS IS FIVE IS NSWNSW 34d27m S 150d56mE 930116 P U BATTAM
48 26 9F.WARDEN HEAD - ULLADULLANSW 35d22m S 150d29mE 930901 U U CHAFER
Distance: 110 km Direction: 202 degs. Time elapsed: 0 yrs 7 mnths 16 days

140 Double-banded Plover *Charadrius bicinctus*

NC5-0612 39.TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 921103 +1 F NEW ZEALAND BANDING SCHEME
48 13 4F.HASTINGS POINTNSW 28d22m S 153d35mE 940323 +1 U KLEIBER
Distance: 2307 km Direction: 315 degs. Time elapsed: 1 yrs 4 mnths 20 days

NC5-0612 39.TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 921103 +1 F NEW ZEALAND BANDING SCHEME
48 13 4F.HASTINGS POINTNSW 28d22m S 153d35mE 940406 +1 U KLEIBER
Distance: 2307 km Direction: 315 degs. Time elapsed: 1 yrs 5 mnths 3 days

153 Bar-tailed Godwit *Limosa lapponica*

072-41326 NB,NORTH END OF NUDGEE BEACH BRISBANEQLD 27d20m S 153d5m E 930503 +1 U DRISCOLL
30 05 X1.PANAMA RD MT WELLINGTON NEW ZEALAND 36d55m S 174d51mE 940307 U U NEW ZEALAND BANDING SCHEME
Distance: 2302 km Direction: 123 degs. Time elapsed: 0 yrs 10 mnths 4 days

165 Great Knot *Calidris tenuirostris*

061-87275 BI,BISHOP IS MOUTH OF BRISBANE RIVERQLD 27d21m S 153d10mE 910303 +1 U DRISCOLL
21 05 8F.MANILA BAY SEASHORE 14d30m N 120d58mE 940501 U U ABAD
Distance: 5805 km Direction: 319 degs. Time elapsed: 3 yrs 1 mnths 28 days

062-09539 B1,BISHOP IS MUUTH OF BRISBANE RIVERQLD 27d21m S 153d10mE 930320 +1 U DRISCOLL
21 05 8F,MANILA BAY SEASHORE 14d30m N 120d58mE 940501 U U ABAD
Distance: 5805 km Direction: 319 degs. Time elapsed: 1 yrs 1 mnths 11 days

062-09854 NB,NORTH END OF NUDGEE BEACH BRISBANEQLD 27d20m S 153d5m E 930503 +1 U DRISCOLL
21 13 8F,MANILA BAY SEASHORE 14d30m N 120d58mE 940501 U U ABAD
Distance: 5798 km Direction: 319 degs. Time elapsed: 0 yrs 11 mnths 28 days

161 Curlew Sandpiper — Calidris ferruginea

041-46352 01,BEACHES CRAB CK RD ROEBUCK BAY BRD 18d0m S 122d22mE 880404 +2 U AUSTRALASIAN WADER STUDY GROUP
05 13 03,MAI PO MARSHES HUNG KUNG 22d29m N 114d2m E 940423 6 U WORLD WILDLIFE FUND FOR NATURE
Distance: 4591 km Direction: 348 degs. Time elapsed: 6 yrs 0 mnths 19 days

041-47739 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 890520 1 U VICTORIAN WADER STUDY GROUP
05 13 08,KANNAN, KEH-YEA RIVER ESTUARY, HSIN C 24d48m N 120d54mE 930828 +2 F TAIWAN BIRD BANDING CENTRE
Distance: 7477 km Direction: 336 degs. Time elapsed: 4 yrs 3 mnths 8 days

162 Red-necked Stint — Calidris ruficollis

041-70602 10,BROOME TOWNWA 17d58m S 122d14mE 920401 +2 U AUSTRALASIAN WADER STUDY GROUP
01 19 3F,AT SEA IN HAI PHONGS TERR WATERS VIET 20d45m N 106d50mE 940330 U U HUU CHIEU
Distance: 4620 km Direction: 338 degs. Time elapsed: 1 yrs 11 mnths 29 days

041-82923 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931229 +2 U VICTORIAN WADER STUDY GROUP
05 13 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 940423 6 U WORLD WILDLIFE FUND FOR NATURE
Distance: 7447 km Direction: 329 degs. Time elapsed: 0 yrs 3 mnths 25 days

GNU-58694 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 910827 5 U WORLD WILDLIFE FUND FOR NATURE
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRD 18d0m S 122d22mE 940305 U U AUSTRALASIAN WADER STUDY GROUP
Distance: 4591 km Direction: 168 degs. Time elapsed: 2 yrs 6 mnths 6 days

032-51169 05,ORIELTON LAGOONIAS 42d47m S 147d32mE 850126 1 U SHOREBIRD STUDY GROUP (BOAT)
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931229 +2 U VICTORIAN WADER STUDY GROUP
Distance: 581 km Direction: 333 degs. Time elapsed: 8 yrs 11 mnths 3 days

AUSTRALASIAN WADER STUDIES GROUP
OFFICE BEARERS

ADVICE TO CONTRIBUTORS

The Stilt publishes original papers and short notes on the waders (shorebirds) of the Australasian/East Asian flyway.

Contributions will be accepted in any form. However where possible they should be typed,well spaced with generous margins and on one side of paper only. They may be submitted as either a computer disk and one hard copy or as hard copy only. Disks should preferably be saved as an ASCII file (text only). If an ASCII file cannot be provided the software used should be specified.Disks may be 3" or 5" and must be IBM compatible. For further advice on suitable software contact the Editor.

The style of presentation for *The Stilt* generally follows that given in 'Advice to Contributors in *Emu*. Briefly these are: Tables and figures should be numbered consecutively with Arabic numerals. Each table or figure should be presented on a separate sheet,be as simple as possible and designed to fit the width of a page or column,though exceptionally they may be printed lengthwise.Drawings and diagrams should be in ink or laser printed if by computer generation. Figures should be sized to allow for reduction (or enlargement) by up to 50%.

Scientific names of species and genera should be printed in italics or underlined. They should appear after the first mention of a species by its English name,not enclosed by brackets. Only one of the names need appear thereafter. English names for birds occurring in Australia are those in *Recommended English Names for Australian Birds,Supplement to Emu*,Vol.77; for endemic New Zealand species those listed in *Annotated Checklist of the Birds of New Zealand*,1970; and for South Asian birds not included in the above those given in *A Field Guide to the Birds of South-East Asia*,1975 and reprints,King,B.,M.Woodcock & E.Dickinson. Nomenclature and order of families should be those of *The Atlas of Australian Birds* or as above for New Zealand or South Asia. Where variation occurs in English or scientific names used in the above sources,or a species mentioned is not listed in any of them,the decision on naming will rest with the Editor.

References should be listed at the end of papers with titles of periodicals given in full. For style see those in this issue.

Dates should be written '1 October 1993' except in tables or figures where they may be abbreviated. The 24-hour clock should be used.

Manuscripts should be sent to the Editor,closing dates are 28 February and 31 August.

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