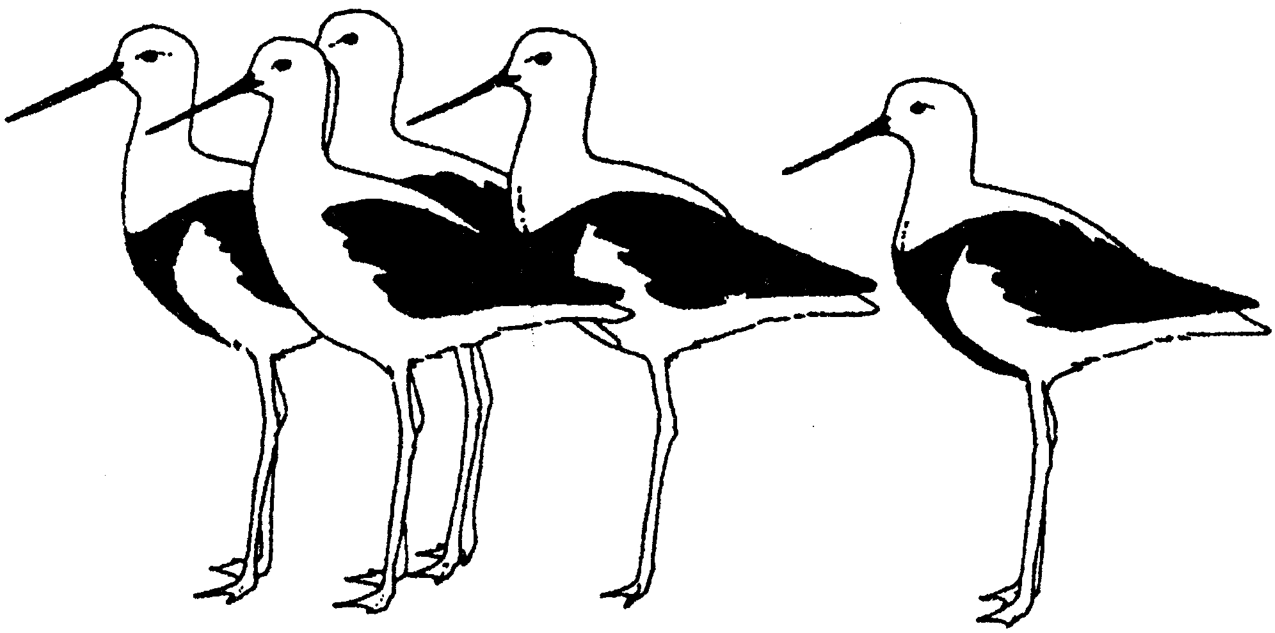
The Stilt

A Bulletin of the East Asian-Australasian Flyway



Bulletin of the Australasian Wader Studies Group

a special interest group of the Royal Australasian Ornithologists Union

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OBJECTIVES OF THE AUSTRALASIAN WADERS STUDIES GROUP (AWSG) OF THE ROYAL AUSTRALASIAN ORNITHOLOGISTS UNION (RAOU):

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, foraging 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.

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MEMBERSHIP OF THE AUSTRALASIAN WADER STUDIES GROUP

Membership of the AWSG is open to anyone interested in the conservation and research of waders (shorebirds) in the East Asian-Australasian Flyway. Members receive the twice yearly journal *The Stilt*, and the quarterly newsletter *The Tattler*. Please direct all membership enquiries to Jane Staley at RAOU HQ, 415 Riversdale Rd, East Hawthorn, 3122. Vic., AUSTRALIA. Ph: 03-9882 2622, fax: 03-9882 2677.

EDITORIAL

As this is the first volume of *The Stilt* in which I have been Editor, it is appropriate to outline my editorial policies, and my vision of the future directions of the bulletin.

Editorial Policies

The text on the inside covers of this issue broadly defines the role of *The Stilt*. In particular, I wish to continue the tradition of a "friendly" reviewing system, and I will endeavour to ensure that all contributions are reviewed. The editorial team will assist contributors, and we are happy to help them overcome any hurdles they face while preparing material.

Scope

I would like to emphasise that this bulletin is not only interested in migratory waders, whose movements define the Flyway, but also in resident (non-migratory) waders from throughout the Flyway. For example, a paper on Malaysian Plovers would be considered appropriate.

Future Directions

I have provisionally developed a few broad goals which I hope to realise during my Editorship. These are:

- To ensure that *The Stilt* presents material from throughout the East Asian-Australasian Flyway, and relevant Pacific Regions.
- To continue, and if possible increase, the number of observational, research and technical papers.
- To increase production quality.

One interesting model for *The Stilt* is the *Wader Study Group Bulletin* (edited by David Stroud), a publication of the International Wader Study Group. Another model can be found in the new format of the *Australasian Raptor Association News* (edited by Mark Holdsworth), a publication of the Australasian Raptor Association which, like the AWSG, is a special interest group of the RAOU. Both are available at the RAOU HQ library.

The Role of Members

The success of *The Stilt* clearly rests with the members of the AWSG, and with regular contributions from authors. Do you have anything to contribute? If you are unsure, please feel free to contact the Editor and discuss any ideas. If you require assistance in the preparation of material, the Editor might be able to assist. Contributors are reminded that a comprehensive and recent literature review for Australasian waders is presented in Volumes 3 and 4 of *HANZAB* (*Handbook of Australian, New Zealand and Antarctic Birds*).

There will always be tasks in the preparation of *The Stilt* that require volunteers. Anyone who is interested in helping is encouraged to contact the Editor.

Finally, I hope you continue to enjoy *The Stilt*, but I also want to hear any ideas or criticisms about the bulletin.

Michael Weston, *Editor*

AWSG COMMITTEE FOR 1996-1998

Subject to members approval of the new Committee structure, the new Committee to take office from 1 June is:

Chairperson	Mark Barter
Vice-Chair	Peter Driscoll
Secretary-Treasurer	Jeff Campbell
Research Coordinator	Roz Jessop
Editor	Michael Weston
Assistant Editor	Phil Straw
Conservation Officer	Sandra Harding
Liaison Officer	Hugo Phillipps
Committee Members	Ken Harris
	David Henderson
	Laurie Living
	Clive Minton
	Brenda Murlis
	Doug Watkins

Brenda Murlis, *Secretary*

CHAIRMAN'S REPORT FOR 1995

1995 can best be described as a year of consolidation, with no major expeditions or publications taking place. Nonetheless, there was much to be pleased with.

As you will have read in *The Stilt*, the shorebird conservation momentum started in Kushiro in December 1994 has continued with development of the Shorebird Action Plan and the Shorebird Flyway Reserve Network The Network is being launched at the March 1996 Ramsar Convention in Brisbane. The AWSG is holding a Conference entitled "Shorebird Conservation in the Asia-Pacific Region" on the weekend prior to the Convention to draw attention to the status of, and threats to, shorebirds in the region, and to enable participants to contribute to the Action Plan. The majority of speakers will come from outside Australia. There will be an opportunity for the collective views of the Conference to be presented at the Ramsar Convention.

Those of you have had a chance to read the wader texts in Volume 3 of *The Handbook of Australian, New Zealand and Antarctic Birds* will have seen that banding and count data from the AWSG, and state wader study groups, have made a major contribution to knowledge. Published information, like this, is extremely important for conservation purposes. Those of you who have contributed to this vast volume of data have reason to be happy with the result.

In the field, perhaps the most significant happening was the Banded Stilt nesting event at Lake Ballard in WA, where fast work by Clive Minton and Western Australia Department of Conservation and Land Management, allowed the completion of the most comprehensive study of the species' breeding biology ever undertaken. Pavel Tomkovich finished his three-year study of Great Knot breeding biology (funded by ANCA through the AWSG) and this time managed to get into the remote mountain tundra before the birds. Forthcoming papers will do much to fill in the annual life cycle of this enigmatic wader, the second most common in Australia. Leg-flagging continues to add considerably to our knowledge of migration routes and movements within Australia. Some 20,000 waders have been leg-flagged within Australia during the last five years; an immense effort for those both making and applying the flags. There have also been some interesting movements of flagged birds to Australia, perhaps the most valuable being a Red Knot from the New Siberian Islands to Broome. Perhaps this is a new sub-species.

Analysis of the AWSG population monitoring data continues and the results should be published during 1996.

There will be another AWSG Expedition to north-western Australia, lasting for seven weeks through most of March and April 1996. Overseas interest is considerable and attendance promises to be the largest ever. It is hoped that there will be a large contingent from countries in the East Asian-Australasian Flyway.

The RAOU Council has approved the proposed changes to the AWSG Committee structure which are designed to take us into the future. The changes involve appointment of a Vice-Chairman, amalgamation of the Secretary and Treasurer roles and appointments of an Assistant Editor, Conservation Officer and three additional Committee members. The major benefits will be improved geographical representation, formal recognition of the AWSG's conservation role and more people to share the work load. The RAOU will be taking over the day-to-day operation of our membership and financial records, which will allow the amalgamation of the major administrative functions. Of course, none of this can occur without your approval. So please vote!

I would like to thank the outgoing Committee and welcome the new one taking office on 1 June 1996. All the old Committee are on the new one but some jobs have changed and we have eight new faces. Welcome to them!

As you will have already noticed, membership subscriptions have been increased, for the first time since 1988, to cover increased costs, mainly in producing *The Stilt* and *The Tattler*. Hopefully, we can maintain these at the same level for some years ahead.

Membership has increased by 12 since 1994 and now numbers 309. Perhaps many members are unaware of the international nature of the Group. This is shown by the fact that we have 102 members from 27 overseas countries. With the growing Flyway conservation activity, it is planned to enlarge the role of *Stilt* and *Tattler*, with editorial and financial assistance from Wetlands International. This will mean still more overseas members.

Mark Barter, *Chairperson*

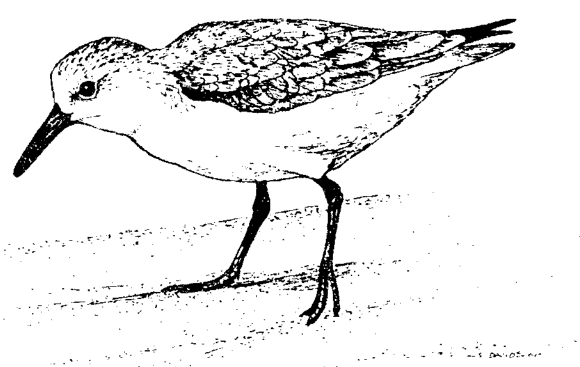
TREASURER'S REPORT FOR 1995

As indicated in *The Stilt* 27 (page 3), present subscription income is entirely used in the production, printing and posting of *The Stilt*, hence the need for an increase in subscription rates in order to finance other AWSG activities and publications, including *The Tattler*. Our end-of-year balance is somewhat inflated because payments associated with *The Stilt* 28 were not due until January 1996 (although the secretary's expenses include pre-payment for the postage of this issue) and our receipts include income from the sale of *Wader Movements in Australia* (later to be transferred to the Research Fund) and from the sale of *A National Plan for Shorebird Conservation in Australia* (profits from this publication will be shared with WWFN).

Further grants from ANCA helped finance continuing studies of the Great Knot in Siberia and contributed towards the expenses of the three AWSG members involved in the "Tundra Ecology '94" expedition to northern Russia. Sandra Harding, our Conservation Officer, attended the Australian Wetlands Alliance Meeting in Sydney, and the AWSG contributed towards her expenses by paying her airfare, and final payments were made to AWSG members who attended the workshop in Kushiro, Japan (the money having been provided from ANCA in 1994).

Donations to the Research Fund were similar to those received in 1994, but profits from the sale of *Wader Movements in Australia* added significantly to our end-of-year balance. $500 was transferred to the AWSG account, this sum having been transferred to the Research Fund in 1989 in order to attract the higher rate of interest for that account.

David Henderson, *Treasurer*



Australasian Wader Studies Group
Statement of Receipts and Payments for the period
1st January 1995-31st December 1995

RECEIPTS	$	PAYMENTS	$
Balance b/f	12059.35	*Stilt* -typing and layout	480.00
Subscriptions	3167.81	-printing	1000.00
Sale of *Stilt* Back Nos.	287.00	-postage	595.45
Sale of *National Plan*	895.6	-envelopes	78.55
Sale of *Wader Movements*	1405.95	*Tattler* -printing	702.15
Sale of *Tattler*	84.60	AWSG letterheads	20.00
Sale of *Xuan Thuy Report*	6.00	Great Knot Studies	10452.96
Consultancy fees from ANCA	13000.00	Expedition to Russia	3000.00
Payment for wader slides	48.95	Airfare for Conservation Officer	229.00
Donations to RAOU Broome appeal	200.00	Kushiro Workshop expenses	3743.00
Wader Conference Registration	65.00	AWB Subscriptions	713.00
AWB Subscriptions	479.00	Transfer to Research Fund	225.00
WSG Subscriptions	120.00	Secretary's expenses	1426.00
Transfer from Research Fund	500.00	Chairman's expenses	359.03
Bank Interest	326.79	Bank Charges	82.40
		State Government Tax	20.96
		Balance c/f	9518.55
	32646.05		**32646.05**

RAOU Research Fund (AWSG)
Statement of Receipts and Payments for the period
1st January 1995-31st December 1995

RECEIPTS	$	PAYMENTS	$
Balance b/f	882.46	Regular Counts expenses	45.93
Donations	372.00	Transfer to AWSG Account	500.00
Sale of *Wader Movements*	785.00	Bank Charges	6.00
Bank Interest	19.87	State Government Tax	0.90
		Balance c/f	1506.50
	2059.33		**2059.33**

AWSG Expeditions
Statement of Receipts and Payments for the period
1st January 1995-31st December 1995

RECEIPTS	$	PAYMENTS	$
Balance b/f	701.04	State Government Tax	3.76
Bank Interest	13.77	Bank Charges	2.50
		Balance c/f	708.55
	714.81		**714.81**

LITERATURE

The list below presents recent literature (articles and books), from sources generally not referenced by standard indexes. In future, a complete list of recent literature will be presented in *The Stilt*. This list will be compiled by the International Wader Study Group, and will be the same as that appearing in the *Wader Study Group Bulletin*. As part of this arrangement, literature from the Flyway will be compiled by the AWSG and submitted for inclusion in the IWSG list. The Literature Editor would appreciate any additions or suggestions for future lists. Please forward details to the Literature Editor.

Andrew, D. 1995. *More on Tattlers*. Aust. Birding 2(2): 7.

Anon. 1995. *Marsh Harrier Robs Lapwing Nest*. Australasian Raptor Ass. News 16(2&3): 23-4.

Anon. 1995. *American Golden Plovers in NSW*. Aust. Birding 2(1): 3.

Anon. 1995. *Working for the Yankee Dowitcher*. Aust. Birding 2(2): 1.

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Baker, G.B., E.B. Dettmann, B.T. Scotney, L.J. Hardy, & D.A.D. Drynan. 1995. *Report on the Australian Bird and Bat Banding Scheme, 1984-95*. ANCA, Canberra.

Bunkport, K. 1995. *Little Aussie Tattlers*. Aust. Birding 2(1): 17-20.

Carey, G. 1995. *Hong Kong Bird Report 1994*. Hong Kong Bird Watching Society, Hong Kong.

Collins, P. 1995. *The Birds of Broome. An Annotated List*. RAOU Broome Bird Observatory, Broome.

Dames & Moore and WBM Oceanics. 1996. *Karumba Draft Environmental Impact Assessment*. Report to Port Corporation of Queensland.

Demong, N.J., & S.T. Emlen. 1995. *Signals of the Flesh*. Aust. Nat. Spring 1995: 26-8.

Edwards, R. 1995. *Northern Exposure*. New Scientist September: 32-36.

Heislers, D. 1994. *Eastern Victorian Coastal Trek: An Environmental Snapshot*. Report of Victorian Coastal Trekkers Inc.

Hutchinson, M. 1995. *Counting the Birds of the Big Basin*. Geo 18(1): 22-3.

Langford, K. 1996. *Working Internationally to Save Our Migratory Wildlife*. Aust. Wildlife Autumn 1996: 20-21.

Lawler, W. 1995. *Wader Roost Construction in Moreton Bay: A Feasibility Study into the Construction of Migratory Wader (Shorebird) High Tide Roosts in Moreton Bay, Qld, using Raby Bay as a Case Study*. QWSG and Qld Dept. Of Lands, Brisbane, Qld.

Rattigan, W. 1995. *The Importance of the Ramsar Convention*. Aust. Cons. 1: 10-12.

Rogers, D., M. Weston & C. Minton. 1995. *Catching up with Australian Birds in Siberia*. Geo 17(5): 94-104.

Ross, E. 1996. *Moreton Bay*. Aust. Wildlife Autumn 1996: 14-16.

Samuel, C. 1996. *Australia's Ramsar Wetlands*. Aust. Wildlife Autumn 1996: 12-13.

Walker, L., & A. Marshall. 1996. *Strictly for the Birds*. On the Road Jan.: 12-14.

Watkins, D. 1996. *An International Network of Reserves for Shorebirds*. Wingspan 6(1): 9.

Weaver, K. & D. Watkins. 1995. *Migrating Downunder*. Aust. Cons. 1: 13-15.

Weston, M.A. 1994. *Beach Residents Living on the Edge*. Geo 16(3): 22-3.

Weston, M.A. 1995. *Snipers Band Together in the Suburbs*. *Geo* 17(3): 18-19.

Michael Weston, *Editor*

VIDEOS

Listed below are three videos, which are not new, but might be useful for those interested in behaviour or field identification of waders. All are available from the RAOU library.

Australia's Birds: Seashores. Geo Wildlife Documentaries. This 52 minute video investigates the life histories of 17 shorebirds.

Australia's Birds: Wetlands. Geo Wildlife Documentaries. During the course of this 51 minute video the life histories of two waders (Red-kneed Dotterel and Black-fronted Plover) are discussed.

New Zealand's Waterbirds. Geo Wildlife Documentaries. This 50 minute video covers the natural history of 6 waders.

Michael Weston, *Editor*

RAOU REPORT INDEX: A NEW TOOL FOR WADER RESEARCH

Everyone who conducts worthwhile ornithological research, whether as a professional, a student or an enthusiastic amateur, will inevitably undertake a literature search to gain background knowledge on their chosen topic. This usually involves scanning the journals and newsletters, comprehensive and authoritative textbooks and state- or regional-based publications. However, one valuable resource which is all-too-often ignored is the Report Series published by the RAOU. Started in 1980, this series contains much information on many groups of birds, particularly waders. There are at least eight RAOU Reports which deal exclusively with waders, including two which are devoted to the ecology of the Latham's Snipe and the Hooded Plover, respectively, while at least six others give details of censuses for the Gulf of Carpenteria, Kakadu National Park, northern Australia and The Coorong. Numerous other reports also contain material on waders including details of surveys and unusual records, and discussions of various management issues. In addition, several Bird Observatory reports also include information on wader-banding activities and regular counts.

In order to provide increased ease of access to this underutilised goldmine of information, the RAOU has prepared a comprehensive species index to the first 75 Reports in the series. In all, the index catalogues hundreds of entries for 78 species of waders - from *Arenia* to Yellowlegs (there weren't any Z-waders listed) - mentioned in the RAOU Reports. Each species is listed twice, under both scientific and common names, and uses the most up-to-date nomenclature, for maximum efficiency. By directing them straight to relevant information, the index will enable researchers to save hours of valuable time, and provide them with useful data which may have otherwise been overlooked. An essential addition to any ornithological library, the index will soon be available through the RAOU Sales Department.

John Peter

WADER LISTS ON THE INTERNET

The Internet currently boasts two main wader lists: 1) the Western Shorebird Group list, and 2) the Waders-l list. Of course, waders are discussed on general bird lists as well, such as the Australian Birdchat Listserver.

Basically, lists are places (locations or addresses) on the Internet where information and correspondence on particular topics are held and distributed. The server distributes material to the Internet account of "subscribers".

Western Shorebird Group List

This list has existed for some time, and it concentrates on waders in the Western Hemisphere. To subscribe to this list send an email message to:
Majordomo@unr.edu

AND in the body of the message type:
subscribe wsg

This information is based on a message from Declan Troy.

Waders-l

Waders-l is a listserver for anyone interested in waders, and is not restricted in any way: both professionals and amateurs are welcome to join in the discussion group. The listserver was initiated in February 1996 to assist with information exchange between wader biologists and enthusiasts.

Examples of its potential use are requests for information, ideas, data and collecting materials, advertising employment, fellowships, availability of written material etc.

In order to post a message, send to:
WADERS-L@UCT.AC.ZA

In order to subscribe, post to:
LISTSERVER@UCT.AC.ZA

AND in the body of the message type:
subscribe waders-l *Your name*

This information was obtained from a message by Murray Lord on the Australian Birdchat Listserver.

Michael Weston, *Editor*

ABSTRACTS OF THE AWSG CONFERENCE ON SHOREBIRD CONSERVATION IN THE ASIA-PACIFIC REGION.

The AWSG Conference on shorebird conservation in the Asia-Pacific Region was held in Brisbane, Queensland (Australia), on 16 and 17 March 1996. The conference was well attended, and delegates from throughout the Flyway were present.

A vote of thanks goes to Peter Driscoll, Phil Straw, the Queensland Wader Study Group and all those who opened their homes to accommodate delegates. Their hard work ensured the conference was a great success.

Proceedings will be prepared in due course. Abstracts of spoken papers presented at the conference are given below. An unscheduled presentation made by Dr Eugeney Syroechkovski, of the Russian Academy of Sciences, is not abstracted below.

BIOLOGY OF MIGRATORY SHOREBIRDS

Theunis Piersma, *International Wader Study Group*

There are few avian groups which can boast being as highly migratory as the shorebird families Charadriidae and Scolopacidae. Plovers and sandpipers travel the globe by the millions, each individual carving out a precarious existence by moving from one acceptable piece of habitat to another in the course of its annual cycle.

Why are so many shorebird species continuously on the move? Most habitats show large fluctuations in quality with respect to food availability, energy expenditure (e.g. weather) and safety (e.g. presence of raptors), so it is easy to understand that organisms capable of moving, have been selected to track the best ecological conditions for survival and reproduction. The migratory mode would have been further enforced by evolving sensory specialisations and the correlated ecological requirements. Long-distance flights which enable shorebirds to track ecological resources in time and space not only require excellent navigational capabilities, but also necessitate a suite of physiological adjustments. The ability to rapidly store fat, the fuel-for-flight, and to remain actively airborne for several days, puts high demands on the metabolic capacities of shorebirds. No shorebird species lays more than four eggs per clutch, few species breed when one year old, and many become quite old relative to their body size and rate of energy expenditure. The great variety of migratory strategies in shorebirds finds a counterpart in their great variability of mating systems. Although some aspects of migration and reproduction are clearly functionally linked, much of the covariation remains unexplained. Shorebirds breeding at Arctic latitudes have particularly short breeding seasons and little time for mate selection. Much of the courtship displays and colourful breeding plumages appear sexually selected quality traits; traits which otherwise may act as handicaps. The biological features of some non-migratory, resident shorebird species provide striking contrasts to the biology of long distance migrants.

SHOREBIRDS OF THE EAST ASIAN-AUSTRALIAN FLYWAY-AN OVERVIEW

Brett A Lane, *WBM Oceanics Australia*

The wider community, which pays for the efforts of shorebird researchers and government officials, requires that we focus clearly on their greatest concern, namely: how to achieve the effective conservation of shorebirds. The purpose of this paper is to provide a geographical perspective on how shorebirds use the East Asian - Australian flyway and to provide some strategic directions for future research and conservation efforts to meet this requirement.

Key geographical characteristics of the flyway are described and, where possible the relationship between these and known important regions for shorebirds are highlighted. Key characteristics relate to:

- geological setting;
- climate and its impact on sea waves, hinterlands weathering and sedimentation;
- tidal characteristics; and
- wetland vegetation.

The importance of the rivers draining the central Asian uplands is highlighted.

The patterns of distribution of shorebirds in the flyway reflect the relationship between geography and biology. The theme is explored using a number of example species.

East Asia represents 14 percent of the earth's land area and it is home to over 56 percent of its human population. This has enormous implications for shorebirds and other animal populations. The extent to which the relationship between geography and biology is being changed by the activities of over half the world's population will be briefly explored.

Some hypotheses and associated predictions based on this changing relationship are offered to suggest a framework to enable future research activities to focus on the mechanisms of population decline in migratory shorebirds. The sooner these mechanisms are clarified then the sooner flyway-wide shorebird management programmes (e.g. the Brisbane Initiative) can deliver on the community's expectations.

AN INTERNATIONAL NETWORK OF SITES FOR SHOREBIRDS

Doug Watkins, *Wetlands International Oceania*

Each year Australia is host to over two million shorebirds from northern Asia and Alaska. To complete their remarkable migration of up to 12000 km, shorebirds are dependent on intermediate staging sites where they can replenish fat reserves needed to power them further on their migration.

In response to these ecological needs a Shorebird Reserve Network proposal has been developed for the East Asian-Australasian Flyway. The Network aims to facilitate international recognition and management of internationally important sites for shorebirds. The Network is to work as a cooperative environmental program, involving site management bodies and local communities, working for the conservation of wetlands of international importance for migratory shorebirds. The Network is modelled on a very successful program (Western Hemisphere Shorebird Reserve Network) that has been in operation in the Americas for the past 10 years.

The major priority for the Network will be to promote the conservation of shorebirds at the intermediate staging sites in the Flyway. Many of these sites are in developing countries. These areas generally have high human demands on wetland resources and very limited resources for conservation.

The Shorebird Reserve Network will be launched at the Ramsar Conference in Brisbane. It is anticipated that over fifteen sites from five countries will be involved in the launch.

The Network program will be managed by Wetlands International and is presently being made possible by the sponsorship of the Australian Nature Conservation Agency.

THREATS TO WADERS ALONG THE EAST ASIAN-AUSTRALASIAN FLYWAY: AN OVERVIEW

David S. Melville, *WWF Hong Kong, GPO Box 12721, Hong Kong*

Several million shorebirds migrate between breeding grounds in the Palaearctic and non-breeding grounds in tropical south-east Asia and Australasia each year. These birds depend upon a range of habitats in their breeding and non-breeding grounds, as well as migratory 'stepping stones' in between. The greatest threat facing these birds is due to habitat loss, both direct and indirect. Immediate problems relate to reclamation of coastal habitats, which is extensive throughout much of each and south-east Asia, and changes to the watersheds of major rivers including deforestation, dams and tidal barrages, which impact on coastal regions. Longer-term impacts on breeding, staging and non-breeding grounds will result from global warming and associated sea level rise. Pollution is a growing problem in parts of the flyway, due to both nutrient enrichment and industrial discharges, although the impacts on shorebirds are little studied in this region. Hunting is an important threat to shorebird populations in some areas, but not in others, and improving socio-economic conditions appear to be reducing hunting pressure in some countries. Human competition for food resources through harvesting of benthos may be a serious problem in some areas, and associated disturbance also may adversely impact on shorebirds. Degradation and/or loss of habitats are likely to result in an increase in the density of birds in those habitats remaining, which may result in changes in patterns of deposition of body reserves, due to competition for food and/or interference in feeding, and thus affect the migration systems of shorebirds, with possible impacts on breeding success due to delayed arrival on the breeding grounds and/or reduced body reserves on arrival. Shorebirds also may be expected to become more concentrated in the remaining areas which may increase disease impacts, although these are little studied in the region.

THREATS AND IMPACTS, CASE STUDIES: HABITAT LOSS, ALTERATION AND THE IMPACTS ON SHOREBIRDS IN JAPAN

Tobai Sadayosi, *World Wide Fund for Nature - Japan*

Seven families and 76 species of shorebirds have been recorded in Japan. Of these, 13 species breed in Japan but only nine of these are resident. The rest of the 67 species are migratory, using Japanese habitats as staging sites. Because of this function in the flyway, tidal flats are the major habitats where highest counts have been made, followed by inland riverbanks, reclaimed land, and rice paddies.

The high concentration of the human population in the lowlands along the coasts has created demands for conversion of tidal flats, mainly into rice paddies. Traditional methods of reclamation or drainage historically allowed creation of new tidal flats. Since 1945, rapid and large scale destruction of wetland habitats has taken place. On a national scale, 33% of tidal flats were lost between 1945 and 1978, and the loss continues. Similar trends were observed for shorelines of lakes and coasts. Between 1945 and 1978 on a regional scale at important sites, the loss of tidal flats ranged from 16% at the Sea of Arawak up to 99% for Osaka.

The largest source of threats to the major habitat, tidal flats, has been reclamation and drainage for agriculture, such as rice paddies, and industrial use, such as port facilities, housing development and, more recently, landfill for refuse. Other types of threats are river mouth barrages and river embankments. Habitats are not lost but degraded in other cases through pollution from domestic sewage, livestock farms, pesticides, and deforestation in the catchment area.

These threats impact on populations of shorebirds. On a national scale, the total numbers counted in spring and autumn have declined since 1981. Between 1973 and 1985, in particular, the Kentish Plover shows a steady decline. This is thought to be due to loss and changes in ecological characters of tidal flats. Impacts have also been recorded at individual important sites such as at Yoshino River Estuary where the two most dominant species, Kentish Plover and Dunlin, declined by almost half. This is thought to be due to the changes of substrates caused by reclamation in the area. At Wajiro, since the construction of an artificial island began, an algal bloom has occurred and the number of species decreased. Most of the remaining important sites are under threat from ongoing or imminent development projects.

In conclusion, large scale destruction and degradation of major habitats, especially tidal flats, has happened and is expected to continue. Urgent action for conservation is called for and the new initiative to recognise and protect important sites on a flyway scale is hoped to reverse this trend. It is also hoped that the framework will prevent a repetition in other countries of what has happened in Japan during the last 50 years.

WATERBIRD HUNTING IN INDRAMAYU/CIREBON (North Coast of West Java): A CASE STUDY

Yus Rusila Noor, *Wetlands International Indonesia*

During the last seven years, AWB-Indonesia, under its cooperative wetland management program with the Directorate General of Forest Protection and Nature Conservation (PHPA), has carried out surveys of waterbird hunting activities along the north coast of West Java. In addition, ecological, conservation and socio-economic surveys, in combination with an awareness programme, have been conducted in the main hunting areas. The Indramayu and Cirebon regions have been known as a centre of waterbird hunting activities in Java since 1940. A total of possibly one million birds were caught in 1979, decreasing to 290,000 birds in 1986 and 47,000 in four peak-season months of 1992.

Local peoples' awareness regarding the status of the hunted bird species (many of them migratory species, some of which are protected under Indonesian law) has gradually increased since AWB/PHPA started the monitoring programme. This has contributed to the decrease in birds taken.

The research conducted during earlier phases of the project showed that local people hunting waterbirds in Indramayu depend on hunting for livelihood. Experience in the area showed clearly that the project needs to have the active support of the bird hunters. Yet, simply prohibiting bird hunting was likely to alienate the bird hunters from cooperating with efforts to reduce the hunting of protected birds. Moreover, such an approach would ensure that the costs of conserving the birds would be borne by those least able to pay: the poor villagers of Indramayu-Cirebon. Local people hunt birds for a living because there are few economic alternatives. Therefore, to overcome the problem in the long term, hunters have to find other ways to maintain their families. To do so the community needs support from outside the area.

Future activities under the programme will focus on developing and implementing these alternatives in combination with continued awareness activities. In addition, the hunting monitoring activities will continue, and plans for the establishment of migratory waterbird research/banding station are being developed.

WATERFOWL DISTURBANCE IN EUROPE: PROBLEMS AND SOLUTIONS

David A Stroud, *Joint Nature Conservation Committee, Monkstone House, City Road, Peterborough, PE1 1JY, UK.*

There are many forms of disturbance experienced by European waterfowl. Most fundamental are the effects of habitat loss through land claim and conversion of wetlands to other habitat types (e.g. for agriculture). Habitat degradation also occurs for a wide variety of reasons.

With high human population densities along much of the coastline of Europe (e.g. 1.1 million people live within 15 km of the Solent Estuary, England which has 32,000 yacht berths and moorings), direct disturbance occurs as a consequence of human activity. Commercial activities such as the extraction of Cockle *Cardium app.* from mudflats, or the commercial digging of mudflats for fishing bait, can greatly restrict waterfowl habitat usage. Disturbance from military activities such as low-flying by jet aircraft, shooting and from recreational activities such as horse-riding, walking, dog-exercising, fishing, sailing, jet skiing, sand yachting, etc., can also have particularly disturbing effects and locally can greatly reduce the carrying capacity of otherwise suitable habitats.

The talk will highlight the various ways in which these effects have been reduced and mitigated against in Europe. Solutions have been sought at a number of scales, countries of the European Union are bound by the EC Birds Directive, which requires, inter alia, the designation of Special Protection Areas for migratory birds. The Directive also regulates at European level, those species which may be hunted, the time of year at which hunting may take place, and modes of hunting which are forbidden. Other International Conventions such as Ramsar and Bonn (especially the African-Eurasian Waterbird Agreement - AEWA) also contain relevant obligations.

Whilst international treaties give broad frameworks and overall management goals (e.g. Ramsar's requirements for the wise-use of wetland and waterfowl resources), all European countries have additional legal measures at national, sub-national (regional), and local levels. These add more specific legal requirements, usually going beyond the controls specified by international treaties. The final tier of this hierarchy are non-statutory measures such as the creation of voluntary nature reserves or the development of codes of conduct with other wetland user groups. In all of the above, practical application may differ from legal aspirations.

Approaches that have been found effective in reducing the impacts of disturbance include:

- the creation of effective refuge areas as a key component of habitat protection and waterfowl management (areas must be adequate in size, quality and controls on disturbance),
- good scientific studies of experimental management, with results widely disseminated as a basis for application in other areas,
- review of good case studies to enable international sharing of problems and different approaches to their solution (e.g. WSG's Disturbance to waterfowl in estuaries),
- derived from the above, best practice guidelines to prevent and reduce disturbance (as envisaged by the AEWA),
- the establishment of partnerships with potential disturbers to voluntarily reduce disturbance levels (e.g. code of conduct),
- strategic guidance on optimal timing and location of damaging or disturbing activities, and
- the undertaking of Environmental Impact assessments for major proposed activities (it is easier to avoid disturbing impacts at the earliest planning stages).

THE WESTERN HEMISPHERE SHOREBIRD RESERVE NETWORK (WHSRN): A MAJOR PROGRAM OF WETLANDS FOR THE AMERICAS

Ian Davidson, *Western Hemisphere Shorebird Reserve Network*

An overview

During migration, shorebirds depend on a chain of critical wetland sites strategically located along their flyways extending from their nesting grounds in the Canadian high Arctic to their non-breeding grounds in Tierra del Fuego in southern Argentina. The diminished ecological function of just one of these critical sites could have disastrous effects on specific shorebird populations or even entire species.

The Western Hemisphere Shorebird Reserve Network Program (WHSRN) of *Wetlands for the Americas* was launched in 1985 in response to research which indicated significant declines in shorebird populations. WHSRN identifies important shorebird sites and seeks to work together with wildlife agencies, land owners, private conservation groups and others to help ensure the conservation of shorebirds and shorebird habitats.

In 1993, critical support from *Wildlife Habitat Canada* enabled *Wetlands for the Americas* to establish an office in Ottawa to further develop the WHSRN Program. Through a stewardship approach to wildlife habitat conservation, *Wetlands for the Americas* and *Wildlife Habitat Canada* work together with partners throughout the Americas to promote the conservation of critical shorebird habitat.

WHSRN is a voluntary collaboration of government and private organisations which are committed to shorebird conservation. WHSRN gives international recognition to critically important shorebird sites and promotes cooperative management and protection of these sites as part of an international reserve network. First established by the *World Wildlife Fund, the International Association of Fish and Wildlife* and the *Philadelphia Academy of Sciences*, WHSRN was eventually managed by Manomet Observatory, Massachusetts. WHSRN is now supported by over 100 conservation oriented organisations at both the government and non-governmental level, throughout the hemisphere.

Since its inception in 1985, WHSRN has designated 31 internationally important reserves throughout the Western Hemisphere, offering protection for approximately 30 million shorebirds and over four million acres (1.6 million hectares) of wetlands. WHSRN embraces shorebirds as a symbol of intense conservation challenge facing wetlands and of the need for international cooperation in the protection of these areas.

THE CONSERVATION OF MIGRATORY BIRDS: THE BONN CONVENTION AND THE AFRICAN/EURASIAN WATERBIRD AGREEMENT; A SUMMARY OF PROGRESS AND PROSPECTS

Gerard C Boere, *International Wader Study Group*

The Bonn Convention is an international legal instrument for the conservation of migratory wild animals, covering, for example, migratory birds, mammals (including African mammals), marine species (e.g. turtles) and invertebrates (e.g. butterflies). It was concluded in 1979 and came into force in 1983. The first Conference of the Parties (1985) resolved to prepare four technical Agreements (conf. Art.IV/4) including the Western Palaearctic Waterfowl Agreement.

The Netherlands Government in early 1988, began developing a draft Western Palaearctic Waterfowl Agreement as part of their Western Palaearctic Flyway conservation programme. A draft, including an Action Plan for duck and geese and a general Management Plan for all waterfowl, was sent in 1991 to the European Commission which offered to sponsor the Agreement (European Commission Delegation in Report of the Parties 1988 UNEP/CMS). The Western Palaearctic Waterfowl Agreement received widespread support.

No progress was made by the European Commission, so the initiative to further the Agreement was returned to the Bonn Convention Secretariat in early 1993. In close co-operation with The Netherlands Government and others, the text of the Agreement and related documents was updated, incorporation a stronger African component and changing the name to the African/Eurasian Waterbird Agreement (AEWA)(Revised edition, April 1994, UNEP/CMS).

The AEWA requires the effective conservation and sustainable use of waterfowl and their habitats throughout the whole flyway. Two specific Action Plans have been drafted; one for ducks, geese and swans and one for storks, ibises and spoonbills. They included specific measures for species, their conservation, hunting and habitat conservation, and they established priorities for the preparation of Flyway Conservation Plans for endangered species and for species which require management measures, e.g. if they caused damage to agricultural crops. The Action Plans also requested an analysis of present hunting practices, a ban on the use of leadshot in wetlands, surveys and monitoring of waterfowl and education and public awareness programmes.

The general Management Plan gives a detailed overview of the present status of species and their populations and describes general conservation and management problems. It also elaborates policy for the long term conservation of waterbirds and their habitat in relation to various human activities.

The AEWA was drafted in close co-operation with government experts and international organisations, strengthening many ongoing activities in the field of integrated flyway conservation, e.g. workshops (Waterfowl and Farmers). Species Conservation Plans (Greenland White-fronted Goose *Anser albifrons flavirostris*, Slender-billed Curlew *Numenius tenuirostris*, Cormorant *Phalacrocorax carbo*) and habitat conservation in the Arctic breeding areas. It is widely felt that concluding the Agreement strongly encourages international co-operation (surveys/research/new reserves/changes in agricultural policies) with Africa and eastern Europe. It could also facilitate co-ordination on particular issues (length of hunting seasons, sustainable use of populations in general).

In the future, the AEWA will function as the governmental platform for integrated conservation and management of the whole Western Palaearctic Flyway. It is not new international legislation but rather acts as a framework for international co-operation and co-ordination for the conservation of a natural resource shared amongst almost 115 Range States.

The first consultative meeting of Range States to the AEWA was held in Nairobi June 1994. The meeting strongly supported the conclusion of the AEWA, and consensus could be achieved on all matters of substance. The formal concluding negotiating meeting took place in June 1995 in the Netherlands.

FRAMEWORKS FOR FLYWAY CONSERVATION - THE KUSHIRO INITIATIVE

Karen Weaver, *Manager Migratory Wildlife Program, Australian Nature Conservation Agency*

The conservation of migratory shorebirds requires action on an international basis because the birds depend on protection and appropriate habitat management in a number of countries throughout their migratory flyways. Arising from the bilateral migratory bird agreement that exists between Australia and Japan was a suggestion that a workshop was needed to discuss such flyway wide, concerted international action. This workshop took place in Kushiro in December 1994 and the outcomes from that workshop include a far-reaching framework for migratory waterbird conservation set within the political imperatives of the Asia-Pacific region.

INTERNATIONAL ACTION PLANS FOR WATERBIRDS - CASE STUDY OF THE ASIA-PACIFIC MIGRATORY SHOREBIRD ACTION PLAN 1996-2000

Taej Mundkur, *Wetlands International Asia Pacific*

The Asia-Pacific Migratory Shorebird Action Plan is being developed as part of an integrated process of conservation planning for migratory waterbirds in the Asia-Pacific. The process has three major levels: Strategy, Action Plans for species groups and Site Networks for species groups. The planning process is not based on a legal framework, but has the support of Governments, interested conservation organisations and individuals. It is a voluntary, cooperative endeavour and is dependent on a recognition of the need and a willingness of countries to work together.

The Action Plan identifies 127 populations of migratory shorebirds in the Asia-Pacific region. It documents their status and distribution across the 55 range states. Three flyways are identified: Central Asian-Indian, East Asian-Australasian and West Pacific.

The Action Plan details 14 objectives under 7 major themes for action: conservation of habitats; conservation of species; research and monitoring; education, information and awareness; training and institutional needs, policy and legislation; and international cooperation. Implementation is discussed on a flyway basis.

One of the key actions identified in the Plan is the establishment of a Shorebird Reserve Network in the East Asian-Australasian Flyway. The Network is important because it is the major mechanism by which conservation initiatives can be transformed into action at sites throughout the flyway. In recognition of the value of this approach, the Australian Government has drafted a recommendation for the 1996 Ramsar Conference calling on countries in the flyway to nominate sites for the Network. It has also made a commitment to funding a half-time Shorebird Flyway Officer to be based at the Wetlands International - Oceania Office.

The three most essential elements of developing the Asia-Pacific Shorebird Action Plan are considered to be: to build and maintain wide support; establish effective implementation mechanisms; and establish effective review mechanisms.

FROM PLANNING TO ACTION

Doug Watkins, *Wetlands International Oceania*

Implementation of conservation initiatives in the Asia-Pacific needs to be based on flyways. Within each flyway there needs to be government support for the Action Plan and strong national organisations that can take up the actions. The centre of activity of implementation is anticipated to be the East Asia-Australasian Flyway because it has the most developed and best resourced organisations for shorebird conservation. Implementation in Central Asia-Indian Flyway and the West Pacific Flyway is anticipated to be constrained because of the lack of specialist conservation organisations and limited resources.

Strong national programs are needed to complement flyway based programs. The central element of implementation will be the Shorebird Reserve Network. This is a key program because it will not only link the most important sites for shorebirds but it will also link government agencies, conservation organisations, site managers and the local communities.

In addition to the Shorebird Reserve Network it is proposed to develop holistic activities around a number of key themes such as: survey and population monitoring, migration studies, research expeditions, site manager training, environmental education centres, threatened species, reducing hunting, communication and strengthening of conservation agencies.

Successful conservation action for shorebirds must be cooperative action on a flyway basis. Take up the challenge ..... be part of it.

POPULATION MONITORING

Peter Driscoll, *Australasian Wader Studies Group*

A current review of the voluntary programme of population monitoring of waders in Australia involves an assessment of results, techniques and procedures and offers recommendations for improving the programme in the future.

Since 1981 waders have been systematically counted in Australia during summer and winter at sites throughout Australia. These counts have been the basis of two major publications on the distribution and abundance of waders. The suitability of the data for assessing long term population trends is only now being addressed. Over the years, data has taken slightly different forms and even though much of it has been computerised, there has been a need to revise, scrutinise and amalgamate a number of databases into a suitable single format.

Valid assessment of population trends requires consistent field and recording techniques over many years which is difficult to achieve with limited resources. The data are adequate for this purpose for only a few areas of Australia and some examples are given.

The value of these count data is still to be realised and in the future will become increasingly important. However, there is a need to rationalise our efforts and revise the programme to make it more applicable to the objective of population monitoring rather than just coarse, periodic and general assessment of numbers for large parts of the country.

A dual approach is needed where complete, short term surveys are undertaken by teams of paid and volunteer workers while strategically significant areas are looked at rigorously on a regular basis. It is also important to persist with local, less systematic counting for the purpose of site management and local conservation of wader habitat.

SHOREBIRD RESEARCHER TRAINING

Kiyoaki Ozaki, *Yamashina Institute for Ornithology, Japan*

Most shorebirds migrate long distances through many countries. We need more and more knowledge about their migration behaviour, especially migration routes, to preserve them effectively. Shorebird banding is an important method of proving their migration routes, but has not been actively done in most East Asian countries.

Yamashina Institute for Ornithology has started bird banding training workshops to encourage banding activities in East Asian Countries. The first of these was run in 1984 in the Philippines. Since that time we have run several training workshops or cooperated in banding activities 28 times in seven countries including the Philippines, Thailand, Vietnam, Indonesia, Taiwan and also in China and Russia (the last two countries already have national banding schemes). Sixteen of these activities were mainly focused on waterbirds including shorebirds.

For those training activities we have used ODA budgets through the Japanese Environment Agency and Ministry of Education as well as funding from NGO's and companies. With the Ministry of Education funds, we have annually invited one or two researchers from each country to Japan for several months of training in banding field work and to learn about the work of the banding centre.

The final target of those training activities is to help set up national bird banding schemes in those countries that don't have a scheme already. Recently, Thailand and Taiwan started national banding schemes using their own bands. Other countries still have difficulties, mainly in getting support and funds from their governments.

Training for banders should continue to be as widely available as possible in as many countries as possible. It is extremely necessary to get government support for banding schemes through international agreements such as multilateral treaties for migratory birds.

COLOUR MARKING PROTOCOL

Doug Watkins, *Wetlands International Oceania*

Increased knowledge of the migration routes of shorebirds is urgently needed. Staging sites need to be identified and managed appropriately if shorebird populations are to be maintained. One valuable method to yield data on movement and staging areas is to attach colour flags to the legs of shorebirds during banding.

Recent colour flagging in Australia, New Zealand and Japan is yielding movement data at over three times the rate of the recapture of banded shorebirds. This dramatic increase in the return rate requires only a small increase in handling time during banding.

Colour marking of shorebirds needs to be coordinated within each flyway to avoid conflict in the use of colour schemes and maximise the return of information. Within each country a banding agency needs to be empowered by the government to control to use of colour marks. It is recommended that each banding agency require a colour marking project proposal for all projects. Each banding agency needs to maintain a national project register for all colour marking projects. At the flyway level international coordination is needed to ensure that colour marking project proposals will not conflict with existing projects.

Two actions are recommended; firstly the development of a colour marking protocol and secondly the development of a flyway colour marking project. A protocol is currently being developed for the Australian Nature Conservation Agency that will identify the constraints and opportunities for the use of colour marking.

It is proposed that a flyway colour flagging project be developed. This would involve inviting banding groups in each country to nominate the species they wish to band and the number they anticipate banding. The colour marking protocol would then be used to optimise the design of the multinational project.

SUMMARY STATEMENT OF THE AWSG CONFERENCE ON SHOREBIRD CONSERVATION IN THE ASIA-PACIFIC REGION.

A Conference entitled "Shorebird Conservation in the Asia-Pacific Region" was held on 16 and 17 March in Brisbane, Australia. The Conference was attended by 145 participants from 16 countries and territories (Australia, Bangladesh, Belgium, Canada, People's Republic of China, Hong Kong, Republic of Indonesia, Japan, Republic of Korea, Malaysia, The Netherlands, New Zealand, The Philippines, Russian Federation, Singapore and the United Kingdom).

The Conference heard presentations by 23 speakers from 15 countries and territories outlining the conservation status of shorebirds and their habitats in the Asia-Pacific Region, and describing the serious threats to migratory shorebirds, and the impacts of these threats.

Options for improving shorebird conservation, particularly the proposed Asia-Pacific Shorebird Action Plan and East Asian - Australasian Shorebird Reserve Network were discussed. Workshop sessions were held on four components of the Action Plan to obtain feedback from participants.

The Conference

- recognised the growing evidence of declining population numbers for many species of shorebirds in the region, due to habitat loss and degradation, disturbance, pollution and hunting, and urged that immediate action be taken to reverse the situation.

- expressed particular concern at the destruction of critically important staging sites for migratory shorebirds in China, the Korean peninsular and Japan.

- welcomed the timely response to the "Kushiro Initiative", which has involved the publication of the Asia-Pacific Migratory Waterbird Conservation Strategy, and the development of the Asia-Pacific Shorebird Action Plan and East Asian-Austalasian Shorebird Reserve Network.

- strongly supported the development of the Asia-Pacific Shorebird Action Plan.

- endorsed the development of the East Asian-Australasian Shorebird Reserve Network.

- called on countries at the Conference of Parties of the Ramsar Convention to support the "Brisbane Initiative" being proposed by the Australian Government.

- noted that successful implementation of the Strategy, Shorebird Action Plan and Shorebird Reserve Network requires the co-operation and co-ordination of national and local Government agencies, inter-governmental agencies, non-government organisations, academic institutions, local people and individuals, both within countries and on a Flyway-wide scale, and called for all to work together for shorebird conservation.

- stressed the need for an effective Flyway-wide communication network to allow all those involved in shorebird management, conservation and research to be well informed.

- recognising the need for improved knowledge of migration routes, recommended that priority be given to analyzing existing data and developing co-operative migration studies involving satellite tracking, especially of the Eastern Curlew, and the use of marking, particularly leg-flagging.

- recognizing the need for improved knmowledge of the abundance, distribution and population trends of shorebirds within the Flyway. It was also recommended that additional surveys and counts be undertaken and that a flyway-wide monitoring programme be established.

- Complimented the RAOU on the publication of the third volume of HANZAB and its contribution to shorebird knowledge.

- Expressed appreciation to the Queensland Museum for making their excellent facilities available and for their co-operation in the running of the Conference.

- Expressed appreciation to all volunteers, particularly those from the Queensland Wader Study Group, for their considerable assistance in ensuring the success of the Conference.

The Conference was organised by the Australasian Wader Studies Group, a special interest group of the Royal Australasian Ornithologists Union, with assistance from Wetlands International - Oceania Program.

WADER THESES

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This is a alphabetical list of theses on shorebirds (by author). It was compiled opportunistically and sporadically from a variety of sources. Some of its contents have been previously published in the *Victorian Wader Study Group Bulletin*. It is certainly incomplete, and contains errors and omissions. Corrections and additions would be welcomed by the compiler.

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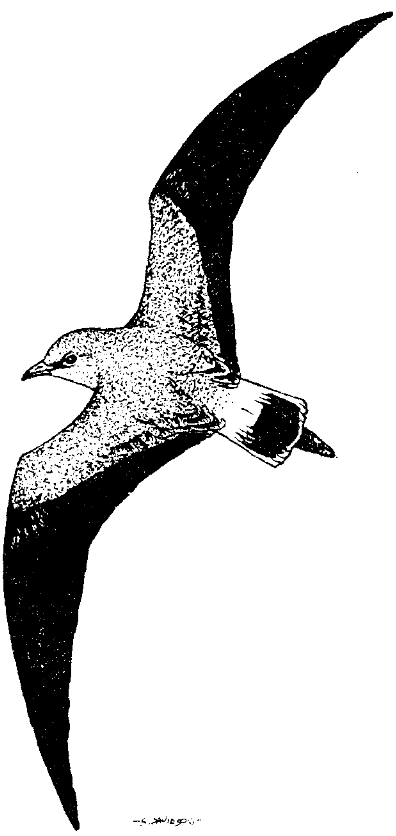

NORTHWARD MIGRATION OF SHOREBIRDS THROUGH THE RED RIVER DELTA, VIETNAM, IN 1994.

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ABSTRACT

The intertidal area of the Red River Delta in northern Vietnam is an important stopover site for migratory shorebirds. During the northward migration in 1994 regular counts at high tide were made in the delta at two different sites, Xuan Thuy Nature Reserve and Cua Day Estuary. The sum of maximum daily figures for 28 species amounted to more than 6000 shorebirds. The spring migration reached a peak in mid-April with counts of around 4000 shorebirds at each site. The most numerous species were Red-necked Stint *Calidris ruficollis*, Lesser Sand Plover *Charadrius mongolus* and Greater Sand Plover *Charadrius leschenaultii*. Based on the maximum counts for each species, it is estimated that the intertidal areas at Cua Day Estuary and the nearby Xuan Thuy Nature Reserve were each used by more than 30000 shorebirds and the entire intertidal area of the Red River Delta was used by more than 118000 shorebirds during the northward migration in 1994. It was observed that Cua Day Estuary seems to support a complementary set of species compared with Xuan Thuy Nature Reserve. The Cua Day Estuary was identified as a wetland area of global/international importance and this is qualified in terms of the estimated numbers of shorebirds. *Stilt* 28 (1996)

INTRODUCTION

The East Asian-Australasian Flyway is one of the most important waterbird migration routes in the world. It is estimated that 4-6 million shorebirds use this flyway (Parish 1987). The Red River Delta in northern Vietnam is an important stopover site for some of the migratory shorebirds using this flyway.

Before 1988, the coastal wetlands of the Red River Delta received little ornithological attention. No long term surveys had been conducted in the delta and only sporadic information existed on shorebird populations. In 1988, a short survey was conducted in Xuan Thuy, which was then identified as a wetland of international importance according to Ramsar criteria, based on records of more than 20000 waterbirds and five red-list species (Scott *et al.* 1989). Vietnam joined the Ramsar Convention in 1988, and Xuan Thuy Nature Reserve was the first Ramsar Area to be listed.

A combined study of birds, bivalves and use of natural resources was conducted from February to June 1994 in the delta. The aim of this study was to provide baseline information for the planning of conservation and sustainable use of the delta. Because of the existing knowledge and protection of the Xuan Thuy Nature Reserve the present survey mainly focuses on the Cua Day Estuary.

The aim of this paper is to provide information on the numbers and timing of migration of the shorebirds using the intertidal area of the Red River Delta during northward migration. Studies of bivalves, crabs, other birds and resource use will be presented elsewhere.

METHODS

Study area

All shorebird counts were conducted at two sites in the Red River Delta; at Cua Day Estuary (19°57'N, 106°09'E), Nghia Hung District, and at Xuan Thuy Nature Reserve (20°16'N, 106°34'E), Xuan Thuy District, both situated in Nam Ha Province (Figure 1).

The principal study area was the intertidal area, defined as the zone outside the main dike which is exposed during the lowest spring low water while covered by water at the highest spring tides. The intertidal area of the two sites consists of large areas with sand- and mudflats, mangrove, sandy beaches and small islands. The proportions of each habitat type have been estimated to be slightly different in the two areas. There were smaller areas of sandflats and larger areas covered with mangrove, including a larger area of mudflats, in Xuan Thuy Nature Reserve compared with the Cua Day Estuary. At both sites, the area behind the main dikes consisted of rice-fields and ponds for aquaculture.

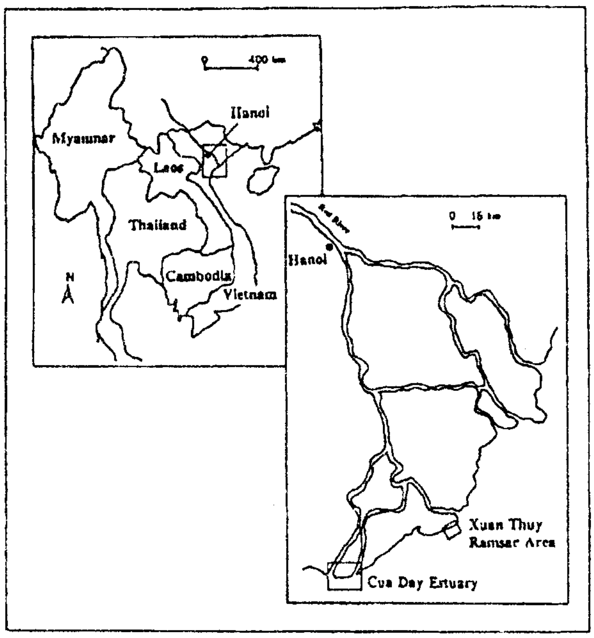

Figure 1. Location of Cua Day Estuary and Xuan Thuy Ramsar Area, Red River Delta, Vietnam

The surface of the intertidal areas of the two sites has been estimated on the basis of topographical maps (1:50,000; AMS (AM) U.S.Army 1967), satellite maps (1:100,000, 1992), and from on-the-ground estimates. The total intertidal area is estimated to be *c*. 35 km^2 in Cua Day Estuary and *c*. 30 km^2 in Xuan Thuy Nature Reserve. With a conservative estimate, the intertidal area in the entire delta is estimated to be at least 120 km^2.

The tidal regime in the delta included only one tidal cycle per day. During the survey period, high tide occurred about one hour later each day, and around the neap period it changed by about 11 hours. Tidal amplitude varied during the survey between *c*. 2.0 m at neap tides and *c*. 3.4 m at spring tides (Anon. 1993b).

Counts

At low tide, extensive areas of intertidal flats were exposed and therefore high tide counts were the main method used for estimating the numbers of shorebirds. Due to the height of the tides and diurnal high tides, counts could only be conducted over a few days, once every second week. Three high tide roosts were identified in Cua Day Estuary and at least two were visited during every high tide period. In Xuan Thuy Nature Reserve two high tide roosts were identified and inspected during each visit. It is thus assumed that a total coverage of the shorebirds using the intertidal area in Cua Day Estuary and Xuan Thuy Nature Reserve was obtained.

High tide counts were made in Cua Day Estuary every second week and in Xuan Thuy Nature Reserve once per month. The counts were conducted in three-day periods at each site, and the maximum daily number in such a period was used for the quantitative estimates. In our opinion, such a maximum daily number gives a more precise estimate of the actual numbers of individuals using the areas because of the presumed high fluctuation in counts from flocks missed at high tide roosts.

High tide counts were conducted in Cua Day Estuary on 1, 15 and 26 March, 11 and 25 April, 14 and 28 May and 5 June, and in Xuan Thuy Nature Reserve on 5 and 28 March, 28 April and 20 May (the first day in each three day period). In addition, low tide counts were made using strip transects in the intertidal area in order to supplement the total counts. Coverage of the intertidal area was probably complete except for the counts on 1 and 5 March due to stormy weather, on 20 May due to too low water levels, and on 28 May due to disturbance from fishermen. Counts were normally carried out by the author and a Vietnamese counterpart. The counts were made on foot, by bicycle or boat, using binoculars and a telescope.

The taxonomic treatment and common names in this paper follow Christidis and Boles (1995).

RESULTS

Species and numbers of shorebirds recorded

A total of 37 species of shorebirds were recorded in the coastal zone of the Red River Delta (Table 1). However, quantitative estimates were made on only 28 species occurring in the intertidal area. Of the other nine species recorded, eight were only seen inland in the rice paddy fields and in the aquatic pond areas: Wood Sandpiper (scientific names for all shorebird species are given in Table 1), Common Sandpiper, Temminck's Stint, Long-toed Stint, Pheasant-tailed Jacana, Black-winged Stilt, Little Ringed Plover and Grey-headed Lapwing; and one species, Red-necked Phalarope, was only observed for sale at the local market. Table 2 and 3 show the trends through the survey in the numbers of shorebirds in Cua Day Estuary and Xuan Thuy Nature Reserve based on high tide counts. In Cua Day Estuary, the Lesser/Greater Sand Plover were the most abundant species (Table 2), accounting for 45% of the total number recorded by high tide counts. Spotted Redshank, Grey-tailed Tattler and Kentish Plover also occurred here in relatively large numbers, accounting for 33% of the total recorded by the high tide counts. In Xuan Thuy Nature Reserve, Red-necked Stint was the most numerous species (Table 3), accounting for 16%

Table 1. Occurence of 37 species of shorebirds in the Red River Delta during February-June 1994. Each month is divided into three periods covering approximately 10 days, each symbolised by "*".

Species	Month				
	FEB	MAR	APR	MAY	JUN
Common Snipe *Gallinago gallinago*		***	*		
Black-tailed Godwit *Limosa limosa*	*	**	***	**	*
Bar-tailed Godwit *Limosa lapponica*			**	*	
Whimbrel *Numenius phaeopus*			***	**	
Eurasian Curlew *Numenius arquata*	*	***	***	*	*
Spotted Redshank *Tringa erythropus*	*	***	***	*	
Common Redshank *Tringa totanus*	*	***	***	***	*
Marsh Sandpiper *Tringa stagnatilis*		***	***		
Common Greenshank *Tringa nebularia*	*	***	***	***	*
Nordmann's Greenshank *Tringa guttifer*			*		
Wood Sandpiper[a] *Tringa glareola*		*	***	**	
Terek Sandpiper *Tringa cinerea*			***	**	*
Common Sandpiper[a] *Tringa hypoleucos*		***	**	*	
Grey-tailed Tattler *Tringa brevipes*			**	***	*
Ruddy Turnstone *Arenaria interpres*		*	***	*	
Asian Dowitcher *Limnodromus semipalmatus*			*	*	*
Great Knot *Calidris tenuirostris*			***	*	
Red Knot *Calidris canutus*			*		
Sanderling *Calidris alba*		**	***	*	*
Red-necked Stint *Calidris ruficollis*		***	***	**	*
Temminck's Stint[a] *Calidris temminckii*		***	*		
Long-toed Stint[a] *Calidris subminuta*		**			
Sharp-tailed Sandpiper *Calidris acuminata*			*		
Dunlin *Calidris alpina*		*	*		
Curlew Sandpiper *Calidris ferruginea*	*	*	**		*
Spoonbill Sandpiper *Eurynorhynchus pygmeus*		*	***		
Broad-billed Sandpiper *Limnicola falcinellus*		*	***		
Red-necked Phalarope[b] *Phalaropus lobatus*			*		
Pheasant-tailed Jacana[a] *Hydrophasianus chirurgus*				*	
Black-winged Stilt[a] *Himantopus himantopus*	*	***	**		
Pacific Golden-Plover *Pluvialis fulva*		**	**	**	
Grey Plover *Pluvialis squatarola*	*	***	***	*	*
Little Ringed Plover[a] *Charadrius dubius*	*	***	*		
Kentish Plover *Charadrius alexandrinus*	*	***	***		
Lesser Plover *Charadrius mongolus*		**	***	**	
Greater Sand Plover *Charadrius leschenaultii*		**	***	***	
Less/Greater Sand Plover *Charadrius mong./lesch.*	*	***	***	***	*
Grey-headed Lapwing[a] *Vanellus cinereus*		*			

a=only in rice-fields and pond areas;
b=sold at local marked

of the total counted on high tide counts. It was followed by Dunlin, Common Redshank, Black-tailed Godwit and Curlew Sandpiper. Almost the same species were recorded at high tide counts in the two sites while Red Knot and Sharp-tailed Sandpiper only appeared in Xuan Thuy Nature Reserve, and Common Snipe only in Cua Day Estuary.

Figure 2 presents the results from the high tide counts from Cua Day Estuary which took place approximately every second week. The peak in the spring migration was in mid-April with 3821 shorebirds recorded while the lowest numbers were recorded in March and June.

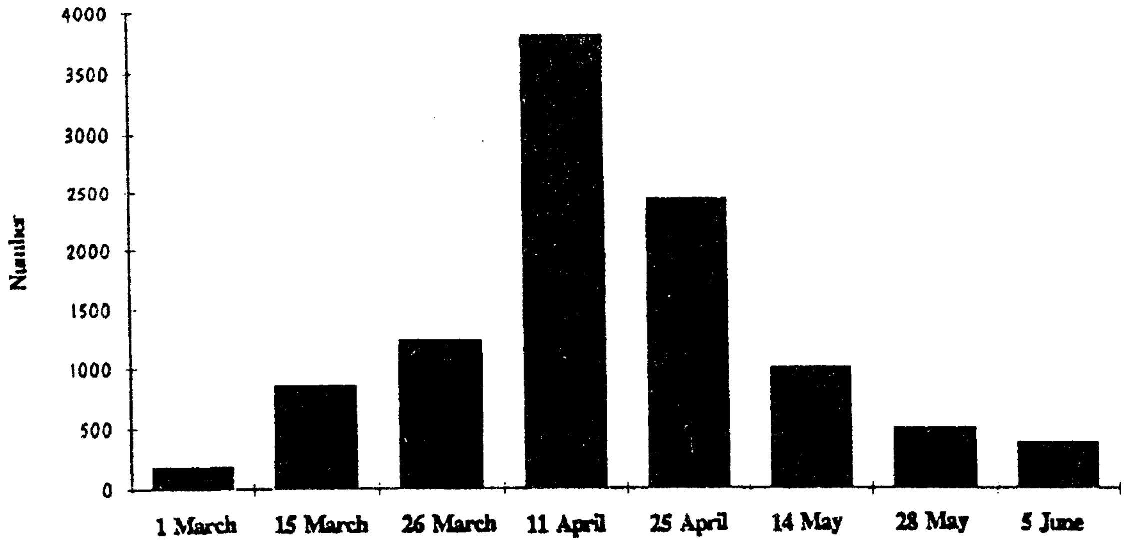

Figure 2. Numbers of shorebirds during high tide counts at Cua Day Estuary, Red River Delta in 1994.

Table 2. Numbers of shorebirds observed at high tide counts in Cua Day Estuary from March to June 1994.

Species	Date							
	1 March	15 March	26 March	11 April	25 April	14 May	28 May	5 June
Common Snipe	-	-	-	2	2	-	-	-
Black-tailed Godwit	-	-	1	43	15	-	-	13
Bar-tailed Godwit-	-	-	4	1	-	1	-	
Whimbrel	-	-	-	-	1	-	-	-
Eurasian Curlew	-	2	2	3	60	-	-	7
Spotted Redshank	-	30	-	760	750	-	-	-
Common Redshank	-	-	-	90	150	-	-	-
Marsh Sandpiper	-	-	-	22	100	-	-	-
Common Greenshank	-	18	28	20	210	87	19	100
Nordmann's Greenshank	-	-	-	-	2	-	-	-
Terek Sandpiper	-	-	-	3	8	8	-	37
Grey-tailed Tattler	-	-	-	3	218	432	480	61
Ruddy Turnstone	-	-	1	2	2	-	-	-
Asian Dowitcher	-	-	-	-	1	-	8	2
Great Knot	-	-	-	2	5	2	-	-
Sanderling	-	21	1	6	41	47	-	2
Red-necked Stint	-	1	-	97	90	24	-	38
Curlew Sandpiper	-	-	-	1	5	-	-	1
Spoonbill Sandpiper	-	-	-	6	-	-	-	-
Broad-billed Sandpiper	-	-	-	2	3	-	-	-
Pacific Golden-Plover	26	5	-	-	-	1	-	-
Grey Plover	-	22	1	3	2	6	-	4
Kentish Plover	85	428	241	21	5	-	-	-
Lesser Sand Plover	-	270	163	521	100	39	-	-
Greater Sand Plover	-	30	-	-	300	110	-	-
Less/Greater Sand Plover	80	35	509	2000	380	61	-	124
Unidentified shorebirds	-	-	300	210	-	200	-	-
TOTAL	191	862	1247	3821	2449	1017	508	389

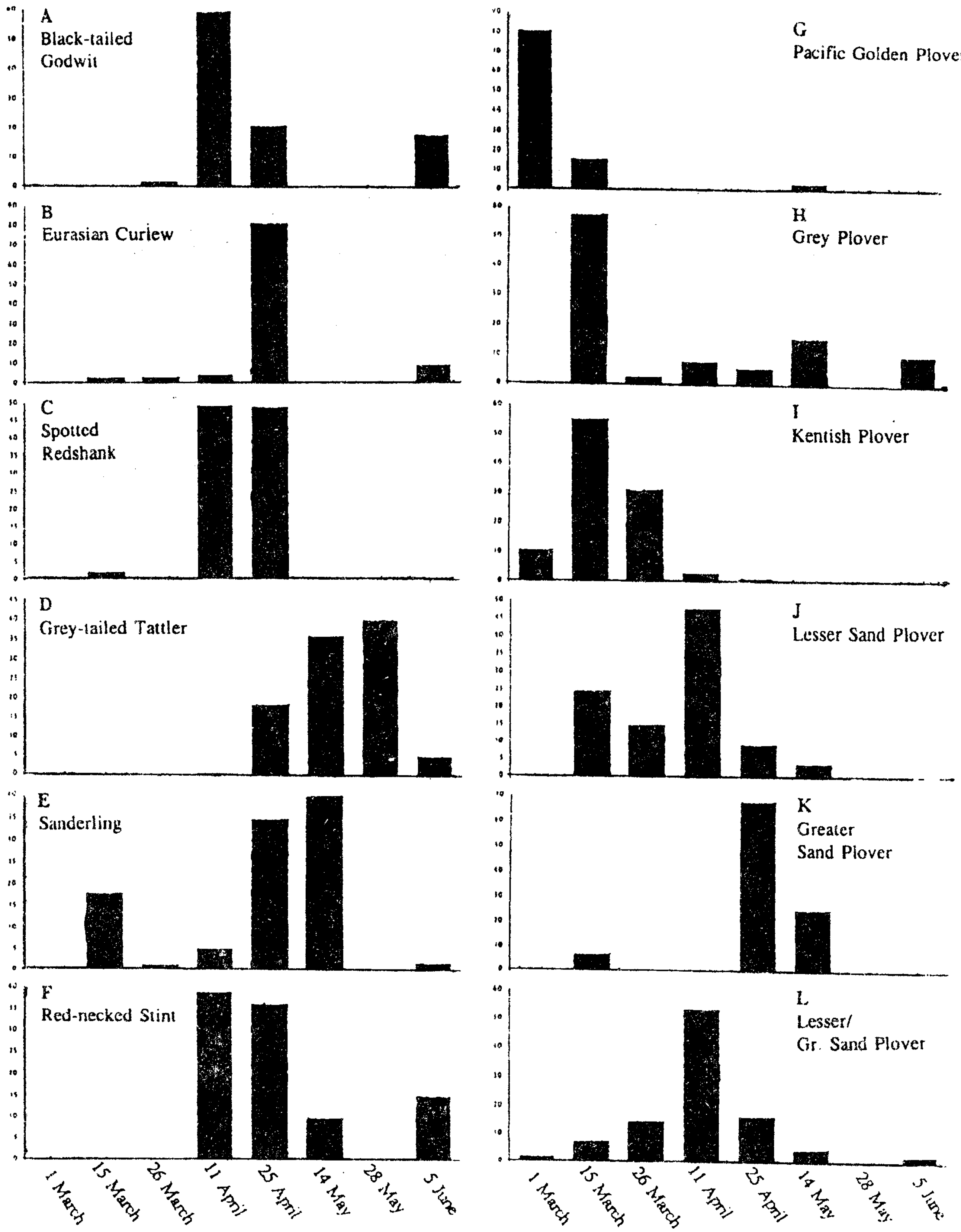

Figure 3. Seasonal change in relative abundance of 11 selected species of shorebirds during northward migration in 1994 from Cua Day Estuary, Red River Delta, Vietnam.

Table 3. Numbers of shorebirds observed at high tide counts in Xuan Thuy Ramsar Area from March to May 1994.

Species	Date			
	5 March	28 March	28 April	20 May
Black-tailed Godwit	3	711	55	2
Bar-tailed Godwit	-	-	12	-
Whimbrel	-	-	164	-
Eurasian Curlew	2	67	40	2
Spotted Redshank	5	17	298	-
Common Redshank	2	32	790	6
Marsh Sandpiper	4	10	8	-
Common Greenshank	-	14	167	4
Nordmann's Greenshank	-	-	5	-
Terek Sandpiper	-	2	116	-
Grey-tailed Tattler	-	-	185	2
Ruddy Turnstone	-	-	4	-
Asian Dowitcher	-	-	164	-
Great Knot	-	-	6	-
Red Knot	-	-	38	-
Sanderling	-	6	21	-
Red-necked Stint	-	14	1,100	97
Sharp-tailed Sandpiper	-	-	1	-
Dunlin -	900	-	-	
Curlew Sandpiper	-	50	611	-
Spoonbill Sandpiper	-	1	2	-
Broad-billed Sandpiper	-	1	51	-
Pacific Golden-Plover	-	-	60	1
Grey Plover	1	130	64	-
Kentish Plover	1	20	9	-
Lesser Sand Plover	-	1	67	-
Greater Sand Plover	-	1	120	-
Less/Greater Sand Plover	2	250	200	13
Unidentified shorebirds	-	600	-	-
TOTAL	19	2,828	4,358	127

Table 4. Maximum numbers of shorebirds observed at low and high tide in the intertidal area in Cua Day Estuary and Xuan Thuy Ramsar Area from February to June 1994.

	Cua Day Estuary	Xuan Thuy Ramsar
Species	N	N
Common Snipe	30	0
Black-tailed Godwit	43	711
Bar-tailed Godwit	4	12
Whimbrel	42	164
Eurasian Curlew	60	67
Spotted Redshank	760	298
Common Redshank	150	790
Marsh Sandpiper	215	8
Common Greenshank	210	167
Nordmann's Greenshank	2	5
Terek Sandpiper	39	116
Grey-tailed Tattler	480	185
Ruddy Turnstone	5	4
Asian Dowitcher	8	164
Great Knot	8	6
Red Knot	0	38
Sanderling	57	21
Red-necked Stint	140	1,100
Sharp-tailed Sandpiper	0	1
Dunlin	1	900
Curlew Sandpiper	450	611
Spoonbill Sandpiper	7	2
Broad-billed Sandpiper	2	51
Pacific Golden-Plover	26	60
Grey Plover	51	130
Kentish Plover	462	20
Lesser Sand Plover	1,097	67
Greater Sand Plover	200	120
Less./Gr. Sand Plover	2,000	250
Total	6,549	6,068

Table 4 shows the maximum daily number of shorebirds observed in the intertidal area of Cua Day Estuary and Xuan Thuy Nature Reserve. There were large variations in the maximum daily numbers of species between the two areas. The highest proportional differences were for Red Knot, Dunlin, Marsh Sandpiper, Broad-billed Sandpiper, Kentish Plover, Asian Dowitcher, Black-tailed Godwit and Lesser Sand Plover. When the maxima for each species are added, the total number of shorebirds in the intertidal area reaches 6549 in Cua Day Estuary and 6068 in Xuan Thuy Nature Reserve.

Seasonal patterns in occurrence of shorebirds in the delta

Seasonal changes in the occurrence of 37 species of shorebirds observed from 25 February to 5 June 1994 in the Red River Delta are given in Table 1. It is seen that some species occurred in the area throughout the whole study period while others were only seen very briefly. The following species were seen less than five times and therefore cannot support any conclusions about the real time schedule of their migrations: Red Knot, Long-toed Stint, Sharp-tailed Sandpiper, Dunlin, Red-necked Pharalope, Pheasant-tailed Jacana and Grey-headed Lapwing.

Variation in the relative abundance during the spring migration of 1994 for 11 selected species is given in Figure 3. It is seen that most species had a migration peak in April. Pacific Golden-Plover (Figure 3g), Grey Plover (3h) and Kentish Plover (3i) were earlier migrants with peaks during March whereas late

Table 5. Relative abundance of shorebirds during high tide counts from March - June 1994 in Cua Day Estuary and Xuan Thuy Ramsar Area. Only species with relative values over 1% are included. Relative abundance is expressed as the proportion of the total number of shorebirds at each high tide count in %.

Species	Cua Day Estuary								Xuan Thuy Ramsar Area			
	Date											
	1	15	26	11	25	14	28	5	5	28	28	20
	March			April		May		June	March		April	May
Black-tailed Godwit	-	-	<0.1	1.1	0.6	-	-	3.3	15.0	25.1	1.3	1.6
Whimbrel	-	-	-	-	<0.1	-	-	-	-	-	3.8	-
Eurasian Curlew	-	0.2	0.2	0.1	2.4	-	-	1.8	10.0	2.4	0.9	1.6
Spotted Redshank	-	3.5	-	19.9	30.6	-	-	-	25.0	0.6	6.8	-
Common Redshank	-	-	-	2.4	6.1	-	-	-	10.0	1.1	18.1	4.7
Marsh Sandpiper	-	-	-	0.6	4.1	-	-	-	20.0	0.4	0.2	-
Common Greenshank	-	2.1	2.2	0.5	8.6	8.6	3.72	5.7	-	0.5	3.8	3.1
Terek Sandpiper	-	-	-	0.1	0.3	0.7	-	9.5	-	1	2.7	-
Grey-tailed Tattler	-	-	-	0.1	8.9	42.4	94.5	15.7	-	-	4.2	1.6
Asian Dowitcher	-	-	-	-	<0.1	-	1.6	0.5	-	-	3.8	-
Sanderling	-	2.4	<0.1	0.2	1.6	4.6	-	0.5	-	0.2	0.5	-
Red-necked Stint	-	0.1	-	2.5	3.7	2.3	-	9.8	-	0.5	25.2	76.4
Dunlin	-	-	-	-	-	-	-	-	-	31.8	-	-
Curlew Sandpiper	-	-	-	<0.1	0.2	-	-	0.3	-	1.8	14.0	-
Broad-billed Sandpiper	-	-	-	<0.1	0.1	-	-	-	-	<0.1	1.2	-
Pacific Golden-Plover	13.6	0.6	-	-	-	<0.1	-	-	-	-	1.4	0.8
Grey Plover	-	2.6	<0.1	0.	1.1	0.6	-	1.0	5.0	4.6	1.5	-
Kentish Plover	44.5	49.7	19.3	0.5	0.2	-	-	-	5.0	0.7	0.2	-
Lesser Sand Plover	-	31.3	13.1	13.6	4.1	3.8	-	-	-	<0.1	1.5	-
Greater Sand Plover	-	3.4	-	-	12.2	10.8	-	-	-	<0.1	2.7	-
Lesser/Greater Sand Plover	41.9	4.14	0.85	2.3	15.5	6.0	-	31.9	10.0	8.8	4.6	10.2
Unidentified shorebirds	-	-	24.1	5.5	-	19.7	-	-	-	21.2	-	-
TOTAL	100	100	99.8	99.5	98.9	99.5	98.2	99.2	100	99.5	98.8	100

migrants were Sanderling (3e), with a peak during late April-early May, and Grey-tailed Tattler (3d), with a peak in May.

The relative abundance for selected species of shorebirds at each high tide count in Cua Day Estuary and Xuan Thuy Nature Reserve is presented in Table 5. On a few occasions a small number of species constituted more than 25% of the total number recorded in both sites on the high tide count. In Cua Day Estuary, Spotted Redshank, Common Greenshank, Grey-tailed Tattler, Kentish Plover, Lesser Sand Plover and Lesser/Greater Sand Plover were the most abundant while in Xuan Thuy Nature Reserve, Black-tailed Godwit, Spotted Redshank, Red-necked Stint and Dunlin were the most abundant species. Most species had relatively low abundances.

Turn-over estimate

No studies of turn-over rates have ever been published on the East-Asian Australasian Flyway but studies of turn-over rate have been conducted in the East Atlantic Flyway. In a coastal wetland in Morocco, Kersten and Smit (1984) found that the turn-over rate of shorebirds was 4.5 - meaning that the total number of shorebirds occurring in the area is equal to 4.5 times the maximum count. This estimation of the turn-over rate was based on colour-marking, counts and numerical fluctuations during March 1981. Based on a judgment over differences and similarities with this coastal wetland in Morocco, it is considered realistic to use the turn-over rate of 4.5 for the Red River Delta.

In the Red River Delta it was not possible to simply add peak counts at the two sites because of a possible interchange between the two areas. Therefore, only the highest daily record of each species was taken as a maximum estimate of birds present in each area (Table 4). Using the peak counts recorded for each species this would mean that Cua Day Estuary and Xuan Thuy Nature Reserve each held a total of *c.* 30000 visiting shorebirds in the intertidal areas. Based on the estimate of the total intertidal area in the entire delta, and assuming the counting areas to be a random sample of

Table 6. Peak number of shorebirds identified at high tide counts during previous surveys in the Red River Delta. Only species with relative values over 1% are included - relative abundance is expressed as the proportion of the total number of identified shorebirds at each high tide count in %. Data compiled from Scott *et al.* (1989), Anon. (1993), Lane *et al.* (1994) and Derek A. Scott (*in litt.* 1995).

	Cua Day Estuary	Xuan Thuy Ramsar Area			
Species	Date				
	8 April 1993	10-12 March 1988	25-28 March 1989	20-22 March 1991	1-4 April 1991
	N=9,790	N=4,259	N=7,047	N=5,270	N=7,352
Common Snipe	-	130	25	-	-
Black-tailed Godwit	120	1,000	4,200	3,000	2,575
Eurasian Curlew	-	300	125	-	100
Spotted Redshank	115	1,500	130	20	44
Common Redshank	140	110	90	310	769
Marsh Sandpiper	40	300	100	175	96
Common Greenshank	550	250	120	237	294
Terek Sandpiper	-	5	1	8	101
Great Knot	-	70	-	-	57
Sanderling	200	4	95	8	20
Red-necked Stint	150	-	95	148	427
Dunlin	-	-	450	220	428
Curlew Sandpiper	10	5	160	301	818
Broad-billed Sandpiper	-	230	100	-	43
Pacific Golden-Plover	-	45	8	36	-
Grey Plover	-	12	32	164	104
Kentish Plover	250	20	525	263	406
Lesser Sand Plover	[a]	200	15	14	85
Great Sand Plover	8,000[a]	5	650	361	518
Unid. shorebirds	210	-	-	-	460

the entire delta, it is estimated that *c.* 118000 shorebirds used the delta during the northward migration in 1994. This is 1.8-3.0% of the estimated total East-Asian Australasian Flyway population of shorebirds (4-6 million).

Previous surveys in the delta

Table 6 gives the peak number at high tide counts of selected shorebird species recorded from one previous survey in Cua Day Estuary (8 April 1993) and three previous surveys in Xuan Thuy Nature Reserve (10-12 March 1988, 25-28 March 1989, 20 March-4 April 1991). In the single survey of Cua Day Estuary, Lesser/Greater Sand Plover were the most dominant species (Anon. 1993a). In the surveys of Xuan Thuy Nature Reserve the most dominant species were the Spotted Redshank in early March 1988 (Scott *in litt.* 1995) and the Black-tailed Godwit in late March 1989 (Scott *et al.* 1989), 1991 and early April 1991 (Lane *et al.* 1994).

DISCUSSION

The northward migration of shorebirds in the Red River Delta was remarkable as a high number of species were recorded in relatively low numbers. Out of 28 species recorded in the intertidal areas, 12 species had peak counts less than 100 (Common Snipe, Bar-tailed Godwit, Eurasian Curlew, Nordmann's Greenshank, Ruddy Turnstone, Great Knot, Red Knot, Sanderling, Sharp-tailed Sandpiper, Spoonbill Sandpiper, Broad-billed Sandpiper and Pacific Golden-Plover). Five of these were recorded in numbers of less than 10 (Nordmann's Greenshank, Ruddy Turnstone, Great Knot, Sharp-tailed Sandpiper, Spoonbill Sandpiper). The records of many species in relative low numbers may result from a combination of a high turn-over rate, low populations, weather conditions, migration strategy (e.g. Piersma 1988) and also possibly from undiscovered high tide roosts.

It is also estimated that the numbers counted may represent only a proportion of those actually using the area because the high tide counts could only be conducted every second week and because of high day to day fluctuations. This is probably the reason why Common Snipe, Red Knot and Sharp-tailed Sandpiper were only observed in one of the sites.

Only seven species had peak counts over 600 (Black-tailed Godwit, Spotted Redshank, Common Redshank, Red-necked Stint, Dunlin, Curlew Sandpiper and Lesser Sand Plover) in one of the sites during this survey. Together with Grey-tailed Tattler, Kentish Plover and Lesser/Greater Sand Plover, these species were the most numerous during the survey.

Seasonal patterns of abundance

An increase in shorebird numbers was observed in the intertidal area of Cua Day Estuary from the beginning of March. Spring migration reached a peak in mid-April with counts around 4000, and declined until the start of June. Individual species showed considerable variation in the pattern of seasonal distribution.

It is possible that the birds counted at the end of February and in early March were a mixture of individuals wintering in the Red River Delta and birds on their way northwards from more southerly non-breeding areas. It is estimated that Pacific Golden-Plover, Grey Plover and Kentish Plover - species with early arrivals (with a peak already in early-March, Fig. 3g-3i) - could have been northern hemisphere winter visitors in the delta. They may be non-breeding visitors, as they are known to spend the non-breeding season in Hong Kong, *c.* 200 km further north (Chalmers 1986).

The patterns of occurrence of some individual species provide evidence of population flux through the area. It is obvious that further studies involving catching and marking of shorebirds in the Red River Delta would be required in order to provide more conclusive evidence of the origins, movements and possible migratory routes of the shorebirds, and their use of the delta as a staging area.

Do Cua Day Estuary and Xuan Thuy Nature Reserve supplement each other?

It was observed that there were more muddy areas and less sandy areas in Xuan Thuy Nature Reserve compared to Cua Day Estuary. It is assumed that this difference in habitat is the reason why some species occurred in relative low numbers at Cua Day Estuary and in high numbers in Xuan Thuy Nature Reserve, even though there was a difference in the number of observation days between the two sites.

There was a tendency for species occurring in higher numbers at Xuan Thuy Nature Reserve (Black-tailed Godwit, Asian Dowitcher, Dunlin and Broad-billed Sandpiper) to prefer muddy areas for feeding (e.g. Hayman *et al.* 1987, Lane 1987). Most of the species occurring in higher numbers in Cua Day Estuary (e.g. Kentish Plover and Lesser Sand Plover) preferred sandy areas for feeding (e.g. Hayman *et al.* 1987).

Only sporadic information exists from previous surveys in the delta and all of these have been conducted in March or early April. Even though there is little comparative material available, it seems that Black-tailed Godwit is very numerous in Xuan Thuy Nature Reserve, with records of up to 4200 individuals in 1989 (Scott *et al.* 1989). According to Figure 3, early April seems to be the peak migration period for Black-tailed Godwit. It is therefore strange that only 120 individuals were observed in early April 1993 (Anon. 1993a) during the only previous visit to Cua Day Estuary. Based on present and previous observations it seems that the Black-tailed Godwit prefers Xuan Thuy Nature Reserve as a stopover site during the northward migration.

The Lesser and the Greater Sand Plovers were often grouped together as identification time rarely allowed us to identify every plover to species level. Even if these two species are lumped they are more numerous at Cua Day Estuary than in Xuan Thuy Nature Reserve according to the present survey (Table 4). The previous surveys have all been conducted before the presumed peak in their spring migration period. It is not known whether the spring migration was earlier in 1993, but 8000 Lesser/Greater Sand Plovers (Anon. 1993a) were recorded in Cua Day Estuary that year. Such high numbers have never been observed in Xuan Thuy Nature Reserve and judging from present and previous observations it seems probable that Cua Day Estuary is the preferred stopover site for Lesser and Greater Sand Plovers during northwards migration.

There may be a slight tendency for species occurring in higher numbers in Cua Day Estuary than in Xuan Thuy Nature Reserve to prefer sandy areas, and for species occurring in higher numbers at Xuan Thuy Nature Reserve than at Cua Day Estuary to prefer muddy areas. The Cua Day Estuary seems to supplement the Xuan Thuy Nature Reserve by providing a complementary set of species.

Turn-over

In order to find out how many shorebirds use the Red River Delta on northwards migration, the value for turn-over rate found by Kersten and Smit (1984) in a coastal wetland in Morocco was used to estimate turn-over rate in the Red River Delta. The estimate should be regarded with caution due to the differences between the two areas. The differences include smaller numbers of wintering shorebirds in the delta, 15 days longer spring migration in the delta and a generally shorter stopover in the delta because of the longer distance to the non-breeding sites. Furthermore, the data used for estimating the turn-over rate in Morocco comprised species other than those found in the delta.

It is presumed that the turn-over rate found in Morocco is a realistic guess for the turn-over rate in the delta judging from the difference in the length of the spring migration period and the assumed shorter stopover period for shorebirds in the delta than in Morocco. It is therefore possible that the turn-over rate found in Morocco in fact represents an underestimate for the delta. For this reason, it is likely that Cua Day Estuary and Xuan Thuy Nature Reserve are each visited by 30000 shorebirds, and that the intertidal areas in the entire delta were visited by at least 118000 shorebirds during northward migration in 1994. Thus the Red River Delta may be used by *c.* 3.0% of the estimated total population of shorebirds (4-6 million) of the East-Asian Australasian Flyway.

International importance of Cua Day Estuary
During the present survey, Cua Day Estuary was identified as a globally/internationally important wetland area based on the estimated occurrence of more than 20000 shorebirds. Whether the value of the area is based on total number of waterbirds (Pedersen *et al.* unpubl.) during the study period or the occurrence of threatened species in the area (Pedersen *et al.* in press) the area still fulfils some of the criteria on the Ramsar Commission qualifying the area to be an internationally important wetland.

Owing to the value of Cua Day Estuary, and as it is assumed to supplement Xuan Thuy Nature Reserve, it is recommended that Cua Day Estuary is protected as a nature reserve under Vietnamese law and gets status as a Ramsar Area.

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READY! STEADY! GO? A CRUCIAL DECISION FOR THE LONG-DISTANCE MIGRANT; AN INTERESTING CHALLENGE FOR THE INVESTIGATOR.

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ABSTRACT
The departure mass of a successful migrant wader is a vital piece of information, not only for the bird itself, but also for those interested in migration energetics and foraging ecology. Methods used to estimate departure mass are reviewed and their limitations discussed. Mass data obtained from Great Knot *Calidris tenuirostris* and Bar-tailed Godwit *Limosa lapponica*, caught before northward departure from north-western Australia, have been analysed to determine the feasibility of identifying "about-to-depart" birds. The initial results are promising. Suggestions are made for additional data needs and refinements to improve the certainty of identification. *Stilt* 28 (1996)

INTRODUCTION
Migratory waders, with their amazing long-distance journeys, easily capture the imagination. Their annual travels between the hemispheres, north to south, east to west, are prodigiously long and often involve lengthy journeys across oceans.

Probably the longest scheduled non-stop flights in the world are those of Great Knot *Calidris tenuirostris* and Bar-tailed Godwit *Limosa lapponica* between north-western Australia and the east coast of China (Barter & Wang 1990). The great circle distance of 5,500km almost certainly underestimates the actual distance flown, as radar studies show that departure directions are around 320^{0} to 330^{0}(Lane & Jessop 1985, Tulp *et al* 1994), whereas Shanghai lies almost due north of Broome (359^{0}). This apparent waywardness seems to be a common phenomenon. Waders flying from west Africa to northern Europe (Piersma *et al* 1990), from eastern Canada to South America (Richardson 1979) and from Iceland to north-eastern Canada (Alerstam *et al.* 1990) also depart in a more "anti-clockwise" direction than appears desirable, at first sight. The ability to gain useful assistance from favourable winds down the track is the explanation.

An equally amazing adventure is that of the Red-necked Stint *Calidris ruficollis*, the smallest common migrant wader in Australia, an individual of which moved the record distance of 12,435km between the banding site in south-eastern Australia and recovery in Yakutia, Russian Far East (Pook 1992). A long way for a species that has an average non-breeding mass of only 29g. Stints of at least 17 years of age have been recaptured in Australia, implying that they have flown a distance equivalent to that to the moon during their annual migrations.

Why do they migrate? Simple! In their case the strategy has evolved as the optimal approach to ensure survival of individuals within the species. How do they do it? Nowhere near as obvious! Numerous brains have been exercised in trying to answer this question.

Developing an understanding of a species' migration strategy requires the use of a variety of information - banding recoveries, sightings of colour-marked birds, systematic counts, turnover rates and measurement of mass gains are some. Understanding the ecological needs of a migrant wader at the different places used during its travels is an essential prerequisite for development of effective species conservation plans which safeguard both birds and habitat.

The strategic decisions required for successful migration to the breeding grounds have been enumerated by Piersma (1994) as:

1) the decision to start preparations for migration, involving moulting into breeding plumage and fuel storage.

2) the decision to depart on a migration flight.

3) the decision to interrupt the flight for refuelling purposes.

4) the decision to cease migrating and commence breeding.

These strategic decisions are supplemented by many smaller, but none the less very important, decisions, which optimise foraging effectiveness, flying efficiency and breeding success.

The common link, or thread, between these decisions is fuel availability. Fat and protein reserves are not only important to fuel migration, but also may be critical for successful breeding, especially shortly after arrival when energy demands during courtship and egg laying are high and inclement weather may severely limit feeding opportunities (Davidson & Evans 1989).

A very important question faced by a migratory wader is "Do I have enough fuel reserves to reach the next refuelling site and survive?" - and then choosing the correct answer! The consequence of being wrong is terminal. Fortunately for waders, evolution and inherited traits provide an "invisible hand" to guide them. Annual survival rates of 70-80% indicate that they get the answer right more often than wrong.

Pity the poor wader researcher who faces a similar question, ie. "What are the departure masses of migrating waders?", but without the assistance of that "invisible hand". The question is a fascinating one. The answer may enable us to predict where the next stop is located. Departure mass is also very important information for the foraging ecologist, who wants to know at what rate a wader builds up fuel reserves and then equate this with the estimated energy intake, based on observations of food prey and foraging success.

Departure mass, then, is a key piece of information in our attempts to understand migration strategies. How do we estimate what it is?

THE ANALYTICAL PROBLEM

It seems to me that there are three methods. All are necessarily indirect and all rely on capturing birds. Necessarily indirect, because it is exceedingly unlikely that a weighed bird will migrate immediately upon release, and if it did, it is just as unlikely that it would be observed to do so.

The first method involves calculating departure mass from manipulated flight range equations, given that the distance flown is known. The second requires extrapolation using information on mass gain rate and departure date. The third method involves analysing mass data from captured birds and, in some way, identifying birds about to depart. Let's explore the flight equation approach first.

Flight range equations

The practical problems associated with employing manipulated flight range equations to estimate departure mass, revolve around the input data (eg. flight range, arrival mass, flight speed, body composition, structural size) and the flight conditions (eg. wind, energetic benefits of formation flying).

Flight range equations are based on either equating fuel load with flight costs (eg. Raveling & Lefebre 1967, McNeil & Cadieux 1972, Greenewalt 1975, Summers & Waltner 1978, Davidson 1984, Castro & Myers 1988,1989) or on aerodynamic theory (Pennycuick 1975). The flight cost versions, which require inputs of departure and lean (or arrival) masses and flight speed, and in some cases wing-length, have been progressively modified to allow for improved estimates of flight cost, body mass decrease during flight, and differences in aerodynamic performance due to structural size. Whilst this increasing sophistication has led to decreasing estimates of flight range, for a given fuel load, the estimates from different models have not been unrealistic, and have generally been greater than the known distances flown (Davidson 1984, Gudmundsson 1991). Similar estimates from the aerodynamic theory model show these to be very much on the low side compared to practice (Davidson 1984).

Initially, in using the equations it was assumed that all mass gain was fat. However, this is not so (Davidson 1984, Davidson & Evans 1989, Castro & Myers 1990, Lindstrom & Piersma 1993). As fat provides around eight times the energy of protein, it is very important to know the contributions of each tissue type to mass gain. Unfortunately, the relative proportions are not fixed across species (Lindstrom & Piersma 1993) and vary with time and place within a species (Davidson 1983, Davidson & Evans 1989, Johnson *et al.* 1989, Castro & Myers 1990). The determination of fat and protein proportions requires carcasses for body composition analysis. It may, though, be possible to use total-body electrical conductivity measurements (Castro *et al.* 1990), which eliminate the undesirable need to collect and sacrifice birds. To complicate matters further there is evidence that waders can undergo premigratory dehydration just before departure, presumably as a strategy to increase flight range (Davidson 1984, Johnson *et al.* 1989).

There are some further difficulties in using flight range equations as they require an estimate of flight speed, assume still air conditions and make no allowance for the energetic benefits of nocturnal departure (Piersma *et al.* 1990) or from formation flying. Data, although variable, is available on flight speeds (eg. Lane & Jessop 1985, Tulp *et al.* 1994). Shorebirds can receive considerable wind assistance during long-distance flights (Zwarts *et al.*1990, Piersma *et al.* 1990, Tulp *et al.* 1994) and formation flying is predicted to allow energy savings of 20-40% (Lissaman & Schollenberger 1970 and Hummel 1973 *in* Alerstam *et al.* 1990).

An arrival mass has to be assumed in order to calculate the required departure mass for a known flight distance. This may be close to the lean mass, but is not necessarily the case. Great Knot and Bar-tailed Godwit arriving at the Chinese coast from Australia were found to be well below lean mass (Barter & Wang 1990). Davidson & Evans (1989) suggest that shorebirds may arrive on the breeding grounds with mass reserves to improve survival chances in the event of poor weather, whilst Gudmundsson *et al.* (1991) suggest that birds may carry excess fuel, gained at a "good" site, in order to minimise time spent at the next staging site if it is "poor". Use of this strategy minimises total migration time and is in contrast to the energy minimisation strategy, in which birds leave as soon as they have enough fuel in order to avoid increased flight costs due to an excessive load.

So, there are real problems in using flight equations to estimate departure masses. The difficulties and assumptions required cast serious doubt on the applicability of this approach. Ens *et al.* (1990a) note that these imprecisions lead to multiplicative, not additive, errors.

Rate of mass gain
Departure masses can be estimated by adding mass gained over the pre-migratory period to the mass at capture. This second approach requires knowledge of both the mass gain rate and departure date. Average mass gain rate can be deduced from successive samples but can be seriously affected by departure of heavy birds and arrival of light birds (Davidson 1984). This leads to underestimates of mass gain rate. Zwarts *et al.* (1990) have shown that if mass increase is not synchronous the average mass increase of the population is always less than the mass increase of individual birds. The underestimate is caused by variations in individual mass gain rates and departure times; the greater these variations, the larger the underestimate.

It would seem that the problems of using average mass gain rate could be overcome by using data from individuals caught more than once during the premigratory period. However, captured waders are susceptible to mass loss following capture and this, consequently, reduces the apparent mass gain rate (see Table 1 in Castro *et al.* (1991) for collected references). Sometimes the effect can be very large. Castro *et al.* (1991) found that the rate of mass loss was about 1.5% of capture mass/h between 18^{0}C and 29^{0}C, but that this rose to 8% between 33^{0}C and 38^{0}C. Ens *et al.* (1990b) determined that it took Ruddy Turnstones 25 days, on average, to recover from the effects of capture in Mauritania.

A further problem with this method is that departure dates are difficult to determine (Davidson 1984). Thus, the approach using mass gain rates to calculate departure mass also has serious practical difficulties.

Direct estimation
The remaining suggestion is that of directly estimating departure masses using data obtained from catches made during the departure period.

This approach has been adopted by Davidson (1984), Ens *et al.*(1990b) and Zwarts *et al.* (1990). All have recognised the need to take into account structural size in order to determine mass gains and flight ranges.

Davidson suggests that the heaviest 10% of the population are "ready-to-go" and can be used to calculate potential flight distances.

Ens *et al.* (1990) and Zwarts *et al.* (1990) both found, for waders at the same stage of breeding plumage, that those in suspended pre-nuptial moult were heavier than those still actively moulting. Both used a combination of mass and moult to pinpoint waders ready to depart. Zwarts *et al.* (1990) suggested that the best estimate of departure mass is the mean of the upper half of the mass frequency distribution of birds in suspended or completed body moult.

These refinements offer the possibility of identifying individual birds that are "about-to-go" and, thus, their departure mass.

METHODS

As a start, an analysis has been carried out of mass data for individual Bar-tailed Godwit and Great Knot caught during the March-April period in north-western Australia, with the twin objectives of developing a method for identifying "about-to-depart" waders and of establishing data needs and refinements for future banding activities.

Fieldwork
A total of 4275 Bar-tailed Godwits and 5853 Great Knots have been caught in north-western Australia since the first expedition in August-September 1981. Since 1992, the Broome Bird Observatory team has caught a few hundred of both species. The vast majority of birds have been captured with cannon nets. All measurements were taken using standard techniques (eg. Rogers 1989).

Available data
Of the possible morphometric (ie. wing-, bill- and total head-length)/mass combinations, those with the largest sample sizes are bill-length/mass for Bar-tailed Godwit and wing-length/mass for Great Knot. These combinations are used in the analyses in order to cater for structural size differences.

A sample of 455 adult Bar-tailed Godwit bill- length/ mass combinations from the October-November period is available to enable the regression equation of non-breeding mass on bill-length to be determined; 310 adult Great Knot wing-length/mass combinations were available for the same purpose.

Approximately 1,900 adult Bar-tailed Godwit and 2,020 adult Great Knot have been captured during the March-April period. For Bar-tailed Godwit, 1696 bill-length/mass combinations are available. The best data series was obtained in 1994, when sufficiently large adult catch sizes (n = 37 to 131) were made on nine occasions from 3 March to 8 April, and these have been used for the analysis. In the case of adult Great Knot, 368 wing-length/mass combinations are available. The small sample size spread over a number of seasons does not allow the same detailed analysis to be carried out as that for Bar-tailed Godwit. As a result, only four Great Knot catches over two migration periods have been analysed and reported.

Analytical technique

The technique employed to identify Bar-tailed Godwit and Great Knot which may be about to depart involves using scatter plots of mass vs. bill-length, or wing-length, and superimposing on these a plot of the mass required to fly 5500 km, using the flight range equation developed by Davidson (1984), and taking into account structural size. Birds with masses "above" the 5500 km line are candidates for early departure.

Use of the manipulated Davidson equation to determine departure mass requires inputs for distance flown, flight speed and lean (or arrival) mass.

Published data for flight speeds (either ground or air) are highly variable, (eg. mean figures in km/h are: Lane & Jessop (1985) - 78[ground]; Williams & Williams (1988) - 60.7 [ground]; Williams & Mao (1990) - 61.2 [ground]; Alerstam *et al.* (1990) - 55.4 to 73.0 [air]; Piersma & Jukema (1990) - 57 [air]; Tulp *et al.* (1994) - 47 [ground]). The flight speed adopted for this analysis is 70 km/h.

The lean mass is taken to be 93% of the non-breeding mass, which is consistent with the findings of Summers & Waltner (1978) and Zwarts *et al.* (1990). Non-breeding mass, as a function of bill- or wing-length, was obtained from the October-November period regression equations, when birds are believed to have a stable mass.

The sexing criteria used for Bar-tailed Godwit are males, 92.0 mm and females =100.0 mm (Barter 1989). Information on the timing of migration departures is, available for all days in March and April in 1994 (AWSG unpub. data).

RESULTS

Lean mass estimation

Scatterplots are given in Figures 1 and 2, respectively. The Bar-tailed Godwit scatterplot clearly demonstrates sexual dimorphism, with limited overlap, whilst that for the Great Knot does not. Bar-tailed Godwit bill-length has a better correlation with mass (n = 455; $r^2 = 0.543$) than does Great Knot wing-length (n = 310; $r^2 = 0.290$). Measurement correction, use of a different morphometric and employment of bivariate cleaning may improve the correlations. These approaches were not available with the existing data sets.

Examination of the mass on bill-length regressions for the individual Bar-tailed Godwit sexes shows that the slope of the male regression is very similar to that of combined regression in Figure 1, whilst that for females is flatter. In this initial foray, the approach of treating the sexes in a combined manner seems reasonable. However, separation of the sexes may well be necessary in future, more rigorous, analyses, especially if improved measurement and data cleaning techniques confirm the difference.

Catch masses

Scatterplots of catches made during the pre-migratory and departure periods are shown in Figures 3 and 4. Unsurprisingly, larger birds tend to be heavier.

The Bar-tailed Godwit set clearly show that individual birds are well above the October-November mean by early March, and the catch mean mass progressively approaches the notional departure mass for a 5500 km flight. Some individual godwit are at departure mass in early March, and numbers above the 5500 km line are substantial during late March and early April. When adults have departed (21 April), the catch mean is close to that of October-November, and no birds are near to departure mass.

Peak departures from Broome occurred in the 6-7 and 10-13 April periods (Fig. 5), although smaller numbers were observed leaving on 28 March and 1-2 April. The departure data is reasonably consistent with that in Figure 3 although, it should be noted that seven out of the ten catches were at Eighty Mile Beach, which is some 160 km from Broome.

Examination of Figure 3 indicates that the proportion of male birds is declining throughout the departure period and this is confirmed in Figure 6. The high proportion of male Godwit present in early March, before departure commences, is consistent with the finding in

Figure 1. Scatterplot for Bar-tailed Godwit measured and weighed in the October-November period. No data cleaning has been carried out, although some combinations seem unlikely. The regression equation for estimating mass is: Mass = 86.9 + 1.94 x bill-length ($r^2 = 0.543$; SE = 20.2 g). The regression line is labelled "mean" in the Figure; also included is a plot of "lean mass". The upper and lower bill-length limits for male and female godwit, at the 95% confidence level, are shown.

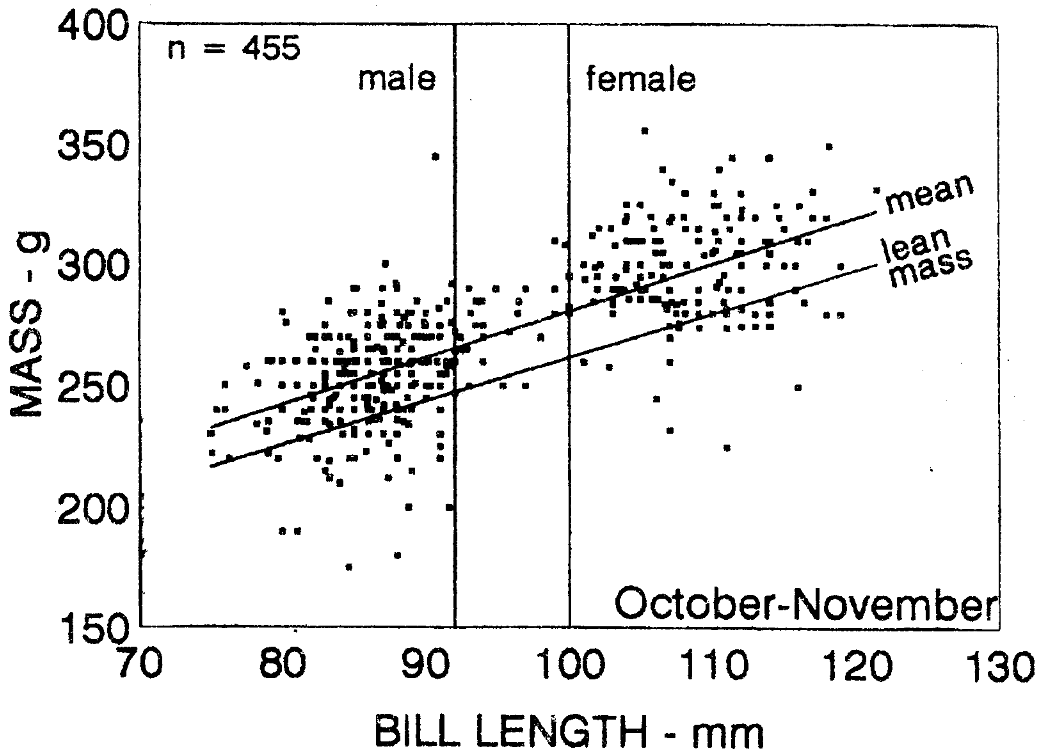


Figure 2. Scatterplot for Great Knot measured and weighed in the October-November period. No data cleaning has been carried out, although some combinations seem unlikely. The regression equation for estimating mass is: Mass = -117.5 + 1.39 x wing-length ($r^2 = 0.290$; SE = 10.3 g). This regression line is labelled "mean"; also included is a plot of "lean mass".

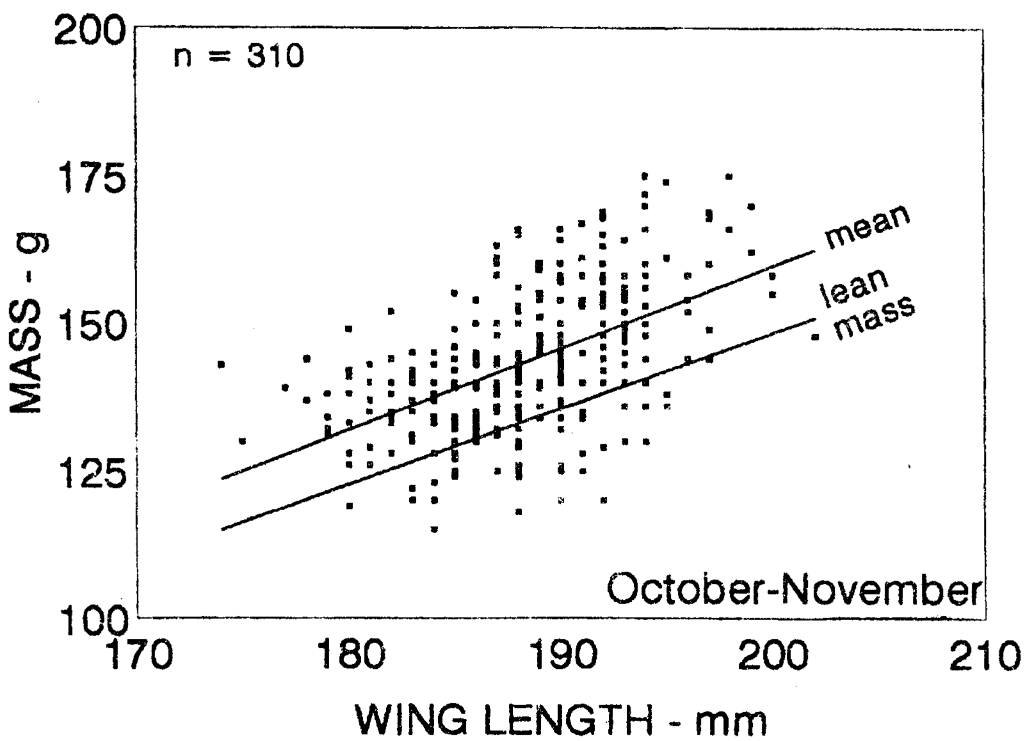
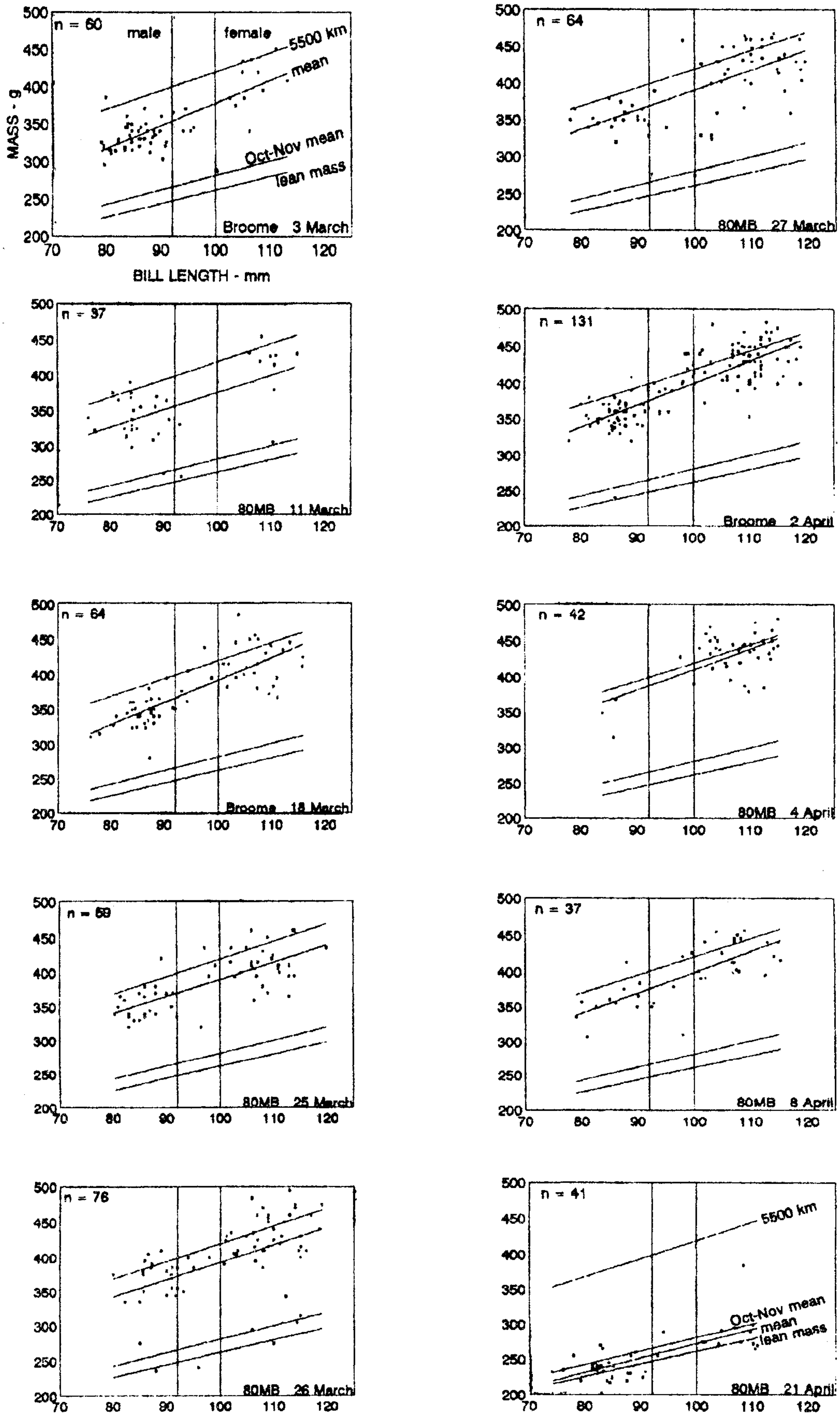


Figure 3. Scatterplots for ten Bar-tailed Godwit catches in the 1994 pre-migration, departure and post-migration periods. All are for adult birds, except the last (21 April) which is for all birds caught. See top left-hand figure for key. The "Oct-Nov mean" and "lean mass" lines have been taken from Figure 1; "mean" is the catch mass on bill-length regression and "5500 km" is the calculated departure mass for birds of varying bill-length. 80MB = Eighty Mile Beach.



Barter (1989) that males form 70% of the population in north-western Australia. The fact that the female proportion from late March onwards is similar to the normal population level of 30% (Barter 1989) indicates that males leave before females commence departing.

The Great Knot data is more limited, due to the lack of morphometric data for structural size estimation. However, the scatterplots show that catch mean masses are well above the October-November mean and good numbers of birds exceed the notional 5500 km departure mass. There is some evidence that adults are departing during the last ten days of March.

In 1994, large numbers of Great Knot were observed departing from Eighty Mile Beach from 21-24 March, and lesser numbers from Broome from 22 March-1 April (AWSG, unpub. data). This is consistent with the departure timing observation above, and indicates that Great Knot leave earlier than Bar-tailed Godwit.

Departure masses

As a first approximation, it appears that departure masses of Bar-tailed Godwit vary from around 380 g up to a maximum of about 470 g, depending on structural size. Interestingly, few birds exceed the notional departure mass by more than 5%.

Great Knot departure masses appear to vary between 230 and 260 g, again depending on structural size. Similarly, few birds exceed the notional departure mass by much.

DISCUSSION

Appropriateness of approach

Despite the significant problems associated with flight range equations and, therefore, the estimation of a notional minimum departure mass dependent on structural size, the results of both the Bar-tailed Godwit and Great Knot analyses provide results which are encouraging. Mean catch masses progressively get closer to the "5500 km" line as the main departure period approaches and many birds are at masses which are reasonably close to the "5500 km" line, but few are much heavier.

The results clearly demonstrate the critical importance of obtaining sufficient morphometric information to allow structural size to be taken into account. Ideally, independent measurements, such as bill- and wing-length, should be available to allow both bivariate data cleaning to be employed and identification of the most appropriate indicator of structural size to be made. For example, whilst bill-length is invariably measured for Bar-tailed Godwit, because of its excellent sexing capability, wing-length may be a better measure of size.

Whilst the results make sense, the use of the "5500 km" line as a selection technique for "about-to-depart" birds is quite arbitrary, in the light of the problems surrounding flight range equations. The "heaviest 10%" suggestion of Davidson (1984) has a similar drawback.

Zwarts *et al.*'s (1990) use of breeding plumage and body moult status provides a method of identifying potential early migrants. In their case, the approach was used to determine mean departure mass (ie. the mean of the upper half of the mass frequency distribution of birds in suspended or completed body moult).

The "plumage and moult" selection technique could be used to identify **individual** birds ready to depart and it would be interesting to see whether such birds are the same as those close to, and above, the "5500 km" lines in Figures 3 and 4. If the two groups are similar, it would provide supporting evidence that plumage and moult status can be used to select departing birds - and, thus, obtain departure masses for known individuals.

What data needs and refinements are necessary to progress this approach to determining departure mass?

Field data requirements

Use of the "plumage and moult" selection technique will require that the degree of breeding plumage and the amount, or absence, of body moult be assessed for each bird. Bill-, head-bill and wing-length, and mass must be obtained for all birds.

The morphometric data will require correction to allow for differences between measurers and, thus, standardisation of measurers will be necessary. Additionally, capture mass loss experiments will need to be carried out so that corrections can be made to individual masses on the basis of both the elapsed time since capture and temperature. This will also require that keeping-cage temperature (perhaps hourly), the catch time and the time at which each bird is processed needs to be recorded on the field sheets.

Evaluation of flight range equations

The possibility of obtaining departure masses for individual birds creates an opportunity to test flight range equations, using an assumed arrival mass and body composition. Two important pieces of information needed are lean mass and body composition at departure.

Accurate estimation of lean mass will require the collection of morphometric data on large samples (say, 500) of both species during the October-January period in order that the best biometric, or combination of biometrics, can be selected for structural size

Figure 4. Scatterplots for four Great Knot catches, two each in the 1988 and 1990 departure periods. All are for adult birds. See top left-hand figure for key. The "Oct-Nov mean" and "lean mass" lines have been taken from Figure 2; "mean" is the catch mass on wing-length regression and "5500 km" is the calculated departure mass for birds of varying wing-length.

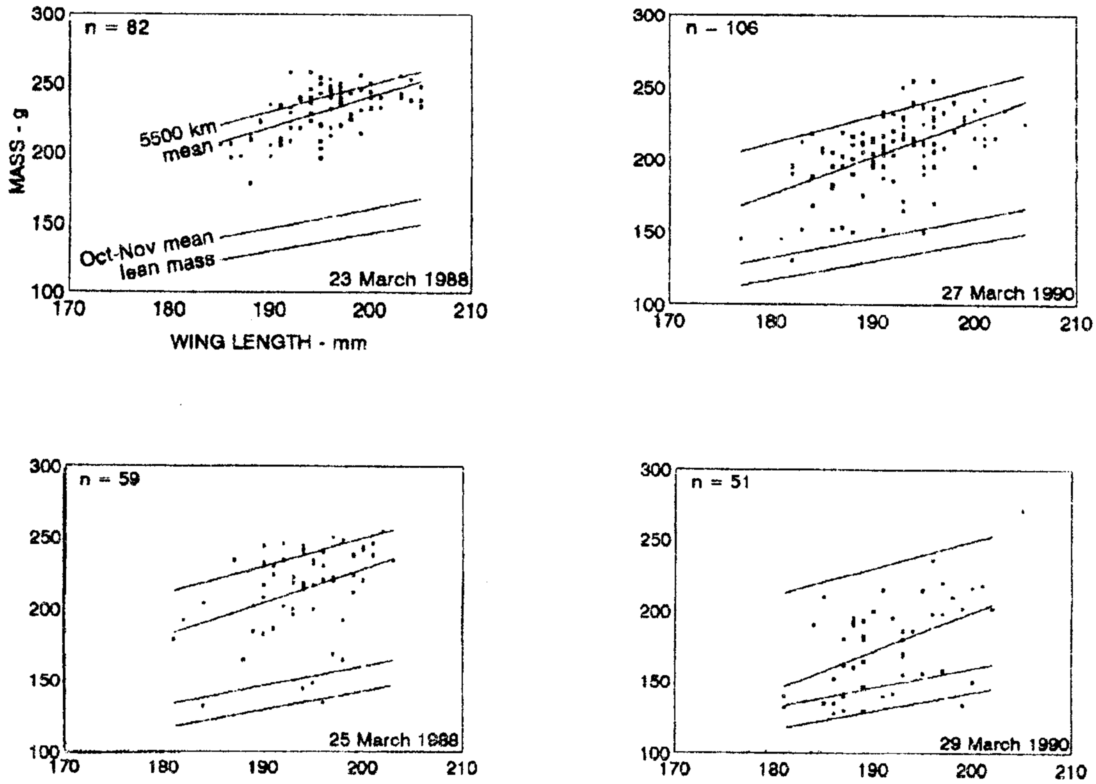


Figure 5. Visual departure for all Bar-tailed Godwit observed leaving Broome during the March-April 1994 period.

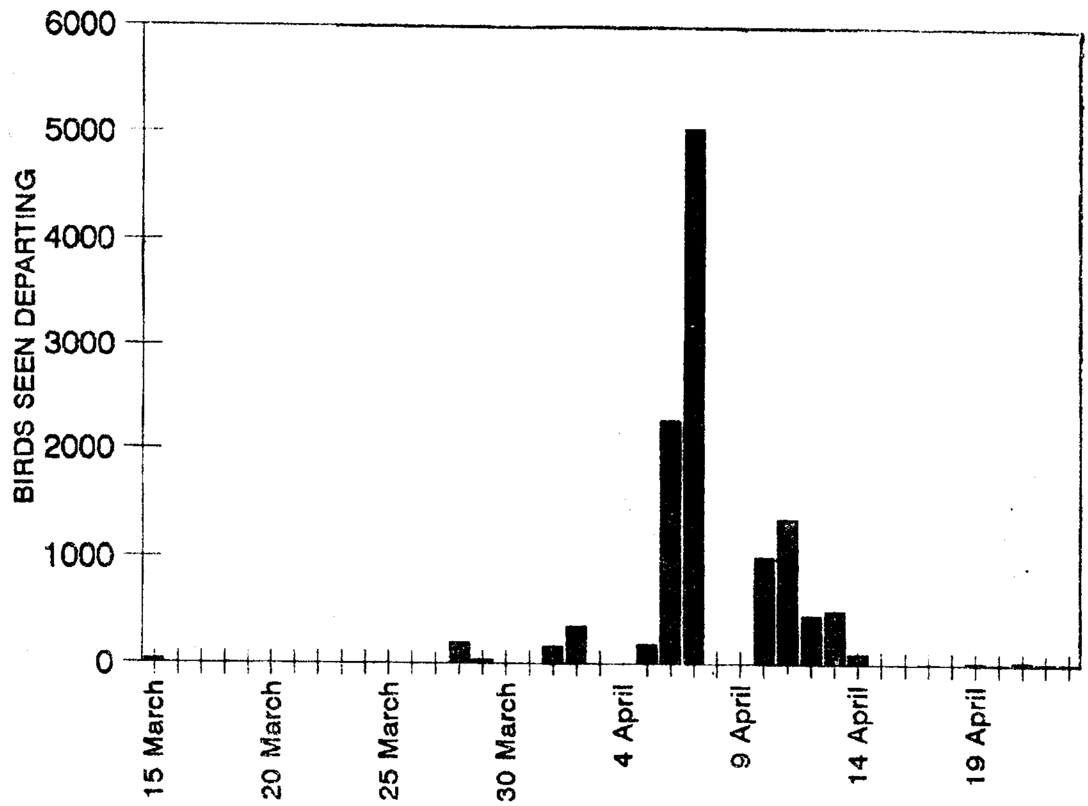
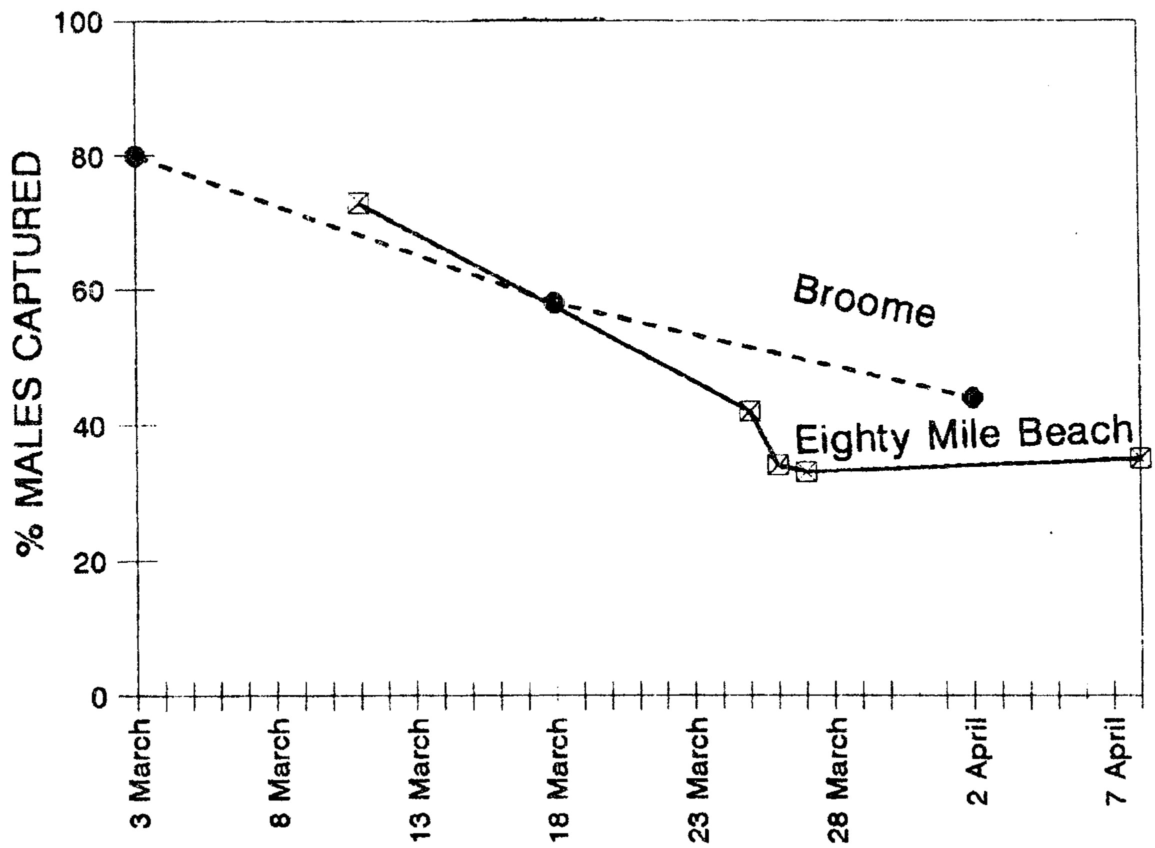


Figure 6. Percentages of males in 1994 Bar-tailed Godwit catches. The catch on 4 April has been omitted as it has an uncharacteristically high female percentage (93%).



estimation. It is suggested that bill-, head-bill and wing-length should be obtained, in addition to mass, for each bird.

Information on body composition is very important because, as noted above, not all mass gain is fat, and fat and protein have very different energy values. It is essential that casualties from banding operations be retained for later analysis, along with their storage history.

The 1996 northward migration season presents an unique opportunity to obtain departure and arrival data on Bar-tailed Godwit and Great Knot at both ends of the Broome-Shanghai non-stop migration leg, with concurrent expeditions taking place to both regions. With considerable luck, it may be possible to obtain arrival data from godwit and knot that have been banded and processed in north-west Australia a few days previously. Body compositions should be obtainable from catching casualties and dead birds taken by hunters. Such data, together with information on departure direction and weather data en-route, may allow an empirical approach to flight range estimation to be made and provide some measure of the energetic benefits of formation flying.

Conclusion

The use of combined moult, mass and biometric data for Bar-tailed Godwit and Great Knot makes it possible to estimate departure masses for individual birds. These data will be of considerable use to both the foraging ecologist and those interested in migration energetics. Hopefully, the data can also be used for the benefit of the migrants, themselves.

The desirability of obtaining real estimates of wader flight costs (Castro & Myers 1989) may be achievable, given knowledge of departure and arrival masses, body compositions and en-route weather conditions between north-west Australia and the east coast of China. Thus, the possibility is presented of proving or modifying existing, or developing new, flight range equations.

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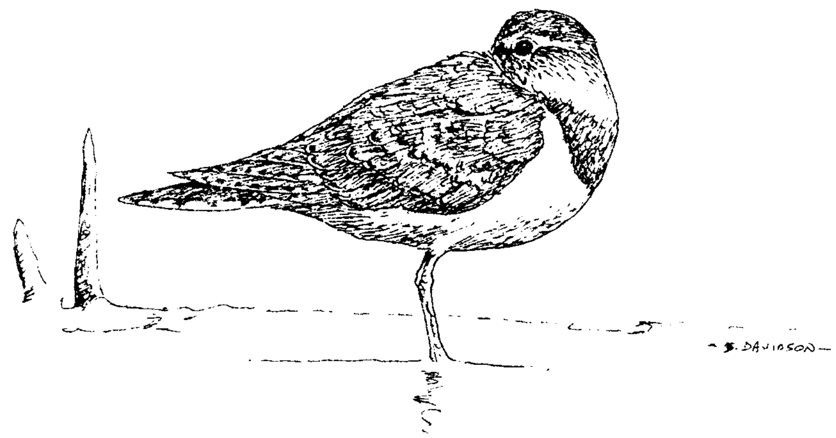

A THIRD REPORT ON THE BIOLOGY OF THE GREAT KNOT, *Calidris tenuirostris*, ON THE BREEDING GROUNDS.

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ABSTRACT
The results of further studies of Great Knots *Calidris tenuirostris* on the breeding grounds are reported. Males displayed a high site fidelity between years. Although the sample size was small, females displayed comparatively low site fidelity. A bird leg-flagged in north western Australia was collected, the first recovery of a Great Knot banded in the non-breeding quarters and recovered in the breeding season. Information on breeding density and success, and food preference are presented. *Stilt* 28 (1996)

INTRODUCTION
A comprehensive review of the literature (published in English) on the Great Knot *Calidris tenuirostris* is presented in Driscoll (1993). This is the third report of research into the breeding biology of the species. For previous reports see Tomkovich (1994, 1995a), and for some other summaries see Tomkovich (1995b,c).

The study area was reached by helicopter from the village of Markovo. In 1995, arrival in the study area was comparatively early (16 May), well before the arrival of the waders. For the first time, this allowed an examination of waders during the prebreeding period. The expedition ended with the return to the village of Markovo (by boat) on 31 July. This report details the results of the 1995 season, and compares the findings with those from the 1993 and 1994 field seasons.

Study Area
The study area was the same as that in the 1993 and 1994 field seasons. This was on the eastern spur of the Shchuchy Mountain Range, north east Siberia (64°55'N, 168°35'E).

RESULTS AND DISCUSSION

Site faithfulness and mate fidelity
Individual colour-marking of Great Knots in the study area in 1993 and 1994 made it possible to record their degree of site faithfulness on the breeding grounds. Twenty-four (92%) of the 26 individually marked adult males that were recorded or marked in 1994 were found back in the study area in 1995. In addition, one male marked in 1993 and not seen (probably missed) in 1994 was present in the study area in 1995. The distribution of all males was very similar between years. They defended prenesting territories, nests and broods on the same mountain tops between years. Broods can move several kilometres so males are not always attached to the same parts of particular mountain tops. Consequently, in 1995 all adult males survived to return to places where they had bred in previous years.

Only two of four marked females were recorded in the study area in 1995. Moreover, one of these was located only in a postbreeding flock. The other marked female that bred in the area did so with the same male for the third consequtive season, probably indicating an individual pattern of strong site fidelity. One more female with distinctive plumage which bred in the study area in 1994, was absent in 1995. These rather poor data indicate more opportunistic territorial behaviour of adult females, when compared to that of adult males.

As a result of the comparatively low site fidelity of females, only one pair reunited in 1995, while most males were competing for new mates. This may explain the fairly large proportion of males left unmated (two of eight males on the study plot, both of which had bred successfully in 1993 and 1994).

Observations from the winter quarters suggest Great Knots start to breed around the age of two years. None of the 29 chicks banded in 1993 were found in the study area in 1994 or 1995. This means either the sample of chicks banded in 1993 was too small, or that young birds disperse widely from their natal site to the site of first breeding. The latter possibility is confirmed indirectly by the absence of geographic variation in the Great Knot.

Other Recoveries
A yellow leg-flagged Great Knot was seen on the study area on 12 July. It was one of two non-local post-breeding migrants. This bird was collected, and proved to be an adult female with inactive brood patches. This record is also the latest known date of a female on the breeding grounds. The bird (band 061-90273) was banded by the AWSG on 7 October 1992 on Eighty Mile Beach, north west Australia. The distance between sites of banding and recovery was

10170 km (see Dettmann 1995). It is the first recovery of a Great Knot with an Australian band from the breeding grounds. Sightings of a bird leg-flagged in the study area and sighted in the non-breeding quarters are summarised by Minton (1995). Recently, an adult marked in the study area in June 1995 was sighted in Queensland, Australia, in November 1995.

Breeding Density

The same area of 9.5-10.0 square kilometres of montane lichen tundra on mountain tops was used for density calculations. In 1993 the area was occupied by 13 broods, in 1994 24 broods were found and we also knew of two unsuccessful nests. In 1995, 23 broods plus a further five breeding pairs occupied the area.

The plateau where observations were most regular was *c.* 1 square kilometre in size. In 1993, this area held three broods, in 1994 six pairs and three unpaired territorial males inhabited this area, and in 1995 the area was inhabited by five pairs and two unmated males. Thus, the density of breeding Great Knot was similar to that in 1994, but twice that of 1993. The increase in density in 1994 can be explained by locally favourable snow conditions early in that season, while the high density in 1995 was probably the result of the strong site faithfulness of males. Not all of these males were able to mate, in particular at least two marked old males who raised chicks in 1993 and 1994 were left unmated in 1995.

Phenology

The early start of observations in 1995 made it possible to gather unique information on the arrival of Great Knots at the breeding grounds. No flock of migratory Knots were noticed in the northern spring. Males simply appeared on their former territories, and later they were joined by females. Eight individually recognisable males appeared at their territories between 22 and 26 May; the two males which arrived on 26 May were unmated for the whole breeding season. Females were observed to be paired to the recognisable males on the same day as arrival (one case) or up to five days later (23 to 29 May). Pairs took 6-7 days to begin egg laying, and 4-5 days to lay four eggs. The first egg was found on 30 May, but there were pairs which formed earlier and probably had started egg laying before this date; this was confirmed by the discovery of several early broods. One replacement clutch was recorded after the first clutch was destroyed by a predator at the end of laying. The latest heavy female was recorded on 15 June.

Hatching took place from 25 June and continued until 6 July, but most hatched before July. Consequently, on average, nesting in 1995 was slightly earlier compared with the previous two seasons.

Six nests were found with incomplete clutches, but only three of these survived to hatching. The incubation period of these clutches (from the last egg laid), was 22.5-23 days. Repeated measurements of chicks showed a rapid development of most broods in 1995. Young of three broods first flew at the age of 17, 19.5 and 19.5 days, but a single chick from a fourth brood under constant observation fledged at the age of 24 days. In comparison, the age of fledging was 20-21 days in 1993, and 25 days in 1994.

Formation of rather large feeding or resting flocks of local Great Knots started in mid-June 1995. Within the area of intensive study, non-local birds appeared in the flock on 27 June. Within two days most of these birds had disappeared, along with local unmated males, failed breeders, and females who deserted their mates (to attend the hatched young). This means the first wave of migration of Great Knots started four days earlier in 1995 compared with 1994. Males that had successfully bred in 1995, departed mainly in the last third of June, after accompanying their chicks for 23-29 days (24-30 days in 1994).

Departure of young birds in 1995 took place from 25 July at an age between 29 to 32 days (the oldest recorded departure age of young birds was 30 days in 1993, and 33 days in 1994). Most young started their migration separately from their parents, and several days later.

Breeding Success

In 1995, hatching occurred in four of the seven known nests. The three other nests were depredated. There were also other breeding pairs recorded in early June. But did not appear with broods in July. Consequently, the rate of nest predation was higher in 1995 in comparison with 1993 and 1994. Nevertheless, predation rate was lower than could be expected on the basis of increasing numbers of rodents and mammalian predators in 1993-95. Thus, we had only a single sighting of *Mustella erminea*, probably the main egg predator of Great Knots, in 1993, four records from 1994, and at least 20 records in 1995 including many family parties. Thus, it is expected that in 1996, after a population crash in rodents, Great Knots will experience heavy nest predation pressure and will have poor breeding success in the mountains in the upper Anadyr River region.

Two of 13 broods under more or less regular observation disappeared, and most probably these chicks died. Partial loss of broods was also recorded. At fledging, or a few days later, broods consisted on average of 2.8 young (n=13) in 1995. This was higher than that recorded in the previous seasons; 2.5 young per brood in 1993 (n=8) and 2.3 in 1994 (n=12). In total, at least 39 juveniles have fledged from 68 chicks banded in 1995 (57%), while the comparable figure for 1994 was 47% Consequently, higher egg-loss in 1995 was compensated by a higher chick survival rate due to favourable weather conditions in summer. In summary, the general results of Great Knot breeding in 1995 means the season was a rather successful one.

Food and Food Resources

Preliminary analysis of faecal samples and stomach contents (from casualties) of chicks have shown that berries (*Arctous alpina, Empetrum nigrum, Vaccinium uliginosum*) were the principle food after the first days of life (from *c*.5 days old). Chicks mainly eat Carabid beetles during the first days of life, and these are eaten to an lesser extent as chicks grow. In 1995 invertebrates were eaten in apparently greater amounts than in 1994. The greater use of higher protein food may explain the quicker development of chicks in 1995.

Adults and fledged young consume both berries and invertebrates, except during the egg laying period when adults forage mainly by deep probing for invertebrates in moist habitats. The latter behaviour may be explained by the need for high protein ingestion rates required for egg formation. Hard-shelled nuts of the Dwarf Pine Tree *Pinus pumila* were found in the stomachs of two adult post-breeding migrants (collected with permission of the relevant Russian authorities). This food was known for Great Knots in the Koryak Highlands (Kistchinski 1980), but not for other species of wader.

Pitfall traps were used in 1994 and 1995 to evaluate arthropod numbers and their intraseasonal abundance. An analysis of these data will hopefully aid the understanding of how hatching dates (and breeding phenology in general) is timed to invertebrate abundance. Counts of berries in late July 1995 in different habitats revealed clear preferences of broods to remain in areas where berries were common. Indeed, some areas used by broods in 1994 were avoided in 1995, and these were found to contain poor crops of berries.

Results from this study of the feeding ecology of Great Knot give us an opportunity to determine the habitat requirements of the species on the breeding grounds. It is now clear that the requirements are complex, and dependent on the stage of breeding. Habitat requirements will influence bird distribution in both the breeding range and local scale, as well as the rate of chick development, and possibly even breeding success.

Breeding Behaviour

Breeding behaviour of the Great Knot has not been previously described. The early arrival to the study area meant that the researchers were able to make sound recordings and drawings of different postures used in this period. Our general impression is that the behaviour of Great Knot is different in many respects from that of the Red Knot *C. cantus*, the closest relative species, but nevertheless it has similar features with the behaviour of many other members of the genus *Calidris*.

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INTRASPECIFIC CONFLICTS BETWEEN FORAGING RED-NECKED STINTS *Calidris ruficollis.*

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The social behaviour of the Red-necked Stint *Calidris ruficollis*, one of Australia's most abundant shorebirds, seems surprisingly little studied, both on its Northern Hemisphere breeding grounds and in its non-breeding areas. Intraspecific conflicts have been observed near nests and broods in Siberia (Morozov & Tomkovich 1986), where Stints occur at relatively low densities. However, in Australia, where densities are much higher, and feeding-flocks may be comprised of thousands of birds, virtually nothing is recorded about interactions. Stints are said to be "sociable, mixing well with other species" when foraging (Hindwood & Hoskin 1954); indeed, interspecific interference is rare in foraging waders (Recher 1966). This is hardly surprising: given the different foraging niches filled by various species (Dann 1987) one would expect there to be minimal competition. In single species feeding-flocks, competition for food resources and resultant conflict with conspecifics seems more likely, yet it seems that little or no information is published.

At Avalon Saltworks, Victoria, Australia, on 28 January, 1996, I observed a small flock of *c.* 12 Red-necked Stints *Calidris ruficollis* feeding as a group in shallow water near the edge of a saltpond. They were foraging near the end of a pipe, through which water was flowing into their pond from an adjacent saltpond. As the birds were feeding, it was clear that they had established discrete feeding territories. Some of these territories were defended with highly-ritualised actions when encroached upon.

A Stint attempting to usurp another's feeding area approached the feeding bird in a bowed posture achieved by leaning forward, so that the head was held low to the ground (or water) with bill pointing straight ahead, parallel to the ground; in conjunction with this, the bird's posterior end was raised so that the tail was erected vertically (not fanned). When approached in this manner, the feeding bird either ran away, thus leaving its foraging site vacant for the aggressive bird to take over and feed in; or the feeding bird defended its territory by adopting a similar posture. In doing so, it stood facing the aggressive bird head-on, so that the bills of the two birds were almost touching. At this stage, if neither Stint backed down, one or both birds fully extended their wings sideways, parallel to the ground, with bodies still remaining in the bowed, forward-leaning posture. If neither bird retreated after this display, they began springing vertically into the air, up to *c.* 15 cm high; after a maximum of 3-4 leaps, one or other bird ran out of the feeding territory, but not the area, by running away to leave the victor to forage in the disputed spot. During these disputes, other Stints continued to feed, seemingly unconcerned by these aggressive/defensive activities; however, during a few minutes' observations, several birds behaved in this manner.

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AN OBSERVATION OF FOOT-TREMBLING IN A SPOON-BILLED SANDPIPER *Eurynorhynchus pygmaeuus.*

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In April 1991, during an AWB/AWSG expedition to the Xuan Thuy Ramsar Reserve, Vietnam, I observed a Spoon-billed Sandpiper *Eurynorhynchus pygmaeuus* foraging with Red-necked Stints *Calidris ruficollis* on the edge of a small tidal lagoon. The substrate in the lagoon was sandy-mud, and the stints were foraging in the wet margin beyond the water's edge. Whilst foraging, the Spoon-billed Sandpiper was observed to reach forward with its right foot and scratch rapidly at the surface. Immediately afterwards it would peck rapidly at the area it had scratched. Each scratching would last for 1-2 seconds and the action was repeated many times.

Similar behaviour, described as foot-vibration or foot-trembling, has been described for Ringed Plovers *Charadrius hiaticula* (Osborne 1982; Pienkowski 1983), Lesser Sand Plovers *C. mongolus* (Piersma 1985) and in Red-kneed Dotterels *Erythrogonys cinctus* (Schulz 1986). Piersma (1985) considered that such behaviour could be interpreted as a means by which foraging Lesser Sand Plovers enhanced the activity or visibility of their invertebrate prey. The rapid-scratching behaviour performed by the Spoon-billed Sandpiper may also be a method employed to enhance its foraging ability.

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DISPLAY FLIGHT OF THE JAPANESE SNIPE *Gallinago hardwickii* IN THE NON-BREEDING GROUNDS.

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INTRODUCTION

Japanese Snipe *Gallinago hardwickii* in Australia use various types of flight in different circumstances. The most common is the sudden eruption from marsh vegetation, often almost at the observers feet, with a rapid low-trajectory straight-line flight to a new source of cover. The bird usually drops into the cover, again assuming invisibility. It may give a short warning call, which other snipe in the area may heed, prompting similar flight responses.

Should the birds be flushed a second time, calling is more urgent and is taken up by more birds. The initial trajectory is higher than that of the first type of flight, often with the birds forming a loose flock and spiralling rapidly upwards, with many sudden changes of direction as they leave the area. This type of flight is known as jinking, it has also been described as zigzag flight (Johnsgard 1981). A third type of flight, drumming, which is rarely seen in Australia, as it is usually associated with the reproductive cycle.

OBSERVATION

Some years ago, in mid-October, on Belmont Common, Geelong, Victoria (Australia), the author chanced upon two birds displaying the drumming flight. The observation was made on a deeply overcast day after several days of heavy rain. Fourteen Japanese Snipe were feeding on the verges of the bicycle path and a shallow, reedy pond at the edge of the golf course. Two snipe were particularly active, jumping about and chasing one another. They had interrupted their feeding several times when one bird leapt vertically about two metres, returning to the ground almost at its take-off point. The other bird did likewise, then rose almost vertically to a height of about five metres, partly closed its wings and with tail spread plunged earthwards. It alighted beside the bird which had first leapt, and which showed no interest in the aerial display which was repeated once. The sound produced by the diving snipe was more like the riffling of a phone book than drumming.

Both birds resumed foraging in the open at the edge of the pond. The other snipe in the group apparently ignored the whole incident, and no birds called during the event. The plumage of the protagonists seemed brighter than that of the rest of the group, with more contrast between light and dark areas. No size difference was apparent, nor was any difference in bill length.

DISCUSSION

Three sequential phases of aerial display have been described by Naarding (1985) viz: Stationary, the bird calling from a prominent fixed perch; followed by Circling with rapid steep ascent to about 60-100m above ground. Then flying and gliding in wide circles while calling. The third phase is the diving display, a steep ascent followed by a dive from height with the tail lifted and fanned, and wings held close to the body, the bird pulling out of the dive some 15-30m from the ground. The bird may circle or perch after this.

The flight seen at Geelong seems to be a much shortened variant of the circling-diving elements, with the added complication of a second bird whose behaviour may have prompted the flight.

Driscoll (1993) notes that tripartite display occurs during migration to, and for the first few weeks on the breeding grounds, and thus is probably restricted to the males. It also occurs at times of low light intensity, afternoon, evening, night and early morning. Perhaps the extremely dull light triggered the behaviour in this case.

The function of the full display in unknown. There is no overt aggression between displaying birds, so that it may be a courtship or pair-formation display. It may be a territorial marker (when aggression might be shown), or it could be a deterrent to predators, drawing attention to the aerial and away from the nest.

In the case described, the initial chasing and short leaping suggested play, which when the higher flight occurred, took on the more serious intent of establishing a higher ranking for that individual within the group.

It was a stroke of luck that this behaviour, although in a much truncated form, was observed in Australia. Other observers are encouraged to publish observations of breeding behaviours from the non-breeding grounds.

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BANDING ROUND-UP: A COMPLETE LIST 1992-1996.

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A revised list of recoveries of Australian-banded waders over 100km from the banding place, between January 1992 and February 1996, is presented. The last complete round-up is presented in Pook (1992), and interim reports can be found in Dettmann (1993, 1994a,b, 1995). This list supersedes the before mentioned reports. A revised list of the symbols used in the presentation of data is shown in Table 1. Recoveries are presented in Table 2. The layout of data in Table 2 is shown below:

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

Permission must be sought from the banders and the ABBBS before using these data in publications.

Table 1. Symbols used in Table 2.

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;

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

Method of encounter:
01 = probably trapped;
02 = probably trapped but the device is unknown to the banding office;
03 = trapped in a mistnet;
04 = trapped with a cage trap;
05 = trapped with a cannon net;
06 = trapped in clap trap, sprung trap, etc;
08 = trapped by hand or with handheld net;
09 = trapped using light device;
13 = hand caught at roost or nest;
15 = deliberately trapped for the aviary;
18 = trapped because band tangled in fishing gear;
20 = trapped because bird tangled in human object;
21 = trapped because bird tangled in fishing gear;
23 = trapped accidentally in marine/aquatic trap;
25 = bird sick or injured;
26 = exhausted;
27 = injured by band;
30 = found near electricity wires;
31 = collided with a moving road vehicle;
33 = collided with moving aircraft;
35 = collided with a lighthouse or stationary night light;
38 = collided with a mast, tower, pole,, wire fence, aerial, sprinkler;
39 = found on road but not certainly hit by car;
40 = band found on bird, no further data on how encountered;
41 = band returned, not reported if on bird;
43 = band number only reported;
46 = colour marking sighted in field, bird one of a cohort colour marked in this manner;
47 = band number read in field (bird not trapped);
48 = colour marking sighted in field;
49 = band number/colour marking sighted on bird in nest;
54 = beachwashed;
55 = found in/on car, ship etc probably encountered elsewhere;
57 = band found on species different to that banded;
58 = leg or wing and band only found;
61 = shot - reason unknown;
63 = taken for scientific study;
67 = taken for food or feathers;
68 = shot for food or sport;
81 = taken by domestic or wild cat;
85 = taken by a wild bird;
89 = taken by a wild fish;
95 = found in still water;
96 = captive bird (was from the wild);
98 = found dead in/near a nest (pulli or adult);
99 = found dead, cause unknown.

Status of encounter:
00 = status of bird and band unknown;
01 = status of bird unknown, band left on bird;
02 = status of bird unknown, band removed from 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;
07 = was mercy killed and the band was left on;
08 = was mercy killed and the band was removed;
09 = rehabilitation attempted but bird died, status of band unknown;
10 = rehabilitation attempted but bird/bat died, band left on;
11 = rehabilitation attempted but bird/bat died, band removed;
13 = bird was released alive with the band;
14 = bird was released alive and the band was removed;
16 = was rehabilitated and released alive with the band;
18 = is alive in captivity and the status of the band is unknown;
19 = is alive in captivity with band;
24 = transported to new site and released with band;
26 = bird was alive in the wild with the band;
29 = bird was partially decomposed and the band was removed;
32 = was skeleton/dried out corpse, band removed.

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Table 2. Details of banded waders recovered more than 100 km from the banding place

Ruddy Turnstone ***Arenaria interpres***

ND9-9806 34,MIRANDA FIRTH OF THAMES NEW ZEALAND 37d10m S 175d19mE 911028 +2 U NZ SCHEME
05 13 SH,ST HELENA ISLAND MORETON BAYQLD 27d23m S 153d13mE 930919 +4 U QWSG
Distance: 2336 km Direction: 291 degs. Time elapsed: 1 yrs 10 mnths 22 days

Pied Oystercatcher ***Haematopus longirostris***

100-82051 11,RHYLL PHILLIP ISLANDVIC 38d21m S 145d19mE 800301 2 U VWSG
48 26 2F,3 MILE ROCKS BEACHPORT C.P.SA 37d29m S 140d1m E 930917 U U COOK
Distance: 475 km Direction: 280 degs. Time elapsed: 13 yrs 6 mnths 16 days

100-82506 X1,CRESCENT ISLAND OCEAN GRANGEVIC 37d58m S 147d45mE 811030 P U BURBIDGE
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930508 +3 U VWSG
Distance: 113 km Direction: 225 degs. Time elapsed: 11 yrs 6 mnths 8 days

100-82507 X1,CRESCENT ISLAND OCEAN GRANGEVIC 37d58m S 147d45mE 811030 P U BURBIDGE
05 13 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 930115 +3 U VWSG
Distance: 272 km Direction: 262 degs. Time elapsed: 11 yrs 2 mnths 16 days

100-85195 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 880702 +2 U VWSG
48 26 98,SMITHTONTAS 40d51m S 145d8m E 950625 U U PLOWRIGHT
Distance: 262 km Direction: 204 degs. Time elapsed: 6 yrs 11 mnths 23 days

100-96760 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 890416 +2 U VWSG
48 26 2F,ON THE BEACH AT CARPENTERS ROCKSA 37d55m S 140d24mE 950205 U U & MS P PERT
Distance: 361 km Direction: 272 degs. Time elapsed: 5 yrs 9 mnths 20 days

100-96771 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 890416 +2 U VWSG
48 26 3F,RIVOLI BAY SOUTHENDSA 37d34m S 140d8m E 930906 U U COOK
Distance: 389 km Direction: 277 degs. Time elapsed: 4 yrs 4 mnths 21 days

100-96839 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 890806 +3 U VWSG
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 VWSG
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

100-96888 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 900610 +3 U VWSG
48 26 7F,PELICAN POINT CARPENTERS ROCKSSA 37d54m S 140d22mE 950204 U U & MS P PERT
Distance: 532 km Direction: 278 degs. Time elapsed: 4 yrs 7 mnths 25 days

100-96915 11,RHYLL PHILLIP ISLANDVIC 38d21m S 145d19mE 900722 1 U VWSG
48 26 X6,SHIPWRECK POINT PERKINS ISLANDTAS 40d45m S 145d2m E 930704 U U LORD
Distance: 268 km Direction: 185 degs. Time elapsed: 2 yrs 11 mnths 12 days

100-96936 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 910209 +2 U VWSG
48 26 23,KILLARNEY BEACHVIC 38d21m S 142d20mE 950927 U U GARRETT
Distance: 193 km Direction: 260 degs. Time elapsed: 4 yrs 7 mnths 18 days

100-99398 16,THE GURDIES WESTERNPORT BAYVIC 38d22m S 145d33mE 910929 2 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930508 +3 U VWSG
Distance: 117 km Direction: 108 degs. Time elapsed: 1 yrs 7 mnths 9 days

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

100-99577 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 920503 1 U VWSG
48 26 23,KILLARNEY BEACHVIC 38d21m S 142d20mE 950927 U U GARRETT
Distance: 193 km Direction: 260 degs. Time elapsed: 3 yrs 4 mnths 24 days

101-03546 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 920606 1 U VWSG
48 26 5F,STOKES POINT, KING ISLANDTAS 40d9m S 143d55mE 960118 U U O'BRIEN
Distance: 266 km Direction: 232 degs. Time elapsed: 3 yrs 7 mnths 12 days

101-03556 11,RHYLL PHILLIP ISLANDVIC 38d21m S 145d19mE 920614 +3 U VWSG
48 26 1F,NR NO.2 ROCK ON BCH AT CANUNDA NAT PA 37d50m S 140d20mE 930924 U U HEYNE
Distance: 440 km Direction: 276 degs. Time elapsed: 1 yrs 3 mnths 10 days

101-03556 11,RHYLL PHILLIP ISLANDVIC 38d21m S 145d19mE 920614 +3 U VWSG
48 26 X6,SHIPWRECK POINT PERKINS ISLANDTAS 40d45m S 145d2m E 940624 U U LORD
Distance: 268 km Direction: 185 degs. Time elapsed: 2 yrs 0 mnths 10 days

101-03563 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 930115 +3 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930507 +3 U VWSG
Distance: 195 km Direction: 105 degs. Time elapsed: 0 yrs 3 mnths 22 days

101-03572 16,THE GURDIES WESTERNPORT BAYVIC 38d22m S 145d33mE 930227 +3 U VWSG
48 26 5F,STOKES POINT, KING ISLANDTAS 40d9m S 143d55mE 960118 U U O'BRIEN
Distance: 243 km Direction: 215 degs. Time elapsed: 2 yrs 10 mnths 22 days

101-03659 30,ALTONA FORESHOREVIC 37d55m S 144d46mE 930521 +3 U VWSG
48 26 7F,ROGER'S ROCKS, 3 KM E OF KILLARNEY BC 38d25m S 142d20mE 951124 U U GARRETT
Distance: 220 km Direction: 255 degs. Time elapsed: 2 yrs 6 mnths 3 days

101-03671 16,THE GURDIES WESTERNPORT BAYVIC 38d22m S 145d33mE 931017 +2 U VWSG
48 26 32,ALBIFRONS IS OCEAN GRANGE LAKES NPVIC 37d57m S 147d47mE 950201 U U RESIDE
Distance: 201 km Direction: 77 degs. Time elapsed: 1 yrs 3 mnths 15 days

101-03694 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 940813 +3 U VWSG
48 26 7F,SAND ISLAND WALLIS LAKE FORSTERNSW 32d11m S 152d29mE 950122 U U NATALA BOWEN
Distance: 911 km Direction: 39 degs. Time elapsed: 0 yrs 5 mnths 9 days

101-03694 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 940813 +3 U VWSG
48 26 7F,SAND ISLAND WALLIS LAKE FORSTERNSW 32d11m S 152d29mE 951023 U U ROSE
Distance: 911 km Direction: 39 degs. Time elapsed: 1 yrs 2 mnths 10 days

101-03965 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 940911 3 U VWSG
48 26 1F,SHELL POINT STH SHORE OF BOTANY BAYNS 34d1m S 151d7m E 941114 U U STRAW
Distance: 696 km Direction: 48 degs. Time elapsed: 0 yrs 2 mnths 3 days

101-04015 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 940911 2 U VWSG
48 26 7F,ROGER'S ROCKS, 3 KM E OF KILLARNEY BC 38d25m S 142d20mE 951124 U U GARRETT
Distance: 279 km Direction: 268 degs. Time elapsed: 1 yrs 2 mnths 13 days

UNK-00247 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930508 +3 U VWSG
46 26 5F,BOURNDA BEACHNSW 36d48m S 149d57mE 951003 U U N COAST BIRD
Distance: 345 km Direction: 54 degs. Time elapsed: 2 yrs 4 mnths 25 days

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

101-03691 30,ALTONA FORESHOREVIC 37d55m S 144d46mE 940709 +2 U VWSG
48 26 23,KILLARNEY BEACHVIC 38d21m S 142d20mE 951011 U U GARRETT
Distance: 218 km Direction: 256 degs. Time elapsed: 1 yrs 3 mnths 2 days

Masked Lapwing *Vanellus miles*

082-74541 D4,MATCHAM GRID BLOCKNSW 33d23m S 151d26mE 911231 J U WB REHAB GRP
96 16 AH,CAMDEN AGRIC GRID BLOCKNSW 34d8m S 150d41mE 920604 1 U WB REHAB GRP
Distance: 108 km Direction: 220 degs. Time elapsed: 0 yrs 5 mnths 4 days

Pacific Golden Plover *Pluvialis fulva*

061-68660 KI,KOORAGANG ISLAND AREA NEWCASTLENSW 32d52m S 151d46mE 900224 +2 U VAN GESSEL
08 13 5F,LUGANVILLE SANTO VANUATU 15d32m S 167d8m E 920919 U U TOI
Distance: 2472 km Direction: 42 degs. Time elapsed: 2 yrs 6 mnths 26 days

Double-banded Plover ***Charadrius bicinctus***

041-00455 02,POINT COOK, ALTONAVIC 37d55m S 144d46mE 800615 J U VWSG
05 14 4F,OHAU RIVER NEW ZELAND 44d20m S 170d11mE 921110 U U ANONYMOUS
Distance: 2234 km Direction: 117 degs. Time elapsed: 12 yrs 4 mnths 26 days

041-09850 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 840505 +2 U VWSG
01 13 5F,TEKAPO RIVER NEW ZEALAND 44d20m S 170d12mE 921020 U U ANONYMOUS
Distance: 2166 km Direction: 116 degs. Time elapsed: 8 yrs 5 mnths 15 days

041-10063 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 840812 +2 M VWSG
01 13 3F,AHURIRI RIVER NEW ZEALAND 44d28m S 169d59mE 921212 U U ANONYMOUS
Distance: 2151 km Direction: 117 degs. Time elapsed: 8 yrs 4 mnths 0 days

041-13106 03,LAUDERDALETAS 42d55m S 147d29mE 830403 +1 U TSSG (BOAT)
05 14 5F,TEKAPO RIVER NEW ZEALAND 44d20m S 170d12mE 921018 U U ANONYMOUS
Distance: 1829 km Direction: 103 degs. Time elapsed: 9 yrs 6 mnths 15 days

041-18098 02,POINT COOK, ALTONAVIC 37d55m S 144d46mE 860706 +2 F VWSG
08 13 4F,OHAU RIVER NEW ZELAND 44d20m S 170d11mE 921110 U U ANONYMOUS
Distance: 2234 km Direction: 117 degs. Time elapsed: 6 yrs 4 mnths 4 days

041-18172 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 860720 1 F VWSG
13 13 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 931208 U U NZ SCHEME
Distance: 2227 km Direction: 116 degs. Time elapsed: 7 yrs 4 mnths 18 days

041-31476 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 870809 +2 M VWSG
13 13 41,OHAU RIVER NEW ZELAND 44d20m S 170d11mE 931106 U U NZ SCHEME
Distance: 2164 km Direction: 116 degs. Time elapsed: 6 yrs 2 mnths 28 days

041-43910 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 880529 +2 U VWSG
01 13 3F,AHURIRI RIVER NEW ZEALAND 44d28m S 169d59mE 920921 U U ANONYMOUS
Distance: 2232 km Direction: 117 degs. Time elapsed: 4 yrs 3 mnths 23 days

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

NB5-3552 01,CASS RIVER NEW ZEALAND 43d53m S 170d30mE 841223 J U NZ SCHEME
48 26 0F,13KM SSE OF GEELONGVIC 38d16m S 144d25mE 950712 U U WESTON
Distance: 2263 km Direction: 277 degs. Time elapsed: 10 yrs 6 mnths 19 days

NC5-0411 44,TEKAPO RIVER, CANTERBURY NEW ZEALAND 44d20m S 170d13mE 911105 +1 M NZ SCHEME
48 26 6F,CONGO POINTNSW N 35d57m S 150d9m E 950315 U U CROWLEY
Distance: 1936 km Direction: 292 degs. Time elapsed: 3 yrs 4 mnths 10 days

NC5-0570 44,TEKAPO RIVER, CANTERBURY NEW ZEALAND 44d20m S 170d13mE 921110 +1 M NZ SCHEME
48 26 6F,CONGO POINTNSW 35d57m S 150d9m E 950313 U U CROWLEY
Distance: 1936 km Direction: 292 degs. Time elapsed: 2 yrs 4 mnths 3 days

NC5-0580 40,AHURIRI RIVER NEW ZEALAND 44d28m S 169d59mE 921115 +1 F NZ SCHEME
48 26 5F,CUDGERA CREEK MOUTH HASTINGS POINTNSW 28d23m S 153d33mE 930418 U U KARR
Distance: 2305 km Direction: 315 degs. Time elapsed: 0 yrs 5 mnths 3 days

NC5-0612 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 921103 +1 F NZ SCHEME
48 13 4F,HASTINGS POINTNSW 28d22m S 153d35mE 930421 +1 U KLEIBER
Distance: 2307 km Direction: 315 degs. Time elapsed: 0 yrs 5 mnths 18 days

NC5-0612 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 921103 +1 F NZ SCHEME
48 13 4F,HASTINGS POINTNSW 28d22m S 153d35mE 930720 +1 U KLEIBER
Distance: 2307 km Direction: 315 degs. Time elapsed: 0 yrs 8 mnths 17 days

NC5-0612 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 921103 +1 F NZ 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 NZ 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

NC5-0761 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 931130 +1 F NZ SCHEME
48 26 X3,BOAT HARBOUR KURNELLNSW 34d1m S 151d13mE 940528 U U PEGLER
Distance: 1990 km Direction: 299 degs. Time elapsed: 0 yrs 5 mnths 28 days

NC5-0761 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 931130 +1 F NZ SCHEME
48 26 4F,BONNIEVALE, PORT HACKINGNSW 34d5m S 151d9m E 940613 U U PEGLER
Distance: 1990 km Direction: 298 degs. Time elapsed: 0 yrs 6 mnths 14 days

NC5-0761 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 931130 +1 F NZ SCHEME
48 26 4F,BONNIEVALE, PORT HACKINGNSW 34d5m S 151d9m E 950708 U U PEGLER
Distance: 1990 km Direction: 298 degs. Time elapsed: 1 yrs 7 mnths 8 days

NC5-0761 39,TEKAPO RIVER, SOUTH ISLAND NZ 44d20m S 170d12mE 931130 +1 F NZ SCHEME
48 26 4F,BONNIEVALE, PORT HACKINGNSW 34d5m S 151d9m E 950709 U U PEGLER
Distance: 1990 km Direction: 298 degs. Time elapsed: 1 yrs 7 mnths 9 days

NC5-0778 40,AHURIRI RIVER NEW ZEALAND 44d28m S 169d59mE 931209 +1 F NZ SCHEME
48 26 9F,WERRIBEEVIC 37d54m S 144d40mE 950517 U U SWINDLEY
Distance: 2230 km Direction: 280 degs. Time elapsed: 1 yrs 5 mnths 8 days

NC5-0778 40,AHURIRI RIVER NEW ZEALAND 44d28m S 169d59mE 931209 +1 F NZ SCHEME
48 26 9F,WERRIBEEVIC 37d54m S 144d40mE 950521 U U SWINDLEY
Distance: 2230 km Direction: 280 degs. Time elapsed: 1 yrs 5 mnths 12 days

NC5-0885 40,AHURIRI RIVER NEW ZEALAND 44d28m S 169d59mE 941113 +1 M NZ SCHEME
48 26 X1,PERKINS ISLANDTAS 40d46m S 145d4m E 950714 U U PLOWRIGHT
Distance: 2071 km Direction: 273 degs. Time elapsed: 0 yrs 8 mnths 1 days

NC5-0900 40,AHURIRI RIVER NEW ZEALAND 44d28m S 169d59mE 941127 P U NZ SCHEME
48 26 X1,PERKINS ISLANDTAS 40d46m S 145d4m E 950714 U U PLOWRIGHT
Distance: 2071 km Direction: 273 degs. Time elapsed: 0 yrs 7 mnths 17 days

Greater Sand Plover *Charadrius leschenaultii*

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

051-55639 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 921010 +3 U AWSG
68 03 0F,DAY RIVER ESTUARY, NAM HA PROV, VIETN 19d57m N 106d7m E 940200 U U DUC
Distance: 4662 km Direction: 338 degs. Time elapsed: -96 yrs 0 mnths 0 days

051-81912 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 940312 +2 U AWSG
67 05 0F,SOUTHERN AREA RED RIVER DELTA, VIETNA 19d57m N 106d7m E 940422 U U PEDERSEN
Distance: 4662 km Direction: 338 degs. Time elapsed: 0 yrs 1 mnths 10 days

Bar-tailed Godwit *Limosa lapponica*

071-63884 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 920324 2 F VWSG
05 13 34,MIRANDA FIRTH OF THAMES NEW ZEALAND 37d10m S 175d19mE 941023 U U NZWSG
Distance: 2532 km Direction: 95 degs. Time elapsed: 2 yrs 6 mnths 29 days

071-85042 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880326 1 U AWSG
99 05 33,MAGADAN REGION, VILLAGE BILIBINO, RUS 68d3m N 166d20mE 930705 U U RUSSIAN SCHEME
Distance: 10201 k Direction: 15 degs. Time elapsed: 5 yrs 3 mnths 9 days

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

071-85364 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880404 1 U AWSG
67 05 8F,CHONGMING ISLAND SHANGHAI CHINA 31d28m N 121d27mE 920417 U U XIAO
Distance: 5500 km Direction: 359 degs. Time elapsed: 4 yrs 0 mnths 13 days

071-85382 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880406 1 U AWSG
05 13 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 921007 +3 U AWSG
Distance: 177 km Direction: 218 degs. Time elapsed: 4 yrs 6 mnths 1 days

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

071-85515 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880407 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU & TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: -96 yrs 0 mnths 0 days

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

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

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

071-86757 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 900404 +2 M AWSG
67 05 8F,CHONGMING ISLAND SHANGHAI CHINA 31d28m N 121d27mE 920410 U U XIAO
Distance: 5638 km Direction: 0 degs. Time elapsed: 2 yrs 0 mnths 6 days

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

072-09636 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 921003 +3 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: -96 yrs 0 mnths 0 days

072-32360 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 921012 +3 U AWSG
01 13 8F,CHONGMING ISLAND SHANGHAI CHINA 31d28m N 121d27mE 930415 U U XIAO
Distance: 5500 km Direction: 359 degs. Time elapsed: 0 yrs 6 mnths 3 days

072-32974 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940303 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 950424 U U TIANHOU/TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: 1 yrs 1 mnths 21 days

072-33410 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 940326 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5572 km Direction: 1 degs. Time elapsed: -96 yrs 0 mnths 0 days

072-33850 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940402 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 950419 U U TIANHOU/TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: 1 yrs 0 mnths 17 days

072-41326 NB,NORTH END OF NUDGEE BEACH BRISBANEQLD 27d20m S 153d5m E 930503 2 U DRISCOLL
30 05 X1,PANAMA RD MT WELLINGTON NEW ZEALAND 36d55m S 174d51mE 940307 U U NZ SCHEME
Distance: 2302 km Direction: 123 degs. Time elapsed: 0 yrs 10 mnths 4 days

072-44204 NB,NORTH END OF NUDGEE BEACH BRISBANEQLD 27d20m S 153d5m E 930904 +3 M QWSG
47 26 X1,SANDRINGHAM BAY, BOTANY BAYNSW 34d0m S 151d8m E 941002 U U NSWWSG
Distance: 764 km Direction: 194 degs. Time elapsed: 1 yrs 0 mnths 28 days

U94-94808 09,41 MILES SW OF PILOT STATION ALASKA 61d30m N 163d50mW 920725 P U BBL (USA)
05 13 MI,STH-EAST MORETON ISLAND SAND BARQLD 27d20m S 153d26mE 930724 1 U QWSG
Distance: 10593 k Direction: 217 degs. Time elapsed: 0 yrs 11 mnths 29 days

Grey-tailed Tattler *Heteroscelus brevipes*

061-71089 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900329 +2 U AWSG
05 13 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 920914 +3 U AWSG
Distance: 177 km Direction: 218 degs. Time elapsed: 2 yrs 5 mnths 16 days

061-90862 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 930411 +2 U AWSG
67 05 0F,SOUTHERN AREA RED RIVER DELTA, VIETNA 19d57m N 106d7m E 940503 U U PEDERSEN
Distance: 4576 km Direction: 336 degs. Time elapsed: 1 yrs 0 mnths 22 days

061-91626 CR,CLARENCE RIVER ESTUARY YAMBANSW 29d25m S 153d20mE 931114 +2 U NSWWSG
05 13 01,OBITSU ESTUARY, KISARAZU-SHI, JAPAN 35d25m N 139d54mE 950830 U U YAMASHINA INST
Distance: 7343 km Direction: 348 degs. Time elapsed: 1 yrs 9 mnths 16 days

Terek Sandpiper *Xenus cinereus*

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

051-53556 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 900407 +2 U AWSG
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 920901 +3 U AWSG
Distance: 177 km Direction: 38 degs. Time elapsed: 2 yrs 4 mnths 25 days

051-53801 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900331 +2 U AWSG
68 05 37,UDA RIVER DELTA, KHABAROVSK REG, RUSS 54d40m N 135d15mE 950715 U U TOMKOVICH
Distance: 8170 km Direction: 8 degs. Time elapsed: 5 yrs 3 mnths 14 days

051-55254 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 920926 +2 U AWSG
03 13 02,UNBUK-DON (UNBUK-RI)YONGJONG IS KOREA 37d30m N 126d34mE 940906 U U PARK
Distance: 6332 km Direction: 5 degs. Time elapsed: 1 yrs 11 mnths 11 days

GNV-04265 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 880831 1 U BTO
05 13 9F,BROOMEWA 18d0m S 122d22mE 921002 U U AWSG
Distance: 4591 km Direction: 168 degs. Time elapsed: 4 yrs 1 mnths 1 days

Curlew Sandpiper *Calidris ferruginea*

040-71967 KI,KOORAGANG ISLAND AREA NEWCASTLENSW 32d52m S 151d46mE 901230 +1 F VAN GESSEL
92 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920504 U U MUNDKAR
Distance: 7804 km Direction: 333 degs. Time elapsed: 1 yrs 4 mnths 4 days

040-95316 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 790310 +1 U VWSG
67 03 8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI 37d9m N 119d0m E 920500 U U MUNDKUR
Distance: 8764 km Direction: 340 degs. Time elapsed: -96 yrs 0 mnths 0 days

040-99054 X8,RALPHS BAY NECKTAS 43d21m S 147d26mE 801019 +2 U HARRIS
99 05 2F,SHOUGUANG COUNTY SHANDONG PROVINCE CH 36d53m N 118d42mE 930531 U U ZHI GUANG
Distance: 9380 km Direction: 337 degs. Time elapsed: 12 yrs 7 mnths 12 days

040-99816 01,KOORAGANG ISLANDNSW 32d52m S 151d46mE 821015 J U BARDEN
05 13 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 930103 U U VWSG
Distance: 831 km Direction: 221 degs. Time elapsed: 10 yrs 2 mnths 19 days

040-99816 01,KOORAGANG ISLANDNSW 32d52m S 151d46mE 821015 J U BARDEN
05 13 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 930103 +2 U VWSG
Distance: 831 km Direction: 221 degs. Time elapsed: 10 yrs 2 mnths 19 days

041-15629 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 851019 +3 U VWSG
61 03 13,TANGGU NEAR TIANJIN CHINA 38d54m N 117d37mE 920500 U U CHINA BIRD BANDING
Distance: 9010 km Direction: 339 degs. Time elapsed: -96 yrs 0 mnths 0 days

041-18661 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 861206 +3 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931229 +2 U VWSG
Distance: 123 km Direction: 298 degs. Time elapsed: 7 yrs 0 mnths 23 days

041-18697 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 861220 +2 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920320 +2 U VWSG
Distance: 213 km Direction: 109 degs. Time elapsed: 5 yrs 3 mnths 0 days

041-44138 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 880626 1 U VWSG
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940911 +3 U AWSG
Distance: 3188 km Direction: 309 degs. Time elapsed: 6 yrs 2 mnths 16 days

041-46154 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 880331 +2 U AWSG
67 03 8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI 37d9m N 119d0m E 920500 U U MUNDKUR
Distance: 6275 km Direction: 358 degs. Time elapsed: -96 yrs 0 mnths 0 days

041-46352 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880404 +2 U AWSG
05 13 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 940423 6 U WWF
Distance: 4591 km Direction: 348 degs. Time elapsed: 6 yrs 0 mnths 19 days

041-46835 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 881204 1 U VWSG
21 05 2F,NTH BCH UJUNG WATU VILLAGE JAVA IS IN 6d30m S 111d5m E 930912 U U YUDI /KOKO
Distance: 4863 km Direction: 308 degs. Time elapsed: 4 yrs 9 mnths 8 days

041-46864 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 881204 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 921129 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 3 yrs 11 mnths 25 days

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

041-58325 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 891230 +2 U VWSG
67 03 8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI 37d9m N 119d0m E 920500 U U MUNDKUR
Distance: 8764 km Direction: 340 degs. Time elapsed: -96 yrs 0 mnths 0 days

041-59524 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 901007 +3 U VWSG
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940911 U U AWSG
Distance: 3173 km Direction: 309 degs. Time elapsed: 3 yrs 11 mnths 4 days

041-59919 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 901230 +2 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920320 +2 U VWSG
Distance: 213 km Direction: 109 degs. Time elapsed: 1 yrs 2 mnths 18 days

041-60099 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 910112 +2 U VWSG
67 03 8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI 37d9m N 119d0m E 920500 U U MUNDKUR
Distance: 8807 km Direction: 339 degs. Time elapsed: -96 yrs 0 mnths 0 days

041-60308 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 910112 +2 U VWSG
68 03 1F,TANGGU NEAR TIANJIN CHINA 38d54m N 117d36mE 920500 U U FAWEN
Distance: 9033 km Direction: 338 degs. Time elapsed: -96 yrs 0 mnths 0 days

041-60689 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 910811 2 U VWSG
54 05 9F,LAKE MODEWARREVIC 38d15m S 144d5m E 920511 U U HIGGINS
Distance: 127 km Direction: 275 degs. Time elapsed: 0 yrs 9 mnths 0 days

041-61286 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 911227 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 921129 +2 U VWSG
Distance: 103 km Direction: 114 degs. Time elapsed: 0 yrs 11 mnths 2 days

041-61748 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 920229 +2 U VWSG
03 13 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 920414 U U WWF
Distance: 7447 km Direction: 329 degs. Time elapsed: 0 yrs 1 mnths 16 days

041-61893 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 920229 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 921129 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 0 yrs 9 mnths 0 days

041-62145 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 920620 1 U VWSG
05 13 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 931217 +2 U VWSG
Distance: 158 km Direction: 288 degs. Time elapsed: 1 yrs 5 mnths 27 days

041-62181 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 920620 1 U VWSG
05 13 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 931217 +2 U VWSG
Distance: 158 km Direction: 288 degs. Time elapsed: 1 yrs 5 mnths 27 days

041-63915 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 920923 +3 U AWSG
03 13 02,ROEBUCK PLAINS, 30KM EAST OF BROOMEWA 17d55m S 122d35mE 940315 +2 U AWSG
Distance: 198 km Direction: 42 degs. Time elapsed: 1 yrs 5 mnths 20 days

041-64214 05,SALTWORKS, PORT HEDLANDWA 20d15m S 118d55mE 920929 +3 U AWSG
01 03 7F,BEN TRE - APP 150KM SW OF SIAGON VIET 11d55m N 105d55mE 950331 U U VAN-CHUC
Distance: 3848 km Direction: 337 degs. Time elapsed: 2 yrs 6 mnths 2 days

041-64416 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 921002 +3 U AWSG
05 13 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 930504 U U WWF
Distance: 4591 km Direction: 348 degs. Time elapsed: 0 yrs 7 mnths 2 days

041-64497 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 921002 +3 U AWSG
67 05 03,SALTPANS OF TANGGU TIANJIN CITY CHINA 39d0m N 117d36mE 930500 U U CHINA BIRD BANDING
Distance: 6356 km Direction: 356 degs. Time elapsed: -96 yrs 0 mnths 0 days

041-65504 01,MOUTH OF BRISBANE RIVERQLD 27d22m S 153d10mE 901021 +1 U THOMPSON
67 05 03,SALTPANS OF TANGGU TIANJIN CITY CHINA 39d0m N 117d36mE 930500 U U CHINA BIRD BANDING
Distance: 8250 km Direction: 332 degs. Time elapsed: -96 yrs 0 mnths 0 days

041-67254 99,CONLU ISLAND N VIETNAM 20d30m N 105d30mE 910409 +2 U AWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 930124 +2 U VWSG
Distance: 7681 km Direction: 148 degs. Time elapsed: 1 yrs 9 mnths 15 days

041-68328 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 930102 +2 U VWSG
67 05 0F,YANG-JIAO-GUO SALT WORKS SHANDONG PRO 37d10m N 119d0m E 930521 U U TIAN HOU
Distance: 8809 km Direction: 339 degs. Time elapsed: 0 yrs 4 mnths 19 days

041-70602 10,BROOME TOWNWA 17d58m S 122d14mE 940401 +2 U AWSG
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

041-82139 NB,NORTH END OF NUDGEE BEACH BRISBANEQLD 27d20m S 153d5m E 930904 +1 U QWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 941126 +2 U VWSG
Distance: 1427 km Direction: 207 degs. Time elapsed: 1 yrs 2 mnths 22 days

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

GNV-58694 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 910827 2 U BTO
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940305 +2 U AWSG
Distance: 4591 km Direction: 168 degs. Time elapsed: 2 yrs 6 mnths 6 days

GNV-69703 05,MAI PO MARSHES HONG KONG 22d29m N 114d19mE 930504 +2 U BTO
05 13 05,SALTWORKS, PORT HEDLANDWA 20d15m S 118d55mE 940413 U U AWSG
Distance: 4777 km Direction: 174 degs. Time elapsed: 0 yrs 11 mnths 9 days

HB0-7767 06,SZU-TSAO, TAI NAN, TAIWAN 23d1m N 120d7m E 900505 U U TAIWAN
05 13 BI,BISHOP IS MOUTH OF BRISBANE RIVERQLD 27d21m S 153d10mE 930110 U U DRISCOLL
Distance: 6629 km Direction: 146 degs. Time elapsed: 2 yrs 8 mnths 5 days

HC0-7558 07,KANGNAN COASTAL AREA, HSIN CHU, TAIWA 24d48m N 120d54mE 920502 +2 U TAIWAN
05 13 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 930103 U U VWSG
Distance: 7477 km Direction: 159 degs. Time elapsed: 0 yrs 8 mnths 1 days

MM2-0135 02,PSU CAMPUS PATTANI SOUTH THAILAND 6d52m N 101d16mE 880828 J U U OF MALAYA
05 13 16,THE GURDIES WESTERNPORT BAYVIC 38d22m S 145d33mE 940102 +2 U VWSG
Distance: 6794 km Direction: 141 degs. Time elapsed: 5 yrs 4 mnths 5 days

SD0-34615 34,TRYOKHOZERKI, KHAKASSIA REPUBLIC, RUS 53d15m N 91d30m E 900826 J U RUSSIAN SCHEME
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931106 +2 U VWSG
Distance: 11359 k Direction: 140 degs. Time elapsed: 3 yrs 2 mnths 11 days

UNK-00227 01,SHIROKOSTAN PEN, NE SIBERIA, RUSSIA 72d21m N 140d15mE 940805 J U LINDSTROM
46 26 X6,SHIPWRECK POINT PERKINS ISLANDTAS 40d45m S 145d2m E 941030 U U PLOWRIGHT
Distance: 12579 k Direction: 176 degs. Time elapsed: 0 yrs 2 mnths 25 days

Red-necked Stint *Calidris ruficollis*

032-12556 BB,BOTANY BAY NORTHNSW 33d57m S 151d11mE 840309 +1 U SMEDLEY
67 03 8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI 37d9m N 119d0m E 920500 U U MUNDKUR
Distance: 8577 km Direction: 334 degs. Time elapsed: -96 yrs 0 mnths 0 days

032-46830 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 841229 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 103 km Direction: 114 degs. Time elapsed: 8 yrs 10 mnths 22 days

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

032-53117 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 920901 2 U AWSG
61 04 6F,DE VRIES PENINSULA, VLADIVOSTOK 43d10m N 132d30mE 940829 U U TOMKOVICH
Distance: 6878 km Direction: 8 degs. Time elapsed: 1 yrs 11 mnths 28 days

032-54655 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 851228 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 7 yrs 10 mnths 23 days

032-77532 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 861227 +2 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 940123 +2 U VWSG
Distance: 130 km Direction: 114 degs. Time elapsed: 7 yrs 0 mnths 27 days

033-40901 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 871227 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 103 km Direction: 114 degs. Time elapsed: 5 yrs 10 mnths 24 days

033-40953 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 871227 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 921129 +2 U VWSG
Distance: 103 km Direction: 114 degs. Time elapsed: 4 yrs 11 mnths 2 days

033-41322 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 880102 +2 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930304 +2 U VWSG
Distance: 213 km Direction: 109 degs. Time elapsed: 5 yrs 2 mnths 2 days

033-43152 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 880220 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 921129 +2 U VWSG
Distance: 103 km Direction: 114 degs. Time elapsed: 4 yrs 9 mnths 9 days

033-43152 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 880220 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 103 km Direction: 114 degs. Time elapsed: 5 yrs 9 mnths 0 days

033-66642 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 881231 +2 U VWSG
67 03 9F,MIAOGANG, NANHUI COUNTY, SHANGHAI CH 30d58m N 121d53mE 920300 U U MUNDKAR
Distance: 8068 km Direction: 339 degs. Time elapsed: -96 yrs 0 mnths 0 days

033-68249 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 890129 +2 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931107 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 4 yrs 9 mnths 9 days

033-68651 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 890129 1 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931106 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 4 yrs 9 mnths 8 days

033-68651 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 890129 1 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 940219 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 5 yrs 0 mnths 21 days

033-69442 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 890129 1 U VWSG
67 03 8F,LAIZHOU BAY, SHANDONG PROVINCE, CHI 37d9m N 119d0m E 920500 U U MUNDKUR
Distance: 8899 km Direction: 338 degs. Time elapsed: -96 yrs 0 mnths 0 days

033-70253 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 890219 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 4 yrs 9 mnths 1 days

033-70360 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 890225 +2 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920320 +2 U VWSG
Distance: 130 km Direction: 114 degs. Time elapsed: 3 yrs 0 mnths 23 days

033-70391 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 890506 1 U VWSG
67 05 03,SALTPANS OF TANGGU TIANJIN CITY CHINA 39d0m N 117d36mE 930500 U U CHINA BIRD
BANDING
Distance: 9093 km Direction: 338 degs. Time elapsed: -96 yrs 0 mnths 0 days

033-72733 PL,SALINE SWAMP SE SIDE OF PORT AUGUSTAS 32d31m S 137d47mE 900122 +1 U KLAU
05 13 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 920307 +2 U VWSG
Distance: 956 km Direction: 135 degs. Time elapsed: 2 yrs 1 mnths 13 days

033-73255 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 901118 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 103 km Direction: 114 degs. Time elapsed: 3 yrs 0 mnths 2 days

033-73534 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 901208 1 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931229 +2 U VWSG
Distance: 123 km Direction: 298 degs. Time elapsed: 3 yrs 0 mnths 21 days

033-74997 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 910101 1 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930304 +2 U VWSG
Distance: 130 km Direction: 114 degs. Time elapsed: 2 yrs 2 mnths 3 days

033-75304 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 920118 1 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 1 yrs 10 mnths 2 days

033-75489 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 920118 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 921129 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 0 yrs 10 mnths 11 days

033-75657 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 901230 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 2 yrs 10 mnths 21 days

033-75735 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 901230 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 123 km Direction: 119 degs. Time elapsed: 2 yrs 10 mnths 21 days

033-76202 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 910323 +2 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 921228 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 1 yrs 9 mnths 5 days

033-76240 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 910323 +2 U VWSG
05 13 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 930102 +2 U VWSG
Distance: 118 km Direction: 287 degs. Time elapsed: 1 yrs 9 mnths 10 days

033-76266 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 910323 +2 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 921229 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 1 yrs 9 mnths 6 days

033-76266 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 910323 +2 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931106 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 2 yrs 7 mnths 14 days

033-76414 06,BARRY BEACH CORNER INLETVIC 38d42m S 146d23mE 910518 1 U VWSG
68 04 5F,USSURI BAY NEAR VLADIVOSTOK RUSSIA 43d10m N 132d30mE 940730 U U TOMKOVICH
Distance: 9208 km Direction: 350 degs. Time elapsed: 3 yrs 2 mnths 12 days

033-77234 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900331 +2 U AWSG
05 13 05,SALTWORKS, PORT HEDLANDWA 20d15m S 118d55mE 921002 +3 U AWSG
Distance: 440 km Direction: 235 degs. Time elapsed: 2 yrs 6 mnths 1 days

033-77915 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 920920 2 U AWSG
05 13 05,SALTWORKS, PORT HEDLANDWA 20d15m S 118d55mE 921002 +3 U AWSG
Distance: 440 km Direction: 235 degs. Time elapsed: 0 yrs 0 mnths 12 days

033-78113 05,SALTWORKS, PORT HEDLANDWA 20d15m S 118d55mE 921002 +3 U AWSG
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 921013 +2 U AWSG
Distance: 440 km Direction: 56 degs. Time elapsed: 0 yrs 0 mnths 11 days

033-78519 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 920920 +3 U AWSG
05 13 05,SALTWORKS, PORT HEDLANDWA 20d15m S 118d55mE 921002 +3 U AWSG
Distance: 440 km Direction: 235 degs. Time elapsed: 0 yrs 0 mnths 12 days

034-12373 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 911227 +2 U VWSG
05 13 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 940122 +2 U VWSG
Distance: 195 km Direction: 105 degs. Time elapsed: 2 yrs 0 mnths 26 days

034-13035 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920320 +2 U VWSG
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 920920 +3 U AWSG
Distance: 3298 km Direction: 307 degs. Time elapsed: 0 yrs 6 mnths 0 days

034-13212 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920320 1 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 921228 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 0 yrs 9 mnths 8 days

034-13212 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920320 1 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931107 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 1 yrs 7 mnths 18 days

034-13333 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 920320 1 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 930123 +2 U VWSG
Distance: 213 km Direction: 288 degs. Time elapsed: 0 yrs 10 mnths 3 days

034-55063 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 921213 +2 U VWSG
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940906 U U AWSG
Distance: 3173 km Direction: 309 degs. Time elapsed: 1 yrs 8 mnths 24 days

034-55664 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 930102 +2 U VWSG
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940430 +2 U AWSG
Distance: 3188 km Direction: 309 degs. Time elapsed: 1 yrs 3 mnths 28 days

034-56085 22,NORTH WEST CORNER SWAN BAY QUEENSCLIF 38d13m S 144d39mE 930117 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 106 km Direction: 115 degs. Time elapsed: 0 yrs 10 mnths 3 days

034-56198 22,NORTH WEST CORNER SWAN BAY QUEENSCLIF 38d13m S 144d39mE 930117 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 106 km Direction: 115 degs. Time elapsed: 0 yrs 10 mnths 3 days

034-56199 22,NORTH WEST CORNER SWAN BAY QUEENSCLIF 38d13m S 144d39mE 930117 +2 U VWSG
05 13 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
Distance: 106 km Direction: 115 degs. Time elapsed: 0 yrs 10 mnths 3 days

034-56206 22,NORTH WEST CORNER SWAN BAY QUEENSCLIF 38d13m S 144d39mE 930117 +2 U VWSG
67 05 03,SALTPANS OF TANGGU TIANJIN CITY CHINA 39d0m N 117d36mE 930500 U U CHINA BIRD BANDING
Distance: 9017 km Direction: 339 degs. Time elapsed: -96 yrs 0 mnths 0 days

034-58204 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 930213 +2 U VWSG
05 13 01,OBITSU ESTUARY, KISARAZU-SHI, JAPAN 35d25m N 139d54mE 950830 U U YAMASHINA INST
Distance: 8206 km Direction: 355 degs. Time elapsed: 2 yrs 6 mnths 17 days

034-58841 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930304 +2 U VWSG
05 13 05,YALLOCK CREEK NEAR KOOWEERUPVIC 38d13m S 145d28mE 940103 +2 U VWSG
Distance: 130 km Direction: 293 degs. Time elapsed: 0 yrs 9 mnths 30 days

034-59808 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 +2 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931229 +2 U VWSG
Distance: 123 km Direction: 298 degs. Time elapsed: 0 yrs 1 mnths 9 days

034-60206 03,INVERLOCH (ANDERSONS INLET & PT. 38d37m S 145d45mE 931120 1 U VWSG
05 13 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 931229 1 U VWSG
Distance: 123 km Direction: 298 degs. Time elapsed: 0 yrs 1 mnths 9 days

034-97511 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 941004 +3 U AWSG
05 13 2F,SOUTH SAKHALIN, ANIVA BAY, RUSSIA 46d44m N 142d43mE 950525 U U ZIKOV
Distance: 7480 km Direction: 15 degs. Time elapsed: 0 yrs 7 mnths 21 days

HA0-4696 05,TATU RIVERMOUTH TAIWAN 24d48m N 120d54mE 890902 +3 U TAIWAN
05 13 05,SALTWORKS, PORT HEDLANDWA 20d15m S 118d55mE 920929 U U AWSG
Distance: 5013 km Direction: 183 degs. Time elapsed: 3 yrs 0 mnths 27 days

UNK-00239 LF,SOUTHERN VICTORIAVIC 38d0m S 145d0m E 910000 U U VWSG
46 26 04,TA-TU-HSI TAICHUNG TAIWAN 24d11m N 120d29mE 950517 U U TAIWAN
Distance: 7371 km Direction: 336 degs. Time elapsed: -96 yrs 0 mnths 0 days

UNK-00241 LF,SOUTHERN VICTORIAVIC 38d0m S 145d0m E 910000 U U VWSG
46 26 11,HUALIEN RIVER, HUALIEN, TAIWAN 23d57m N 121d36mE 950527 U U TAIWAN
Distance: 7307 km Direction: 337 degs. Time elapsed: -96 yrs 0 mnths 0 days

UNK-00244 LF,SOUTHERN VICTORIAVIC 38d0m S 145d0m E 910000 U U VWSG
46 26 X1,PORT AUGUSTA ETSA LAKES COMPLEXSA 32d31m S 137d48mE 951022 U U LANGDON
Distance: 893 km Direction: 311 degs. Time elapsed: -96 yrs 0 mnths 0 days

Sharp-tailed Sandpiper *Calidris acuminata*

041-08327 02,PALMERSTON DARWINNT 12d31m S 130d58mE 841124 +1 F VAN GESSEL
68 05 6F,ANDRYUSHKA NIZHNEKOLYMSKY DIST N YAKU 69d48m N 154d34mE 930620 U U TOMKOVICH
Distance: 9332 km Direction: 8 degs. Time elapsed: 8 yrs 6 mnths 27 days

Red Knot *Calidris canutus*

051-15348 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 870118 1 U VWSG
05 13 14,JORDANS F SE KAIPARA HARBOUR NEW ZEAL 36d34m S 174d26mE 941218 U U NZWSG
Distance: 2639 km Direction: 96 degs. Time elapsed: 7 yrs 11 mnths 0 days

051-15348 01,WERRIBEE SEWERAGE FARM (SPIT, PT WILS 38d5m S 144d31mE 870118 1 U VWSG
05 13 2F,SOUTH EAST KAIPARA HARBOUR NEW ZEALAN 36d34m S 174d26mE 941218 U U NZWSG
Distance: 2639 km Direction: 96 degs. Time elapsed: 7 yrs 11 mnths 0 days

051-15420 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 870221 +2 U VWSG
05 13 2F,SOUTH EAST KAIPARA HARBOUR NEW ZEALAN 36d34m S 174d26mE 930307 +1 U NZWSG
Distance: 2624 km Direction: 95 degs. Time elapsed: 6 yrs 0 mnths 14 days

051-18455 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 860105 1 U VWSG
03 07 03,NAKDONG ESTUARY KOREA 35d8m N 128d54mE 920416 U U PARK
Distance: 8318 km Direction: 347 degs. Time elapsed: 6 yrs 3 mnths 11 days

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

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

051-28857 PR,SOUTH SIDE PRINCESS ROYAL HARBOUR ALB 35d5m S 117d53mE 910316 +2 U SMITH
05 13 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 951029 +3 U VWSG
Distance: 2405 km Direction: 106 degs. Time elapsed: 4 yrs 7 mnths 13 days

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

051-31296 BI,BISHOP IS MOUTH OF BRISBANE RIVERQLD 27d21m S 153d10mE 901021 +2 U DRISCOLL
05 13 2F,SOUTH EAST KAIPARA HARBOUR NEW ZEALAN 36d34m S 174d26mE 930307 +1 U NZWSG
Distance: 2245 km Direction: 122 degs. Time elapsed: 2 yrs 4 mnths 14 days

051-31296 BI,BISHOP IS MOUTH OF BRISBANE RIVERQLD 27d21m S 153d10mE 901021 +2 U DRISCOLL
05 13 2F,SOUTH EAST KAIPARA HARBOUR NEW ZEALAN 36d34m S 174d26mE 930307 U U NZWSG
Distance: 2245 km Direction: 122 degs. Time elapsed: 2 yrs 4 mnths 14 days

051-39133 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 880406 +1 U AWSG
67 03 18,CHONGMING ISLAND SHANGHAI CHINA 31d27m N 121d53mE 950410 U U CHINA BIRD BANDING
Distance: 5497 km Direction: 359 degs. Time elapsed: 7 yrs 0 mnths 4 days

051-40093 07,OFF MANNS BEACH CORNER INLETVIC 38d41m S 146d50mE 930307 +2 U VWSG
05 13 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 930605 2 U VWSG
Distance: 195 km Direction: 284 degs. Time elapsed: 0 yrs 2 mnths 29 days

051-40159 04,SWAN ISLAND QUEENSCLIFFVIC 38d15m S 144d40mE 930605 2 U VWSG
05 13 56,FINNISS BEACH NR MOUTH OF FINNISS RIV 12d53m S 130d19mE 950914 +2 U CHATTO
Distance: 3156 km Direction: 329 degs. Time elapsed: 2 yrs 3 mnths 9 days

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

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

051-53018 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 910811 2 U VWSG
05 13 8F,TARAMAIRE FIRTH OF THAMES NZ 37d9m S 175d19mE 920704 U U RIEGEN
Distance: 2610 km Direction: 96 degs. Time elapsed: 0 yrs 10 mnths 23 days

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

051-54797 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 920916 +3 U AWSG
61 03 39,OKHOTSKIY DIST, ULBEYA R. MOUTH, 59d22m N 144d25mE 950901 U U RUSSIAN SCHEME
Distance: 8831 km Direction: 11 degs. Time elapsed: 2 yrs 11 mnths 16 days

051-56717 01,MOUTH OF BRISBANE RIVERQLD 27d22m S 153d10mE 901021 +2 U THOMPSON
05 13 2F,SOUTH EAST KAIPARA HARBOUR NEW ZEALAN 36d34m S 174d26mE 930307 +1 U NZWSG
Distance: 2244 km Direction: 122 degs. Time elapsed: 2 yrs 4 mnths 14 days

051-56717 01,MOUTH OF BRISBANE RIVERQLD 27d22m S 153d10mE 901021 +2 U THOMPSON
05 13 2F,SOUTH EAST KAIPARA HARBOUR NEW ZEALAN 36d34m S 174d26mE 930307 U U NZWSG
Distance: 2244 km Direction: 122 degs. Time elapsed: 2 yrs 4 mnths 14 days

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

051-56759 NB,NORTH END OF NUDGEE BEACH BRISBANEQLD 27d20m S 153d5m E 921026 +1 U DRISCOLL
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 7268 km Direction: 331 degs. Time elapsed: -96 yrs 0 mnths 0 days

051-59681 08,STOCKYARD PT, LANG LANG, WESTERNPORTV 38d22m S 145d32mE 920704 1 U VWSG
05 13 34,MIRANDA FIRTH OF THAMES NEW ZEALAND 37d10m S 175d19mE 931218 U U NZWSG
Distance: 2609 km Direction: 96 degs. Time elapsed: 1 yrs 5 mnths 14 days

GXR-81219 03,MAI PO MARSHES HONG KONG 22d29m N 114d2m E 910909 J U BTO
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940911 U U AWSG
Distance: 4591 km Direction: 168 degs. Time elapsed: 3 yrs 0 mnths 2 days

NC3-1161 14,JORDANS F SE KAIPARA HARBOUR NEW ZEAL 36d34m S 174d26mE 870228 +2 U NZ SCHEME
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 9281 km Direction: 317 degs. Time elapsed: -96 yrs 0 mnths 0 days

NC3-1444 14,JORDANS F SE KAIPARA HARBOUR NEW ZEAL 36d34m S 174d26mE 890223 +2 U NZ SCHEME
05 13 DC,DUX CREEK, BRIBIE ISLANDQLD 27d3m S 153d8m E 931017 +1 U QWSG
Distance: 2266 km Direction: 292 degs. Time elapsed: 4 yrs 7 mnths 24 days

NC4-5552 34,MIRANDA FIRTH OF THAMES NEW ZEALAND 37d10m S 175d19mE 901103 +1 U NZ SCHEME
05 13 NB,NORTH END OF NUDGEE BEACH BRISBANEQLD 27d20m S 153d5m E 930904 +4 U QWSG
Distance: 2351 km Direction: 291 degs. Time elapsed: 2 yrs 10 mnths 1 days

UNK-00240 LF,SOUTHERN VICTORIAVIC 38d0m S 145d0m E 910000 U U VWSG
46 26 11,HUALIEN RIVER, HUALIEN, TAIWAN 23d57m N 121d36mE 950525 U U TAIWAN
Distance: 7307 km Direction: 337 degs. Time elapsed: -96 yrs 0 mnths 0 days

Great Knot *Calidris tenuirostris*

051-28837 PR,SOUTH SIDE PRINCESS ROYAL HARBOUR ALB 35d5m S 117d53mE 910316 +2 U SMITH
05 13 C3,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 940310 +2 U AWSG
Distance: 1793 km Direction: 12 degs. Time elapsed: 2 yrs 11 mnths 22 days

061-37938 08,ROEBUCK BAYWA 18d4m S 122d19mE 810830 +1 U WAWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5440 km Direction: 359 degs. Time elapsed: -96 yrs 0 mnths 0 days

061-38561 02,10 KM SOUTH OF ANNA PLAINS 80 MILE BE 19d15m S 121d20mE 820824 +1 U WAWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 950423 U U TIANHOU/TANG SIXIAN
Distance: 5572 km Direction: 1 degs. Time elapsed: 12 yrs 7 mnths 30 days

061-39475 09,6K SW OF BROOMEWA 17d58m S 122d16mE 820330 +1 U WAWSG
92 03 8F,ZHELING HANGZHOU BAY CHINA 30d40m N 121d10mE 920416 U U MUNDKAR
Distance: 5422 km Direction: 359 degs. Time elapsed: 10 yrs 0 mnths 17 days

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

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

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

061-45052 PR,SOUTH SIDE PRINCESS ROYAL HARBOUR ALB 35d5m S 117d53mE 910316 +2 U SMITH
05 13 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940906 +3 U AWSG
Distance: 1950 km Direction: 14 degs. Time elapsed: 3 yrs 5 mnths 21 days

061-45131 PR,SOUTH SIDE PRINCESS ROYAL HARBOUR ALB 35d5m S 117d53mE 940903 +3 U SMITH
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 950420 U U TIANHOU/TANG SIXIAN
Distance: 7343 km Direction: 4 degs. Time elapsed: 0 yrs 7 mnths 17 days

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

061-71174 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900329 1 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: -96 yrs 0 mnths 0 days

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

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

061-71802 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 900411 -2 U AWSG
05 13 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 920924 +3 U AWSG
Distance: 177 km Direction: 218 degs. Time elapsed: 2 yrs 5 mnths 13 days

061-72510 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 920916 +3 U AWSG
05 13 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 940312 +2 U AWSG
Distance: 177 km Direction: 218 degs. Time elapsed: 1 yrs 5 mnths 24 days

061-72897 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 920926 2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5572 km Direction: 1 degs. Time elapsed: -96 yrs 0 mnths 0 days

061-87275 BI,BISHOP IS MOUTH OF BRISBANE RIVERQLD 27d21m S 153d10mE 910303 +2 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

061-90273 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 921007 2 U AWSG
63 04 35,BALAGANCHIK R (ANADYR DIST), NE SIBER 64d55m N 168d35mE 950712 +1 F TOMKOVICH
Distance: 10177 k Direction: 18 degs. Time elapsed: 2 yrs 9 mnths 5 days

061-90448 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 921016 +3 U AWSG
67 05 8F,EAST END OF CHONGMIN ISLAND, CHINA 31d30m N 121d52mE 940205 U U XIAO
Distance: 5503 km Direction: 359 degs. Time elapsed: 1 yrs 3 mnths 20 days

061-90778 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 930330 1 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 950420 U U TIANHOU/TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: 2 yrs 0 mnths 21 days

061-91351 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940305 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: -96 yrs 0 mnths 0 days

061-91392 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 940310 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 950420 U U TIANHOU/TANG SIXIAN
Distance: 5572 km Direction: 1 degs. Time elapsed: 1 yrs 1 mnths 10 days

061-92046 BI,BISHOP IS MOUTH OF BRISBANE RIVERQLD 27d21m S 153d10mE 910303 +2 U DRISCOLL
25 11 0F,AT SEA NR BORDER OF INDONESA & PNG 9d25m S 141d1m E 950417 U U ROROMA
Distance: 2366 km Direction: 325 degs. Time elapsed: 4 yrs 1 mnths 14 days

062-08535 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 940310 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5572 km Direction: 1 degs. Time elapsed: -96 yrs 0 mnths 0 days

062-08558 03,SHORES OF THE 80 MILE BEACHWA 19d15m S 121d20mE 940310 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5572 km Direction: 1 degs. Time elapsed: -96 yrs 0 mnths 0 days

062-09024 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940318 +2 U AWSG
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 5433 km Direction: 359 degs. Time elapsed: -96 yrs 0 mnths 0 days

062-09539 BI,BISHOP IS MOUTH 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

K50-00918 01,SOUTH SIDE OF YONGJONG ISLAND KOREA 37d27m N 126d29mE 931019 2 U KOREAN SCHEME
05 13 PR,SOUTH SIDE PRINCESS ROYAL HARBOUR ALB 35d5m S 117d53mE 940903 2 U SMITH
Distance: 8112 km Direction: 187 degs. Time elapsed: 0 yrs 10 mnths 15 days

SP9-04986 35,BALAGANCHIK R (ANADYR DIST), NE SIBER 64d55m N 168d35mE 940622 +3 F RUSSIAN SCHEME
48 26 X1,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 940909 U U BROOME BIRD OBS
Distance: 10011 k Direction: 223 degs. Time elapsed: 0 yrs 2 mnths 18 days

SP9-04986 35,BALAGANCHIK R (ANADYR DIST), NE SIBER 64d55m N 168d35mE 940622 +3 F RUSSIAN SCHEME
48 26 X1,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 951017 U U BROOME BIRD OBS
Distance: 10011 k Direction: 223 degs. Time elapsed: 1 yrs 3 mnths 25 days

UNK-00238 LF,COASTAL AREA, SOUTH-EAST QUEENSLANDQL 27d20m S 153d10mE 920000 U U QWSG
46 26 10,LANYANG RIVER, I-LAN TAIWAN 24d42m N 121d35mE 950405 U U TAIWAN
Distance: 6702 km Direction: 327 degs. Time elapsed: -96 yrs 0 mnths 0 days

Sanderling *Calidris alba*

041-60356 23,KILLARNEY BEACHVIC 38d21m S 142d20mE 910302 +2 U VWSG
05 13 53,BROWN BAY, 15KM E OF PORT MACDONNELLS 38d3m S 140d50mE 950206 U U VWSG
Distance: 135 km Direction: 284 degs. Time elapsed: 3 yrs 11 mnths 4 days

041-60451 23,KILLARNEY BEACHVIC 38d21m S 142d20mE 910302 +2 U VWSG
05 13 51,CANUNDA NATIONAL PARKSA 37d37m S 140d11mE 931128 +2 U VWSG
Distance: 205 km Direction: 293 degs. Time elapsed: 2 yrs 8 mnths 26 days

041-60457 23,KILLARNEY BEACHVIC 38d21m S 142d20mE 910302 +2 U VWSG
05 13 51,CANUNDA NATIONAL PARKSA 37d37m S 140d11mE 931128 +2 U VWSG
Distance: 205 km Direction: 293 degs. Time elapsed: 2 yrs 8 mnths 26 days

041-60472 23,KILLARNEY BEACHVIC 38d21m S 142d20mE 910302 +2 U VWSG
05 13 51,CANUNDA NATIONAL FARKSA 37d37m S 140d11mE 931128 +2 U VWSG
Distance: 205 km Direction: 293 degs. Time elapsed: 2 yrs 8 mnths 26 days

UNK-00242 LF,SOUTHERN VICTORIAVIC 38d0m S 145d0m E 910000 U U VWSG
46 26 8F,HOPETOUNWA 33d57m S 120d7m E 941013 U U HEERMANS
Distance: 2276 km Direction: 274 degs. Time elapsed: -96 yrs 0 mnths 0 days

Broad-billed Sandpiper *Limicola falcinellus*

041-64697 01,BEACHES CRAB CK RD ROEBUCK BAY BRO 18d0m S 122d22mE 921015 +2 U AWSG
61 05 38,SAKHALIN, OKHINSKIY, BAYKAL BAY, RUSS 53d35m N 142d23mE 940730 U U RUSSIAN SCHEME
Distance: 8185 km Direction: 12 degs. Time elapsed: 1 yrs 9 mnths 15 days

UNK-00245 20,FUREN LAKE, NEMURO CITY, HOKKAIDO, JA 43d16m N 145d27mE 940000 J U YAMASHINA INST
46 26 NB,NEWELL BEACH, 8KM NE MOSSMANQLD 16d26m S 145d23mE 951115 U U RICHARDS
Distance: 6637 km Direction: 180 degs. Time elapsed: -96 yrs 0 mnths 0 days

Dunlin *Calidris alpina*

HB0-0800 09,TATU RIVER ESTUARY 24d11m N 120d29mE 890926 U U TAIWAN
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 755 km Direction: 10 degs. Time elapsed: -96 yrs 0 mnths 0 days

HB0-1145 09,TATU RIVER ESTUARY 24d11m N 120d29mE 870926 U U TAIWAN
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 755 km Direction: 10 degs. Time elapsed: -96 yrs 0 mnths 0 days

HB0-5680 07,KANGNAN COASTAL AREA, HSIN CHU, TAIWA 24d48m N 120d54mE 910112 U U TAIWAN
67 05 05,MIAO-GANG YANGTZE R EST, SHANGHAI, CH 30d52m N 121d52mE 940400 U U TIANHOU/TANG SIXIAN
Distance: 681 km Direction: 8 degs. Time elapsed: -96 yrs 0 mnths 0 days

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Indexes:

Author and species indexes have been published within *The Stilt* to volume 24.

Volumes Indexed	Volume containing Index
1-6	7
7-12	13
13-18	19
19-24	25

ADVICE TO CONTRIBUTORS

The Stilt publishes original papers, technical notes and short communications on the waders ("shorebirds") of the East Asian/Australasian Flyway and relevant Pacific regions. The Editor welcomes any enquiries or questions from potential contributors.

Format

Contributions are preferred in both diskette and hard copy formats. Fully formatted texts, and where appropriate graphics, should be submitted in Word 6 for Windows compatible files on a 3.5" diskette. Please specify the format in which the file is saved, and virus-scan all disks. Two good-quality printed versions (text and graphics) should accompany the disk.

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The style of presentation for *The Stilt* generally follows that given in *"Advice to Contributors"* in *Emu*, the official journal of the RAOU. Particularly, authors are referred to the style used in this edition of *The Stilt*. Matters of style are briefly outlined on the inside back cover of volume 27 of the *Stilt*.

Nomenclature and Taxonomy

English and scientific names for species occurring in Australia are those in *The Taxonomy of the Birds of Australia and its Territories* (Christidis, L., & W. Boles. 1994. RAOU Monograph 2); for those species occurring in New Zealand, or vagrant to Antarctica, the *Handbook of Australian, New Zealand and Antarctic Birds* (Volumes 2 and 3) should be used as a guide; for Asian birds not covered by either of the above *A Field Guide to the Birds of South-East Asia* (King, B., M. Woodcock & E. Dickinson. 1975 and reprints).

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