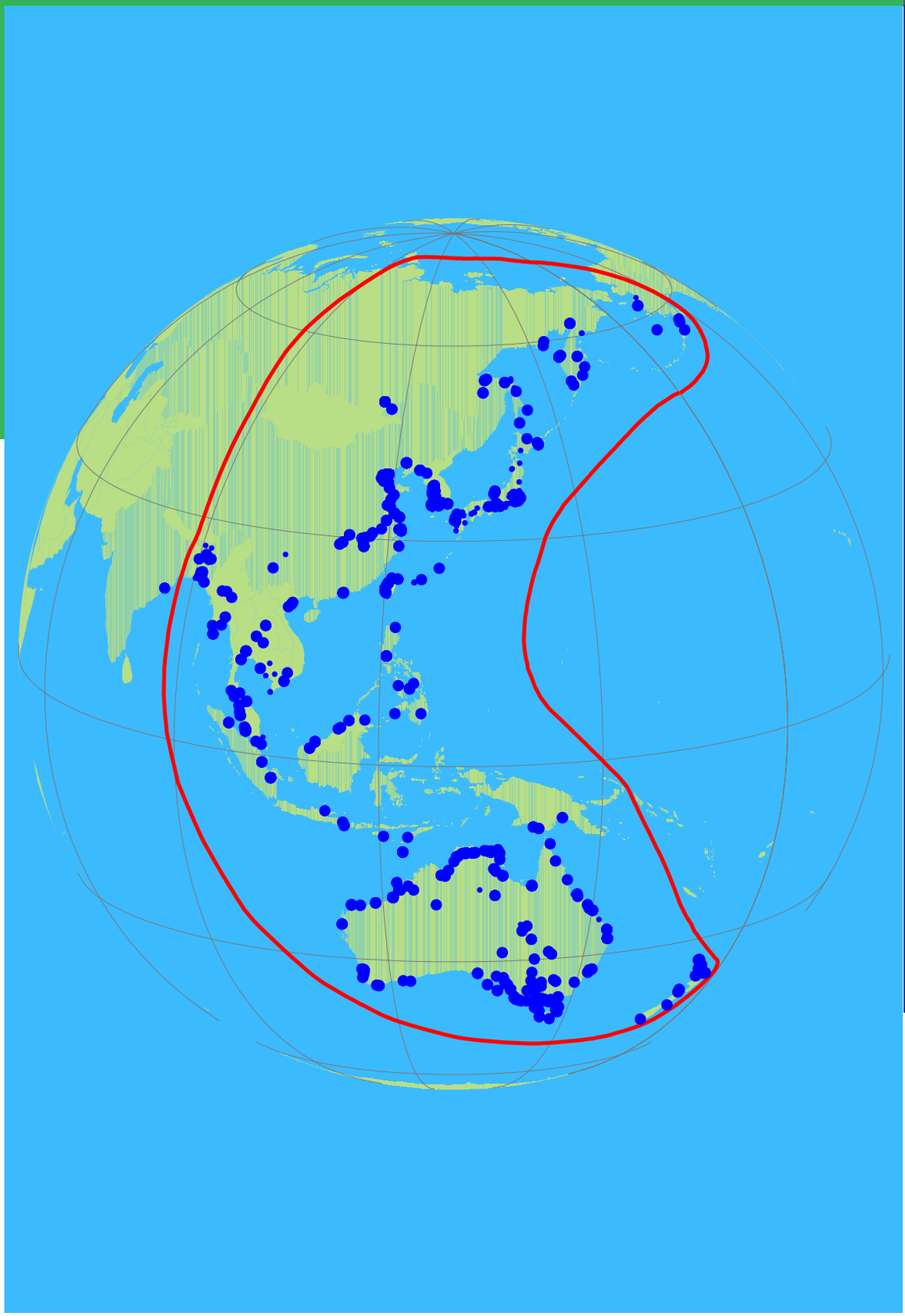
Migratory Shorebirds of the East Asian - Australasian Flyway:
Population Estimates and Internationally Important Sites

M. Bamford, D. Watkins, W. Bancroft, G. Tischler and J. Wahl



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MIGRATORY SHOREBIRDS OF THE EAST ASIAN - AUSTRALASIAN FLYWAY: Population Estimates and Internationally Important Sites

M. Bamford, D. Watkins, W. Bancroft, G. Tischler and J. Wahl **Wetlands International**

Mission:

To sustain and restore wetlands, their resources and biodiversity for future generations.

The East Asian – Australasian Flyway is one of the world's great flyways for migratory shorebirds. It includes 23 countries and extends from Arctic Russia and North America south to Australia and New Zealand, and incorporates eastern, south-eastern and parts of southern Asia. The spectacular migratory feats of shorebirds pose a conservation challenge in this and other flyways, and therefore as part of the Migratory Shorebird Action Plan, Wetlands International - Oceania undertook a review of population sizes and identification of important sites for shorebirds in the Flyway.

This review was based on the collation and analysis of count data and almost 100 000 records were processed. It involved the development of population estimates using non-breeding period count data, and then the application of 1% of this population estimate to all count data of a species for the identification of Internationally Important Sites. The 1% criterion for the identification of Wetlands of International Importance was established by the Ramsar Convention on Wetlands.

Fifty-four migratory shorebird species are present regularly in the Flyway, with some represented by two or more subspecies. Fifteen of the species are confined to the Flyway. Population estimates ranged from 1 000 (Spotted Greenshank) to 2.88 million (Oriental Pratincole), with a minimum of 8 million shorebirds in the Flyway. For 20 species, data were so inadequate that only an estimated population range could be proposed. The population estimates of some species have changed since previously calculated; estimates have increased in some cases due to access to better data, but species with small and possibly declining populations are of concern.

This review identified 400 sites of International Importance, with the greatest numbers of sites in Australia, Japan, China and South Korea. The distribution of sites reflected survey coverage as well as size of a country and its usage by migratory shorebirds. Some countries (North Korea, Mongolia) and regions within countries (inland Australia and China) were inadequately surveyed.

A comparison of non-breeding period count data from Sites of International Importance with population estimates suggests that site identification is inadequate for over half the migratory shorebird species in the Flyway.

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FLYWAY: Population Estimates and Internationally Important Sites

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Population Estimates and Internationally Important Sites

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This work was a component of the:
- **East Asian - Australasian Shorebird Action Plan: 2001-2005**
- **Asia-Pacific Migratory Waterbird Conservation Strategy: 2001-2005**

It now contributes to the Partnership for the East Asian - Australasian Flyway

Wetlands International 2008

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In all that endless blue of space,
Where latitude and longitude are words,
not numbered lines.
How do they know,
the way to go.
Between a home and a home;
Returning and returning.

What guides them, directs them,
Along the skyroads and across the oceans.
Who guards them, looks over them,
Amongst the cloudways and the thunder.
How do they know,
the way to go.
Between a home and a home;
Returning and returning.

J. Bamford

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We relied on shorebird count data that have accumulated over some decades through the efforts of Wetlands International and its Asian Waterfowl Census, the Australasian Wader Studies Group and its shorebird population monitoring programme, and the work of individuals who counted birds and reported their findings. It is only through the foresight of such organisations and the relentless and largely unpaid efforts of individuals that this mass of data was available to us. Inevitably there will be data that we missed during the course of the project, and all we can do is apologise and encourage people to publish their observations whenever they can, thus making them more available for the future.

Having massaged count data into population estimates, we then relied upon feedback from people with much greater knowledge than us concerning the shorebirds of their region. Many people responded to our requests for comments and some even dug into records and found additional data for us. Our thanks to Bob Gill (Alaska), Yuri Gerasimov (Russia), Maki Koyama, Tobai Sadayosi, Minoru Kashiwagi (Japan), Nial Moores (South Korea), Mark Barter (South Korea and China), Lew Young (Hong Kong), Weiting Liu (Taiwan), Phil Round (Cambodia), Taej Mundkur (Malaysia), Andrew Crossland (Indonesia) and Phil Straw, Chris Hassell, Ray Chatto, Roger Jaensch, Jim Wilson, Peter Driscoll and Clive Minton (Australia). Additional thanks to Bob Gill, Mark Barter and Roger Jaensch, who provided valuable comments upon early versions of this report.

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Mike Bamford and Doug Watkins

1st May 2008

Summary

Migratory shorebirds present a particular conservation challenge because their patterns of movement take them across international boundaries, in some cases almost spanning the globe. They utilise different sites in different countries at different times of the year, and conservation of these species therefore requires the management of the suite of sites that are important to them. To identify important sites requires count data and population estimates to put those count data into perspective.

The need for this information in the East Asian - Australasian region was identified in the Asia-Pacific Migratory Shorebird Action Plan, and Wetlands International undertook to implement this component of the Plan through this review. This review therefore aimed to:

- Develop population estimates for shorebirds in the East Asian - Australasian (EAA) Flyway;
- Identify sites of international importance for migratory shorebirds in the EAA Flyway.

This review is the first time that the identification of sites of international importance for migratory shorebirds across the EAA Flyway has been conducted.

Shorebirds and the EAA Flyway

'Flyway' is the term used to describe a geographic region that supports a group of populations of migratory waterbirds throughout their annual cycle. Up to nine flyways are recognised worldwide, each reflecting a grouping of populations that use similar migratory routes. The EAA Flyway extends from the Russian Far East and Alaska in the north to Australia and New Zealand in the south, and incorporates eastern Asia and parts of south Asia. There are 23 countries within this region.

Fifty-four species of migratory shorebirds utilise the EAA Flyway, with a number of other species present as vagrants.

Population estimates

The past decade of the "Asia – Pacific Migratory Waterbird Conservation Strategy" and its linked "Action Plan for Migratory Shorebirds in the East Asian – Australasian Flyway" has provided considerable stimulation and support for the collection of new data on shorebird numbers. This review provides the first opportunity to draw this information together from across the flyway, e.g., Yellow Sea (Barter 2003), northern Australia (Driscoll 1996) and expanded coverage by the Asian Waterbird Census (Li and Mundkur 2004).

The size of shorebird populations in the EAA Flyway were calculated based on a review of count data. Over 100 000 count records were included in the review, with the main sources of data being the Asian Waterfowl Census, and population monitoring programmes in Australia and Japan. Data were collated into regions within each country, and for species with adequate data, the highest non-breeding period count of each species in each region was used as the basis for a regional estimate. Non-breeding period data were used because it was assumed that there would be minimal movement of birds between regions and similar numbers of birds would be present in each region each non-breeding period. Regional estimates were pooled for each country, with adjustments made to derive country estimates. Adjustments were made on the basis of the estimated proportion of habitat included in surveys and with advice from ornithologists experienced in each country. Country estimates were then pooled to produce population estimates for the EAA Flyway.

Estimates were presented for 34 of the 54 shorebird species included in the review. Data were inadequate for the remaining 20 species, but population ranges were provided. These were species that are cryptic or disperse across freshwater wetlands and are therefore difficult to count. Population estimates for migratory shorebirds in the EAA Flyway ranged from 1 000 (Spotted Greenshank) to 2.88 million (Oriental Pratincole), with a minimum total for all species of approximately 8 million.

Comparison with previous estimates

Many population estimates were similar to previously calculated values or fell within previously proposed population ranges, but for a number of species this review produced substantially changed estimates. The review concluded that many populations were present in larger numbers than could previously be substantiated. For example; Whimbrel (100 000 compared with 55 000), Eurasian Curlew (40 000 compared with 35 000) and Grey-tailed Tattler (60 000 compared with 40 000). Such increased population estimates are probably due to more comprehensive count data. A few species are believed to be less abundant than previously thought. These include the Red-necked Stint (325 000 compared with 471 000) and Curlew Sandpiper (180 000 compared with 250 000). To some extent, these lower estimates have come about because of improved information, but there is also concern that species such as the Curlew Sandpiper are declining in population size.

Two shorebird species in the EAA Flyway, the Spoon-billed Sandpiper and Spotted Greenshank, are listed as Endangered by the IUCN (2006). Previous population estimates for these species were <3 000 and 1 000 respectively, and the review found no evidence for larger numbers than these. Two further species, the Asian Dowitcher and Black-tailed Godwit, are listed as Near Threatened (IUCN 2006).

There is a shortage of count information on cryptic shorebirds and those that utilise freshwater inland wetlands. This has greatly limited the ability to derive population estimates for these populations.

Internationally Important Sites

The identification of important sites was based upon Criterion 6 of the Ramsar Convention, which states that "a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird". The criterion also allows for the recognition of internationally important sites based upon the movement of significant numbers of birds through a site during migration (staging criterion). In this review the staging criterion adopted was 0.25% of a population.

Four hundred (400) internationally important sites were identified, with the largest numbers of sites in Australia (119), China (51) and Japan (89). Sites of international importance were identified in the non-breeding and migration periods, as shorebirds are generally dispersed when breeding. Major sites or regions where sites were concentrated were: Moroshechnaya Estuary (Russia), Daursky Nature Reserve (Russia), Yellow Sea area (South Korea, North Korea, China), southern Honshu (Japan), Manila Bay (Philippines), Gulf of Thailand (Thailand), west coast of Malaya (Malaysia), south-eastern Sumatra (Indonesia), Roebuck Bay/80 Mile Beach (Australia), south-eastern Gulf of Carpentaria (Australia), Moreton Bay/Great Sandy Strait (Australia), southern Victoria to Eyre Peninsula/ Spencer Gulf (Australia) and North Island (New Zealand).

Usage of sites by shorebirds varied. In the north of the Flyway, sites were important on migration and very high proportions of some populations passed through particular areas. For example, possibly all Whimbrels in the EAA Flyway utilise Moroshechnaya Estuary on southward migration, a high proportion of Temminck's Stint use Daursky Nature Reserve, while an estimated 90% of the Flyway's Lesser Sand Plovers utilise the Yellow Sea area on northward migration. The Yellow Sea area has previously been identified as a key staging area within the EAA Flyway, being especially important for species that fly non-stop between eastern Asia and northern Australia. The Roebuck Bay/Eighty Mile Beach region of north-western Australia is also a key staging area, but in addition supports large numbers of birds throughout the year. Conservation of such key areas is essential to maintain the migration of many shorebird populations in the Flyway.

Sites important in the non-breeding period were widespread, reflecting differences in the non-breeding period distribution of shorebird populations. The majority of identified important sites in the non-breeding period were in Australia, but for some species important non-breeding period sites were confined to specific regions within south-eastern Asia. While the majority of migratory shorebirds in the Flyway used a limited number of sites in coastal eastern Asia between breeding grounds in the north and non-breeding period sites in the south, there were also species that used inland Asia and a suite of species that spent the non-breeding period in south-eastern and across to southern Asia.

The available data contributing to this document are limited in several ways, leading to incomplete identification of important sites in the Flyway. This is particularly the case where:

- A species is cryptic, non-flocking or in habitats difficult to count, such as inland freshwater sites, etc (includes 20 species in this Flyway).
- In regions where there are few surveys or reliable count data, including inland Asia and Australia.
- During migration periods for many species, as shorebird surveys concentrate on the non-breeding period.
- The boundary of a site is difficult to define – in many cases the boundary of a management unit was used to define the site boundary.

Conclusions

These updated population estimates and lists of important sites in each country of the Flyway enable some interpretation to identify the key areas in which to focus protection and wise use of habitat for migratory shorebirds. This knowledge can thus provide a basis for directing coordinated international conservation actions and efforts within each country. Key implications for conservation to come from this review are:

- The list of internationally important sites identified will assist the development of a

Network of Internationally Important Sites in the Flyway. The Network provides a basis for implementing internationally coordinated conservation efforts to conserve the wetlands that migrating birds need to survive. Staging sites form a large component of these internationally important sites. Whilst shorebirds may use staging sites more intermittently than breeding or non-breeding sites, the staging sites are extremely important for successful migration. A large number of staging sites are in Asia where impacts and threats are highest and often require more urgent conservation effort.

- Areas and countries with least information are often areas where shorebird field skills and general education and awareness are also needed.
- Data limitations indicate where more information is needed, including for species, habitats, regions and periods that are poorly surveyed.
- The boundaries of sites are often poorly-defined in available information. For site conservation, improved recognition of site boundaries is essential.

Whilst this document will help to determine priorities for shorebird conservation in the East Asian – Australasian Flyway, the available data to identify important sites in the Flyway are still incomplete and require ongoing updating and review.

1. INTRODUCTION

Shorebirds, also known as waders, undergo amongst the most spectacular feats of migration seen in the animal kingdom, with some species travelling in excess of 20 000km a year during a life span that may exceed 20 years. Migration enables them to breed in highly productive wetlands at high (Arctic) latitudes of the northern hemisphere during the brief northern summer, and then disperse widely to the south for the rest of the year.

The migratory lifestyle of shorebirds is fascinating but it also presents a major conservation problem: the birds rely on sites at opposite ends of the planet, and some in-between, at different times of the year. To compound this problem, shorebirds commonly use coastal habitats and congregate at a small number of sites. Their conservation thereby often conflicts with human use of such areas. Major impacts are habitat loss and degradation, hunting and other disturbance, and competition for food.

As shorebirds are not constrained by international boundaries, their conservation requires that governments cooperate and coordinate conservation efforts, especially the identification and protection of important sites. The identification of important sites requires information on the numbers of birds at sites and the total size of each shorebird population.

The need for this information in the East Asian – Australasian region was identified in the Asia-Pacific Migratory Shorebird Action Plan (Shorebird Working Group 1997 and 2000), and Wetlands International undertook to implement this component of the Plan. A key element of the East Asian – Australasian Shorebird Action Plan is developing a network of internationally important sites across the Flyway.

This review therefore has two major components:

1. Population estimates for shorebirds in the East Asian – Australasian (EAA) Flyway; and
2. Identification of sites of international importance for migratory shorebirds in the EAA Flyway.

1.1 Definition of the East Asian - Australasian Flyway

'Flyway' is the term used to describe a geographic region that supports a group of populations of migratory waterbirds throughout their annual cycle. Up to nine major flyways for shorebirds are recognised worldwide, each reflecting a grouping of populations that use similar migratory routes.

The concept of flyways provides a useful means to delimit populations, and is therefore a tool for research and conservation. The flyways can be listed according to the layout of the continents as follows (see Figure 1.1):

The Americas:

- Eastern Pacific;
- Central;
- Western Atlantic;

Eurasia to Africa:

- Northern and eastern Atlantic;
- Europe and western Asia to western Africa;
- Central Asia to eastern/southern Africa;

Central/eastern Asia to southern Asia/Australasia:

- Central Asia to southern Asia (Central Asian);
- East Asia to Australasia;
- Russian Far East/Alaska to the Pacific islands (Central Pacific).

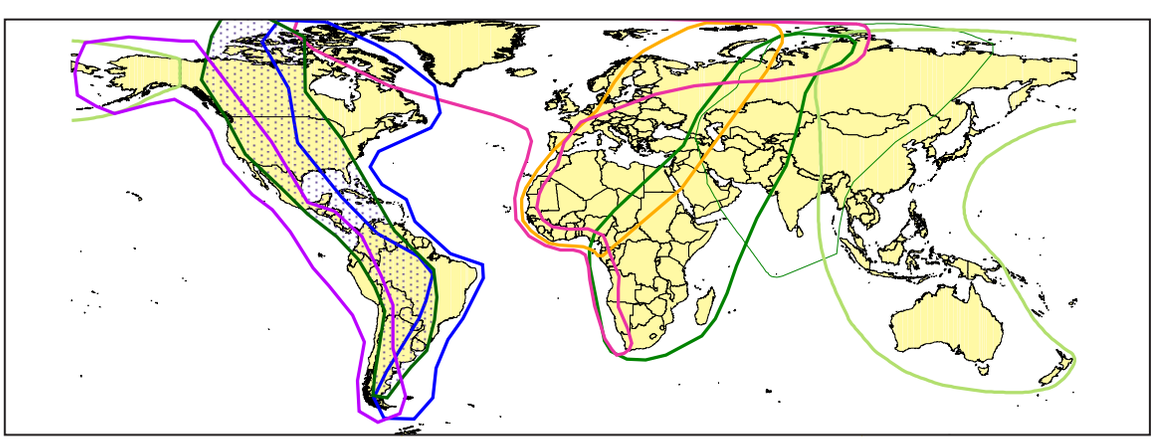

Figure 1.1. Flyways of the World

This review is focused on the East Asian – Australasian Flyway (Figure 1.2). Shorebirds are considered to use the EAA Flyway if their migration takes them through eastern Asia. The Flyway extends from north-eastern Asia and western Alaska to the southern limits of Australia and New Zealand, encompassing eastern Asia as far west as longitude 87°E and thereby including Mongolia, western China and eastern India. The inclusion of parts of India and the Andaman and Nicobar Islands is due to observations and banding recoveries indicating that some shorebirds move along the east coast of Asia and then across to Bangladesh and eastern India.

There is some overlap of flyway boundaries in the eastern and western extremities of the EAA Flyway.

1.2 Countries of the East Asian - Australasian Flyway

Countries that are within the EAA Flyway are listed below. In the case of the United States of America the term 'Alaska' is used in this review because only this State is included in the EAA Flyway. Also shown in the list is the short name used in this review to refer to the country.

- United States of America, State of Alaska (Alaska)
- Russian Federation (Russia)
- Mongolia
- People's Republic of China (China)
- People's Democratic Republic of Korea (North Korea)
- Republic of Korea (South Korea)
- Japan
- Republic of the Philippines (Philippines)
- Socialist Republic of Vietnam (Vietnam)
- Lao People's Democratic Republic (Laos)
- Kingdom of Thailand (Thailand)
- Kingdom of Cambodia (Cambodia)
- Union of Myanmar (Myanmar)
- People's Republic of Bangladesh (Bangladesh)
- Republic of India (India)
- Federation of Malaysia (Malaysia)
- Republic of Singapore (Singapore)
- Negara Brunei Darussalam (Brunei)
- Republic of Indonesia (Indonesia)
- Timor Leste (Timor)
- Independent State of Papua New Guinea (Papua New Guinea)
- Commonwealth of Australia (Australia)
- New Zealand

A number of Pacific Island nations are situated at the eastern margin of the EAA Flyway but, as there was insufficient information on shorebird numbers, they have not been included in the review.

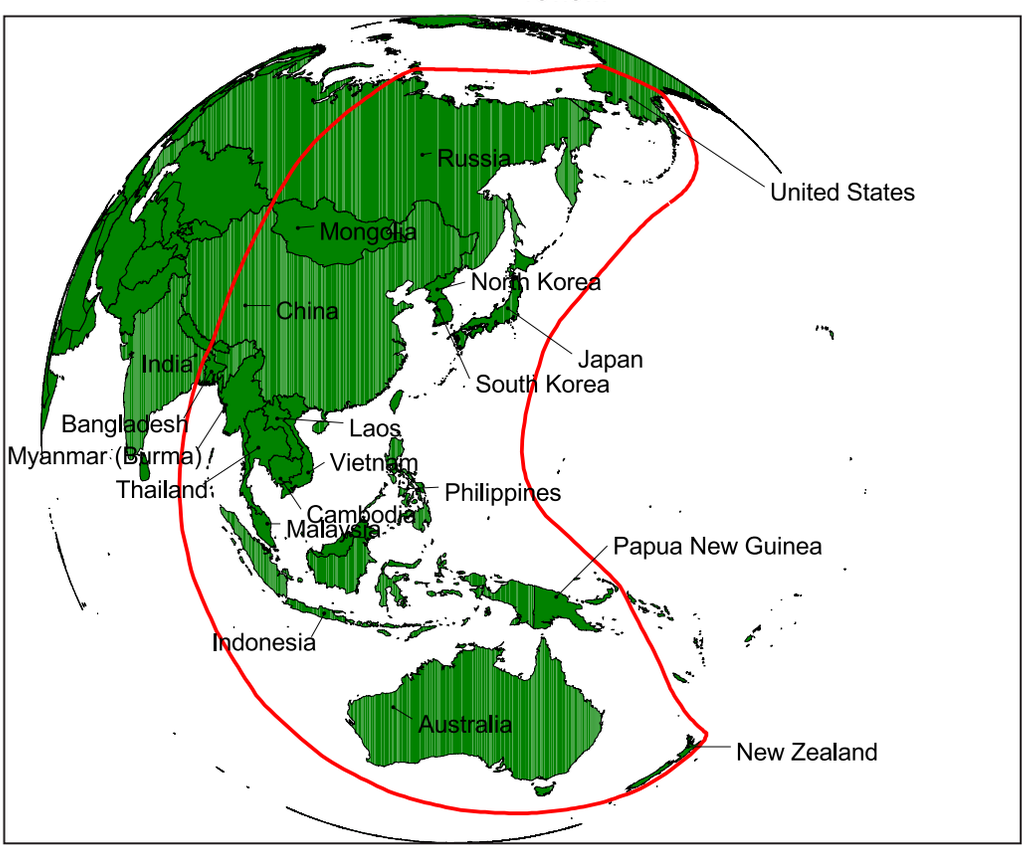

Figure 1.2. East Asian-Australasian Flyway

1.3 Migratory Shorebirds of the East Asian - Australasian Flyway

Shorebirds are members of the Order Charadriiformes. In the EAA Flyway, the families with most species of migratory shorebird are the Scolopacidae (sandpipers and allies) and the Charadriidae (lapwings and plovers).

The majority of shorebird species depend on wetland habitats and undergo annual migrations, typically breeding at high latitudes of the northern hemisphere but migrating south for the non-breeding period. This migration takes some species as far as the temperate latitudes of the southern hemisphere. There are exceptions, as some migratory shorebirds occur in non-wetland environments such as dry grasslands, and a few species have atypical migratory patterns.

Shorebirds are considered to be migratory "if the entire population or any geographically separate part of the population cyclically and predictably crosses one or more national jurisdictional boundaries" (excerpt from the text of the Convention on Migratory Species - http://www.cms.int/).

The shorebird populations recorded in the EAA Flyway, arranged by species and subspecies, are listed in Appendix 1, and those that are migratory are indicated.

Generally, observers are unable to recognise subspecies in the field during shorebird surveys. Estimates are therefore included for only a small number of subspecies where their distributions are sufficiently well-known for counts to be confidently assigned to separate subspecies. Where this approach was applied it has been explained in detail in the species account (e.g. Lesser Sand Plover).

Species were considered to be vagrants in the EAA Flyway when their numbers during the non-breeding period were assessed to be less than 1% of their global abundance (as estimated by Delany and Scott 2002).

This review addresses 54 migratory shorebird species. Six of these species are represented by at least two subspecies in the Flyway.

English and scientific names used in this review generally follow Delany and Scott (2002). Appendix 1 provides alternative English and scientific names.

1.4 The annual cycle in the East Asian - Australasian Flyway

The annual cycle for shorebirds in the Flyway has four periods broadly defined as follows:

- Breeding (B) - May to August;
- Southward migration (SM) - August to November;
- Non-breeding (NB) - December to February;
- Northward migration (NM) - March to May.

The extent of each period is considered to be approximate as migratory patterns vary between species. A few species, such as Australian Pratincole and Double-banded Plover, do not fit this model and where this situation occurs it is discussed in the species account. Terms such as winter, summer, spring and autumn (fall), and over-wintering and over-summering, have been avoided because of the confusion they cause with respect to species that migrate between the northern and southern hemispheres.

1.5 Population and Population Size

Ecologists use the concept of 'population' for conservation management of migratory shorebirds. In this review a population is defined as a group of individuals, within a species, that develops genetic distinctiveness through the consistent use of particular breeding areas and migration routes. It is essential to implement conservation action at the population (rather than at the species) level to maintain biological diversity. Many of the species that use the EAA Flyway have separate populations that occur in other flyways, whereas a few species consist of only one population that is confined to the EAA Flyway.

The sizes of shorebird populations vary seasonally and annually. The size of a population is usually greatest at the end of the breeding period, due to the recruitment of young, and least just prior to the breeding period, at which time mortality has reduced the population size to the annual minimum. Across years, the population of a species can also vary due to differences in breeding success, and this has been recorded for some migratory shorebirds such as the Curlew Sandpiper (Thomas 1970). In this review, population estimates are based largely upon count data from the non-breeding period because the available data set was best for that period. In that period, the size of the population is between the annual maximum and annual minimum and, although it is the annual minimum of a species' population size that is critical to its survival, this was the best approach based on available data.

2. METHODS

2.1 Derivation of Population Estimates

The Convention on Wetlands (Ramsar, Iran, 1971) provides a global mechanism for the recognition of Wetlands of International Importance. The Convention has a number of criteria for identifying important sites, one of which relates to sites supporting 1% of the population of a shorebird. The East Asian – Australasian Shorebird Action Plan adopted this criterion for identifying internationally important sites for migratory shorebirds. To apply the 1% criterion, a population estimate is required in order to calculate the threshold that indicates when the criterion is met.

Population estimates for the EAA Flyway have been derived previously (e.g. Watkins 1993, Delany and Scott 2002). Recent work under the Shorebird Action Plan has generated a considerable volume of new count data, especially from eastern and south-eastern Asia. The present review draws on this expanded information base.

Estimates of population size need to be based on data on shorebird distribution and abundance. In the EAA Flyway, data on breeding densities and distribution are very limited. Surveys during migration periods are problematic to use for estimating population size unless the surveys are comprehensive (e.g. Barter 2002). The most comprehensive distribution and abundance data are from site counts during the non-breeding period (December to February), and it is these data that were used to derive population size estimates in this review.

The steps involved in the derivation of estimates of population size were:

1. Collate count data for the non-breeding period from across the EAA Flyway;
2. Assign data to 'survey regions', being either an entire country or regions within large countries;
3. Identify the maximum count of each population in the non-breeding period in each survey region (Regional Maxima);
4. Sum Regional Maxima within a country and adjust on the basis of the estimated coverage of habitat in surveys in that country (Country Estimate);
5. Sum the Country Estimates to yield an estimate of population size within the EAA Flyway (Flyway Estimate);
6. Adjust the Flyway Estimate by applying a set of rounding rules (see Country and Flyway Population Estimates, below); and
7. For species with inadequate count data to form the basis of a population estimate, assign a population range (see Populations for which Estimates could not be Derived, below).

In Australia, regional estimates were developed from the Regional Maxima and these were then summed to yield the Country Estimate.

Given the data available, two key assumptions were made to enable population estimates to be derived from count information:

- Any movement of shorebirds between survey regions during the non-breeding period is insufficient to influence the estimation process, and,
- Numbers present in each survey region are similar during the non-breeding period each year.

2.1.1 Count data

Ideally, population estimates would be derived from count data collected from extensive field surveys over the entire EAA Flyway, with all data collected simultaneously or at least within a short period of time. With the exception of New Zealand, Japan and some parts of Australia, however, such comprehensive data are not available.

Of necessity this review is therefore based on information from a wide range of published and unpublished sources. All sources of information are listed in the reference section. Published data were peer reviewed. Unpublished data came from systematic surveys conducted by observers under the supervision of reputable ornithological organisations. Such organisations typically provide training to new observers, and their survey programs are led by persons whose capability in counting and identifying shorebirds is widely recognised by peers.

Records from the Asian Waterbird Census database (Wetlands International) provided the core information for countries in Asia. Count data from the Population Monitoring Programme of the Australasian Wader Studies Group (Birds Australia) represented the largest single source of data. It was beyond the scope of this review to systematically vet all records, so identifications and counts were accepted unless conspicuously erroneous. Location information (latitudes and longitudes) was vetted during mapping of important sites in this review.

The review database contains approximately 100 000 records, with each record being a count of a species at a site on a particular date. Cov-

erage varied considerably, being extensive in Australia, Japan and New Zealand, moderately extensive in some regions, such as the Yellow Sea area (Barter 2002), but limited in most other countries. Data were available from the late 1970s, with some records from the 1960s, but only data collected from 1986 onwards were used in analyses. The authors decided that records more than 20 years old might not provide realistic indications of current population sizes.

2.1.2 Deriving Country and Flyway Estimates

In most parts of the Flyway the coverage of sites during the non-breeding period was incomplete. In order to develop Country Estimates, a conservative extrapolation was made based on the level of coverage of sites and the availability of habitat in each country. In Australia, it was possible to make extrapolations at the regional level because of a detailed knowledge on the extent of surveys and of available habitat.

Wherever possible, Regional Maxima and Country Estimates were reviewed by experienced ornithologists with local knowledge of the regions.

In some survey regions, especially those with frequent surveys, it was apparent that there were occasional high counts due either to fluctuations in actual population size, or to events that led to an unusual concentration of birds. This appeared to be particularly the case in Australia, where surveys have been carried out since the early 1980s. In Australia, expert opinion considered that some Regional Maxima were not representative of the size of populations usually present in that survey region during the non-breeding period. As a result, some Regional Estimates are less than the corresponding Regional Maxima.

The sums of the Regional Maxima and Estimates for each country are presented in Section 3.1. For Australia, the data are also presented by survey regions in Appendix 2.

Because Country Estimates ranged in magnitude from a few hundred to hundreds of thousands of birds, a set of rounding rules was applied to the Flyway Estimate of each species so that unrealistically precise estimates were not presented.

These rounding rules were:

Population size	Rounding
<10 000	nearest 500
10 000 – 25 000	nearest 1 000
25 000 – 100 000	nearest 5 000
100 000 – 250 000	nearest 10 000
>250 000	nearest 25 000

2.1.3 Species for which Population Estimates could not be derived

Despite the collation of a large data set, it was not possible to calculate population estimates for 20 of the 54 species assessed. These were species that are typically not sampled adequately during waterbird surveys because they are cryptic, do not form flocks and/or use inland wetlands and other habitats that are poorly surveyed. For these species, no Country Estimates were derived and for the EAA Flyway estimate the population range classes of Delany and Scott (2002) were applied.

The minimum of the range for these populations was used as the basis for the 1% threshold (Section 2.2). This approach differs from that of Delany and Scott (2002) where the maximum range value was used to derive the 1% threshold. Delany and Scott defend their approach by indicating that sites identified as internationally important will continue to meet the threshold, even if subsequent data show that the minimum population estimate is considerably lower.

We argue that shorebird conservation is better achieved by taking a precautionary approach and using the minimum value of the range to derive the 1% threshold.

This ensures that sites of potential international importance are recognised. This promotes appropriate management until such time as data is sufficient to fully assess their international importance. In contrast, if the maximum of the range is used and subsequent analysis generates a population estimate below that maximum, some sites that are internationally important may not have been appropriately managed.

2.2 Identification of Internationally Important Sites

The identification of internationally important sites is an important component of planning for the conservation of migratory shorebirds. It is also essential to the development of the Shorebird Site Network in the EAA Flyway.

Internationally important sites are those that

meet Criterion 6 of the Ramsar Convention, which states that “a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird” (Ramsar Convention Bureau 2000). In the case of a species with a population estimate of >2 000 000 the 1% threshold is set at 20 000 (Ramsar Convention Bureau 2000).

In addition to application of the 1% criterion to individual counts, the Ramsar Convention recognises the importance of sites that are important during migration, when birds move quickly through the site over a matter of only days or weeks. This phenomenon is termed ’turnover‘ and because of this passage of birds, the actual number that depends on a “staging” site is higher than the number present at any one time. To allow for this turnover, ‘staging criteria’ were applied to data collected from the northward and southward migration periods. To meet the staging criterion for a population, a site must have at least one count equal to or greater than 0.25% of the estimated size of the population. Such a count must be from a migration period and the site must be in a location that is used by birds on migration.

The staging criterion was applied conservatively and was not considered applicable in the non-breeding range of a species.

Whereas the population estimates were generated only from data from the non-breeding period, these estimates were applied to data from all four periods of the year for the identification of internationally important sites.

Two further issues need to be addressed in the application of Ramsar Criterion 6: the definition of a site and the meaning of the term “regularly supports”.

2.2.1 Site definition

Defining what constitutes a site was essential for the purpose of this review but was difficult to achieve because of the many sources of information, the lack of a uniform approach to defining sites across all survey efforts and the lack of familiarity of the authors with many of the (numerous) sites.

Some count data came from sites that were discrete and small in area, such as a single sand spit being used by shorebirds when roosting at high tide. Other sites were more complex and, for example, may have consisted of many square kilometres of mudflat where birds were foraging. The site name may have been given as an entire national park or reserve within which the count site(s) was located. There were also records from sites that were close together, such as the opposite sides of a bay, and instances where the same site was given different names by different observers.

The Ramsar Convention recommends that a wetland site should form an ecological unit, and can therefore be (for example) an entire bay, a lake or a network of small wetlands. This guideline was used to group clusters of records under one site name, with the highest single count being used to identify the importance of that site.

Defining ecological units facilitates management planning for the wise use of internationally important wetlands. In some cases protection/management units were already defined in the form of national parks or reserves. Where records from such a protected management unit could not readily be assigned to an ecological unit, the management unit was defined as the site. The most extreme example of this was Yancheng National Nature Reserve in China, which consists of a large expanse of continuous mudflats that cannot be readily divided into ecological units.

2.2.2 Definition of “Regularly Supports”

According to guidelines developed by the Ramsar Convention, for a site to be considered to “regularly support” 1% of a population, the 1% threshold must be achieved in at least two out of three seasons, or must be met by the mean of at least five maximum annual counts. The guidelines imply that this approach should be followed where there is a substantial body of count data. The majority of sites in the EAA Flyway do not have sufficient count data for this purpose. Allowance has been made for sites in remote areas, and it is accepted that “single counts can help establish the relative importance of the site for a species” (Ramsar Convention 2000). Sites in the EAA Flyway were therefore considered to have met the 1% criterion on the basis of a single count.

2.3 Presentation of Results

Results of this review are presented in three sections: an Overview, Species Accounts and Country Accounts.

The Overview section provides summary information on population sizes, important sites and species in the EAA Flyway and has four components:

- A table that summarises count data from the non-breeding period and population estimates for each species in each country. This al-

lows for a comparison to be made between the pooled Regional Maxima count data and the country population estimate derived from them. The table includes the EAA Flyway population estimate and previous estimates.

- A table that summarises information on species in countries of the EAA Flyway. For each country, this table includes the number of species on which non-breeding period data were available, the number of species that were represented by >1% and >5% of their Flyway population estimate, and the distribution of important sites by period (SM, NB, NM and B).
- A table that summarises information on sites in countries of the EAA Flyway. For each country, the total number of important sites is presented, as is the number of sites identified as important in each period (SM, NB, NM and B).
- Observations and conclusions arising from the above summary information.

The Species and Country Accounts refer back to the Overview but provide detailed information on species and countries respectively. Structures of the Species Accounts and Country Accounts are explained in the outline of each section.

3. OVERVIEW

3.1 Shorebirds and the EAA Flyway

The EAA Flyway is one of the world's major flyways for migratory shorebirds. Most species of this flyway pass through eastern Asia on migration, but are drawn from breeding grounds that extend across northern Asia and into North America. Therefore, the breeding range of EAA Flyway birds overlaps with the breeding range of birds that utilise other flyways. In the non-breeding period, birds of the EAA Flyway may occur as far west as the east coast of India, south to Australia and New Zealand, and across to the Western Pacific. There is overlap in the non-breeding extent of the EAA Flyway with the Central Asian Flyway to the west and the Central Pacific Flyway to the east.

This review estimated that a minimum of 8 million shorebirds of 54 species occur in the EAA Flyway, and identified 400 sites of international importance for their populations. The estimated population size of each species is presented in Table 3.1, with pooled count data and estimates (where applicable) for each country. Criteria used for the identification of important sites are included.

Many of the shorebird species in the EAA Flyway are represented by populations in other flyways. These other populations may or may not be genetically distinct. Eleven species, however, are confined to the EAA Flyway, while a further six species are represented by a subspecies endemic to the EAA Flyway.

3.2 Data Limitations on Shorebird Counts

There are a number of limitations to the existing database of shorebird counts for the purpose of estimating population sizes and identifying important sites. These are discussed below.

3.2.1 Shorebird behaviour and habitat

The majority of shorebirds forage on tidal shorelines and roost in flocks during high tide, which facilitates counting. Some species, however, do not normally aggregate even at high tide and these can be overlooked or under-surveyed. There are also many species that utilise non-tidal and often freshwater wetlands, and some that occur mainly on grasslands. Such birds may be dispersed and therefore hard to locate and comprehensively count. Some freshwater species, particularly the snipe and painted-snipe, are also cryptic and favour vegetated wetlands, making them especially hard to observe. As a result of these behavioural and habitat differences, shorebirds that readily flock and utilise tidal environments during the non-breeding period are better represented in count data than species that do not.

3.2.2 Survey coverage of countries

Inevitably, there have been more surveys undertaken in some countries than in others. Japan and New Zealand have been well-surveyed, and Barter (2002) has undertaken and reviewed work in the Yellow Sea. Australia has had considerable survey effort in populated parts of the country, but more remote coastal and inland regions have received less attention. The same pattern has occurred elsewhere, with surveys regularly carried out at known and accessible sites, but many areas, especially away from the coast, being under-represented. This review has identified Mongolia, North Korea, inland China and some tropical coastal areas (parts of Indonesia, Papua New Guinea and Australia) as being especially under-represented in surveys.

3.2.3 Survey coverage of habitats

Species of freshwater wetlands and grasslands may not only be difficult to count, but occur in habitats that may be difficult to access. For example, massive distances are involved in just getting to inland wetlands of Australia and China, whereas coastal wetlands are often accessible. Some coastal environments, particularly mangroves, are an exception to this, as birds may roost in trees or in small, tidal creeks where they cannot be seen.

3.2.4 Shorebird identification

Even among shorebirds that roost in flocks on tidal coastlines, there can be difficulties with species that occur in small numbers in mixed flocks, as these may be under-surveyed, and there can be difficulties with identification. The Lesser and Greater Sand Plovers can be difficult to distinguish in the field, and M. Barter (pers. comm.) considers this may account for the low numbers of Greater Sand Plover recorded in the Yellow Sea. Separation of different populations (within the same species) in the field is rarely possible, while the recognition of regional populations with distinct migration patterns can only be achieved through a comprehensive flagging programme. This has begun in several countries and may eventually allow for the development of an understanding of migratory pathways followed by species, subspecies and populations within the EAA Flyway.

Table 3.1 Population Estimates for Migratory Shorebirds in the East Asian - Australasian Flyway

Species	Max. Count	Sum Country Estimates	Flyway Estimate	1%	Staging
Common Snipe	NA	NA	100 000-1 000 000	1 000	250
Japanese Snipe	NA	NA	36 000	360	90
Swinhoe's Snipe	NA	NA	25 000-100 000	250	63
Solitary Snipe	NA	NA	10 000-100 000	100	25
Pintail Snipe	NA	NA	25 000-1 000 000	250	63
Eurasian Woodcock	NA	NA	25 000-1 000 000	250	63
Black-tailed Godwit	158 720	162 750	160 000	1 600	400
Bar-tailed Godwit	321 580	326 450	325 000	3 250	813
Little Curlew	180 970	180 950	180 000	1 800	450
Whimbrel	54 270	NA	100 000	1 000	250
Eurasian Curlew	33 200	39 550	40 000	400	100
Far Eastern Curlew	38 880	37 800	38 000	380	95
Spotted Redshank	NA	NA	25 000-100 000	250	63
Common Redshank	64 360	72 750	75 000	750	188
Marsh Sandpiper	NA	NA	100 000-1 000 000	1 000	250
Common Greenshank	57 120	58 700	60 000	600	150
Spotted Greenshank	NA	NA	1 000	10	3
Green Sandpiper	NA	NA	25 000-100 000	250	63
Wood Sandpiper	NA	NA	100 000-1 000 000	1 000	250
Terek Sandpiper	52 660	58 050	60 000	600	150
Common Sandpiper	NA	NA	25 000-100 000	250	63
Grey-tailed Tattler	43 720	48 900	50 000	500	125
Ruddy Turnstone	31 210	35 050	35 000	350	88
Asian Dowitcher	23 280	23 610	24 000	240	60
Great Knot	379 125	379 350	375 000	3 750	938
Red Knot	218 960	219 450	220 000	2 200	550
Sanderling	21 420	21 550	22 000	220	55
Red-necked Stint	309 100	318 500	325 000	3 250	813
Long-toed Stint	24 200	25 600	25 000	250	63
Temminck's Stint	NA	NA	25 000 - 100 000	250	63
Sharp-tailed Sandpiper	155 420	154 500	160 000	1 600	400
Dunlin	NA	NA	950 000-2 750 000	9 500	2 375
Curlew Sandpiper	178 750	175 700	180 000	1 800	450
Spoon-billed Sandpiper	NA	NA	<3 000	30	7
Broad-billed Sandpiper	25 130	25 100	25 000	250	63
Red-necked Phalarope	NA	NA	100 000-1 000 000	1 000	250

Table 3.1 (cont.) Population Estimates for Migratory Shorebirds in the East Asian - Australasian Flyway

Species	Max. Count	Sum Country Estimates	Flyway Estimate	1%	Staging
Asian Painted-snipe	NA	NA	10 000-100 000	100	25
Pheasant-tailed Jacana	NA	NA	25 000-100 000	250	63
Eurasian Oystercatcher	NA	NA	10 000	100	25
Black-winged Stilt	NA	NA	25 000-100 000	250	63
Pied Avocet	NA	NA	25 000-100 000	250	63
Pacific Golden Plover	NA	NA	100 000-1 000 000	1 000	250
Grey Plover	NA	NA	125 000	1 250	313
Little Ringed Plover	24 200	24 600	25 000	250	63
Kentish Plover	96 910	NA	110 000	1 100	275
Double-banded Plover	NA	NA	50 000	500	125
Lesser Sand Plover	130 560	143 950	140 000	1 400	350
Greater Sand Plover	103 420	109 400	110 000	1 100	275
Long-billed Plover	2 510	NA	<10 000	100	25
Oriental Plover	70 100	70 100	70 000	700	175
Grey-headed Lapwing	NA	NA	25 000-100 000	250	63
Northern Lapwing	NA	NA	100 000-1 000 000	1 000	250
Oriental Pratincole	73 030	2 883 000	2 880 000	20 000	5 000
Australian Pratincole	60 300	60 300	60 000	600	150

Notes: **Max. Count** - sum of Regional Maxima

Sum Country Estimates - sum of national population estimates

Flyway Estimate - rounded Estimate or estimate range for the Flyway

1% - the numerical criterion applied to the Flyway population estimate of the species to identify sites of international importance

Staging - the numerical criterion used to identify sites of international importance during migration.

20 000 - if the population estimate is greater than 200 000 the 1% criterion is set at 20 000

3.2.5 Survey coverage of seasonal periods

The above limitations can hinder the estimation of population sizes and the documentation of important sites. A further limitation is the time of year in which surveys are undertaken. Surveys are often carried out in the non-breeding period and data from this time of year were used for the calculation of population estimates. This means that sites important at other times of the year may have been overlooked. These sites could be significant for species that are dispersed during the non-breeding period but aggregate during migration. Few counts are carried out during the breeding period when most shorebirds are expected to be dispersed across breeding sites, but important sites have been identified in Australia and New Zealand at this time of the year. These counts were presumably aggregations of immature and other non-breeding birds, but identification of sites used by this cohort of a species' population is important. Chatto (2003) found an increase in the abundance of some shorebird species in northern Australia during the breeding period.

3.2.6 Flyway overlap

The identification of important sites in Alaska is difficult because they may be used by shorebirds of both the EAA Flyway and one of the American flyways. Similarly, some species in countries such as Bangladesh may be represented by both EAA and CA populations. As noted above, the recognition of distinct flyway populations in regions of overlap can only be achieved through a colour flagging programme, especially if this is based on the breeding grounds.

3.3 Shorebird Species Population Estimates

3.3.1 Abundance

Population estimates were calculated for 34 of the 54 species included in this review, with population ranges for the remaining 20 species. These were data-deficient species because they were under-sampled due to behaviour or habitat (see Data Limitations). The most abundant species were the Dunlin (a minimum of 950 000) and the Oriental Pratincole (2.88 million), while the least abundant species were the Endangered Spotted Greenshank (1 000) and the Vulnerable Spoon-billed Sandpiper (<3 000). Two other species in the EAA Flyway, the Far Eastern Curlew and Asian Dowitcher, are listed as Near Threatened (Birdlife International 2001).

3.3.2 Distribution

Summed count data and Country Estimates (of those species for which these could be calculated) illustrate where species occur during the non-breeding period (Table 3.2). There is considerable variation in the distribution of species, but there are some common patterns.

During the non-breeding period shorebird concentrations are mainly in:

- Australasia, e.g. Red-necked Stint;
- South-eastern Asia, e.g. Asian Dowitcher, Long-toed Stint;
- Myanmar/Bangladesh/India, e.g. Spoon-billed Sandpiper, Spotted Greenshank, Pheasant-tailed Jacana and Grey-headed Lapwing;
- Inland Asia, e.g. Dunlin, Spotted Redshank.
- Coastal eastern Asia, e.g. Kentish Plover, Eurasian Oystercatcher.

Not all species fit into these classes with some overlapping, such as between Australasia and south-eastern Asia. The Sanderling and Ruddy Turnstone occupy temperate areas in both the northern and southern hemisphere during the non-breeding period, with low numbers and few important sites in the tropics in this period. Distinct populations may be involved.

Countries around the Bay of Bengal (Myanmar, Bangladesh and India) are in the overlap zone between the EAA and the Central Asian Flyways. They are of special interest as they are within the main non-breeding range of several species that have small populations and are endemic to the EAA Flyway. Species that utilise the Bay of Bengal region, and those of inland and coastal eastern Asia, remain within the northern hemisphere during the non-breeding period.

3.3.3 Changes and trends

Population estimates for shorebirds in the EAA Flyway have been calculated previously (Watkins 1993, Rose and Scott 1997, Delany and Scott 2002), making it possible to examine trends in estimates. These trends may reflect real patterns in the size of populations, or may be the result of improved information.

The populations of many species do appear to be stable, while for other species improved information has allowed for an upward revision of the population estimate. Such species include the Far Eastern Curlew, Eurasian Curlew, Asian Dowitcher and Oriental Pratincole.

Lack of adequate data in the past and currently makes it difficult to determine if lower estimates are due entirely to improved information. For

some species, however, there is reason to believe that their population is declining. This includes the Spoon-billed Sandpiper, already listed as Vulnerable, and the Curlew Sandpiper and Red-necked Stint. Declines of these latter two species may be part of a long-term cycle (Minton *et al.* 2005). Declining and even apparently stable numbers for species with low population numbers are a concern.

In a few cases, species are undergoing local changes in distribution and abundance. The Far Eastern Curlew has declined in abundance in parts of southern Australia (Higgins and Davies 1996), while the Black-winged Stilt has expanded into Taiwan and the Red Knot has increased in abundance on migration through Mai Po.

3.4 Internationally Important Sites

3.4.1 Distribution of important sites across the Flyway

The distribution of the 400 important sites across the 23 countries that make up the EAA Flyway is summarised in Table 3.3. The number of important sites in each country is a function of coverage as well as the size and location of the country, availability of habitat and abundance of migratory shorebirds. This is well illustrated with Japan, a small country compared with some others in the EAA Flyway, but with a large number of sites. Japan does support large numbers of shorebirds, especially during migration periods, but it is also well-surveyed. Apart from Japan, countries with many important sites are Australia, China, South Korea, Philippines, Malaysia and Indonesia. There are undoubtedly more sites to be identified in all countries, but countries where the identification of sites is particularly deficient are Mongolia, North Korea, Papua New Guinea, Cambodia and Laos. There are also likely to be further important sites identified in inland Asia and inland Australia, particularly during migration periods.

Table 3.3 also examines the distribution of important sites in each country by period. For example, in Australia there are 35 sites recognized as important during southward migration but only 21 during northward migration, while 18 are important during the breeding period and 95 during the non-breeding period. The number of sites recognized in each country in each period contributes to an understanding of migratory patterns in the EAA Flyway. This information is discussed below and in the country accounts.

3.4.2 Breeding Period

Regions used for breeding by migratory shorebirds that occur in the EAA Flyway are moderately well known and include large areas of Arctic and Sub-Arctic Russia and Alaska, and areas within China, the Korean peninsula and Japan. Outside these main northern breeding areas for migratory shorebirds, there are species that also breed further south, such as in Taiwan (Black-winged Stilt) and the Philippines (Pheasant-tailed Jacana). Two species breed only in the southern hemisphere: Australian Pratincole on grasslands of northern Australia and Double-banded Plover in New Zealand.

Few important breeding sites were identified during the breeding period because most species are dispersed when breeding. This dispersal means that conservation on a landscape scale is required and the identification of individual sites is not an appropriate measure.

Not all birds return to the breeding grounds during the breeding period. Many young birds remain in the non-breeding areas – perhaps undertaking a partial migration to preferred habitat. Within the breeding period but outside the breeding range of the shorebirds, important sites were identified in several countries, particularly Australia and New Zealand. These were sites that supported important numbers of non-breeding birds, including immature specimens. In parts of northern Australia, there is an increase in the abundance of some species during the breeding period (Chatto 2003), due to the partial migration of non-breeding birds from southern Australia. The identification of important sites that are used during the breeding period by non-breeding birds is crucial, as these birds are often the future recruits into the breeding population. There appeared to be very little breeding period data from much of the Flyway and therefore, it is likely that sites important for non-breeding birds during the breeding period are under-represented.

3.4.3 Southward and Northward Migration

Some species of migratory shorebirds follow the same route on southward and northward migration, but in many species there are differences in the usage of important sites between these two periods. As a result, there are differences in the distribution of important sites during southward and northward migration (Table 3.3), and the number of species with important sites in different countries (Table 3.4).

Across the Flyway, shorebird numbers are concentrated during southward migration in the far

Table 3.3: Distribution of known internationally important sites for migratory shorebirds within the EAA Flyway (by country), and the number recognized as important in that country within each period.

Country	# Sites	%	SM	NB	NM	B
Australia	119	29.8	35	94	20	17
Japan	89	22.3	48	4	77	
China	51	12.8	8	34	24	1
Russia	25	6.3	19		11	
South Korea	24	6.0	18	4	18	
New Zealand	14	3.5		14	1	2
Malaysia	13	3.3	5	11	2	
Bangladesh	12	3.0		11	1	
Thailand	9	2.3	1	8	3	
Indonesia	8	2.0	3	7	2	
Philippines	8	2.0		6	3	
Myanmar	6	1.5		6		
USA	6	1.5	6			
Vietnam	6	1.5	1	2	5	
Papua New Guinea	3	0.8	1	2	1	
Brunei	2	0.5	2			
Cambodia	1	0.3		1		
India	1	0.3		1		
North Korea	1	0.3			1	
Singapore	1	0.3			1	
Timor Leste	1	0.3		1		
Mongolia	0					
Laos	0					
Totals	**400**	**100**	**147**	**207**	**170**	**20**

north, such as some Russian sites, and the far south, including Indonesia and northern Australia. In contrast, numbers appear concentrated during northward migration in eastern and parts of south-eastern Asia (China, Japan, Philippines and Vietnam). This suggests that there are some common underlying differences between southward and northward migration in the EAA Flyway. Understanding such general patterns can be important for the identification of regions where data may be deficient. However, it needs to be recognised that what appear to be patterns can be the result of biases in existing datasets.

In Russia, more sites are recognized as important during southward than northward migration (Table 3.3), but more species are reported in important numbers during northward migration (Table 3.4). This pattern may be related to the availability of sites, with many sites icebound during northward migration, thus concentrating birds on fewer sites. On southward migration, a number of species are believed to fly direct from coastal Russian sites around the Sea of Okhotsk to non-breeding areas in south-eastern Asia and Australia.

On northward migration there is greater use of the Yellow Sea area of China and the Korean Peninsula, Japan, the Philippines and parts of south-eastern Asia. The concentration of birds in the Yellow Sea area in this period is especially significant, as for some species up to 90% of their EAA Flyway population passes through this region (Barter 2002). On northward migration the Yellow Sea may be the final staging point before flights to the breeding grounds, so the birds are putting on condition and waiting for suitable weather conditions before completing their migration. When they arrive on the breeding grounds, they need sufficient reserves to begin breeding and they may arrive before foraging areas at the breeding grounds have thawed out.

Northern Australia and possibly Indonesia are more important on southward than northward migration, due largely to the species that fly direct from Russia. On northward migration, however, many species depart from southern Australia and overfly the north of the country. Slightly higher usage of sites in parts of south-eastern Asia during northward than southward migration may be related to this. Within south-eastern Asia, there are some subtle seasonal differences, such as only southward migration of several species through Borneo. In Thailand, Pattani Bay is important mainly during southward migration, whereas the Bight of Bangkok is important only in the non-breeding and northward migration periods.

Species that undertake long, direct flights tend to have few important sites on migration. In contrast, a number of species disperse widely through eastern and south-eastern Asia and their important sites are scattered. Some of these species may make use of inland sites, particularly in China or Mongolia, but records are inadequate from this region. Other species are reported to migrate on a broad front so tend not to aggregate in significant numbers at particular sites.

3.4.4 Non-Breeding Period

The distribution of shorebird species in the EAA Flyway during the non-breeding period varies. Four broad distribution classes were recognised: Australasia, south-eastern Asia, Myanmar/Bangladesh/India and inland China. Therefore, the distribution of important sites in the non-breeding period can be expected to reflect these groupings. A large proportion (87%) of sites identified as important in the non-breeding period are in Australia (Table 3.3), but there are important non-breeding period sites throughout Asia, overlapping with the breeding range of some species.

3.5 Concentrations of Internationally Important Sites in the EAA Flyway

3.5.1 Key Areas

A small number of sites in the Flyway have been identified as supporting especially high concentrations or support a high number of species of shorebirds, either on migration and/or during the non-breeding period. These sites or clusters help to identify which locations in the Flyway shorebirds will mostly depend on to maintain populations. There are 9 major regions in the Flyway which support 15 or more species in internationally important numbers, and some of these also support a large proportion of the flyway population of at least one species:

Daursky Nature Reserve (Russia). Important for 30 species, making this the most significant site in Russia. It is used mainly during northward migration and probably supports birds from both the EAA and Central Asian Flyways. Habitat that extends from the Daursky Nature Reserve into Mongolia has not been surveyed.

Moroshechnaya River Estuary (Russia). It is estimated that one million shorebirds pass through this site on southward migration, with about 300 000 on northward migration (Gerasimov and Gerasimov 1997). The area is important for at least 17 species.

Yellow Sea area (China, North Korea, South Korea). It is estimated that two million shorebirds pass through this region on northward migration, with about half that number on southward migration (Barter 2002). The region supports >90% of the EAA population of 6 species, and >30% of the EAA population of 18 species (Barter 2002). Sites within the area are important for almost 50 species on migration, and are important for breeding by 5 species.

Southern Honshu (Japan). Approximately half the important sites in Japan are on southern Honshu and adjacent islands and are utilised more on northward than southward migration. The region contains sites that are important for 22 species.

Manila Bay (Philippines). Important for 15 species during the non-breeding and northward migration periods.

West coast of Malaya (Malaysia). Sites important for at least 16 species occur on this coastline and are recognised during both migration periods and the non-breeding period.

South-eastern Sumatra (Indonesia). This region contains Banyuasin Delta and nearby coastline and is important mainly during southward migration for 15 species.

Roebuck Bay/80 Mile Beach (Australia). One of the most important areas in the EAA Flyway, with a single count on the 80 Mile Beach of

336 000 shorebirds and on Roebuck Bay of 170 900 (Australian Nature Conservation Agency 1996). Used more heavily during southward than northward migration, and with many birds staying through the non-breeding period. Numbers of some species remain high during the breeding period (Australian Nature Conservation Agency 1996). Important for 18 shorebird species.

South-eastern Gulf of Carpentaria (Australia). Important mainly during southward migration for 16 species, many of which disperse to south-eastern Australia and New Zealand.

3.5.2 Other areas

There are 4 areas in the Flyway that support a large proportion of the Flyway population of particular species, or 5-14 species in internationally important numbers:

Northern Gulf of Thailand (Thailand). This region is recognised as one of the most important for waterbirds in Thailand (Round 2002), and is important for 14 species in either the non-breeding period or during northward migration.

Moreton Bay/Great Sandy Strait (Australia). Important throughout the year for at least some species and important for 10 species overall.

Southern Victoria and Eyre Peninsula/Spencer Gulf (Australia). These two regions contain major non-breeding concentrations of species that use southern Australia such as Curlew Sandpiper and Red-necked Stint.

North Island (New Zealand). Although important for few species, this area supports almost the entire population of one race of the Bar-tailed Godwit (*L. l. anadyrensis*) and a third of the Flyway's Red Knots during the non-breeding period.

3.6 Implications of this Review

3.6.1 Implications for Conservation

The updated Flyway population estimates and lists of important sites presented here enable some interpretation to identify key areas in which to focus protection and wise use of habitat for migratory shorebirds. This knowledge can thus provide a basis for directing coordinated international conservation actions. Whilst this document can help to determine priorities for shorebird conservation in the EAA Flyway, the available data to identify important sites in the Flyway are still incomplete and require ongoing updating and review. Key implications for conservation to come from this review are:

The list of internationally important sites identified can help toward developing Networks of Important Sites in the East Asian - Australasian Flyway. These networks form a basis for implementing internationally coordinated conservation efforts to help conserve the ecological network of wetlands that migrating birds need to survive. Staging sites form a large component of these internationally important sites. Whilst shorebirds may use staging sites more intermittently than breeding or non-breeding sites, the staging sites are extremely important for successful migration. A large number of staging sites are in Asia where impacts and threats are highest and often require more urgent conservation effort:

- Areas and countries with least information are often areas where shorebird field skills and general education and awareness are also needed.
- Significant data limitations still exist for this Flyway, pointing out the priority need for more information on particular species, habitats, regions or periods
- The boundaries of sites are often poorly-defined in the available information. For site conservation, improved recognition of site boundaries is imperative.

3.6.2 Threats and Threatened Species

Threats to shorebirds are well-documented but difficult to manage. Direct loss of habitat due to land reclamation is a major concern in parts of Asia. The effects of altered sediment flows and accumulation due to dam construction in major river systems, such as the Three Rivers Dam in China (Barter 2002), are largely unknown and unpredictable. Predicted slight rises in sea level due to the Greenhouse Effect could result in the loss of large areas of tidal flats, especially where the coastline is developed and therefore the tidal habitat cannot move inland.

Disturbance of shorebirds can take place even in conservation areas and is emerging as a major conservation issue. It often results from recreational activities such as fishing, walking, wind-surfing and kite-surfing (Paton *et al.* 2000). Shorebirds may have limited foraging opportunities during low tide periods, and disturbance can prevent them from foraging effectively. Disturbance can also affect roosting birds and cause them to waste energy required for migration.

Shorebirds are sensitive to loss of habitat and disturbance because they rely on small areas and often few sites, especially during migration. Their use of sites in different countries makes management of threats particularly difficult.

Species most sensitive are those in which the entire population relies on few sites and undertakes extremely long flights between these, such as the Red Knot. Such species require maximum fuel loads before undertaking long flights, and may arrive with very low body weights, and therefore need to forage efficiently to recover condition.

Despite threats and the loss of large areas of habitat in recent decades, shorebird numbers remain high. Only two species in the EAA flyway are listed as Threatened (Birdlife International 2001): the Spotted Greenshank (Endangered) and the Spoon-billed Sandpiper (Vulnerable). Both species have critically low populations and both rely on countries in the west of the Flyway, such as India and Bangladesh, during the non-breeding period. It is not known if impacts in their non-breeding range have contributed to their threatened status. The Far Eastern Curlew and Asian Dowitcher are listed as Near Threatened, but have larger populations than several other species in the Flyway, including the Eurasian Oystercatcher, Long-billed Plover and Grey-headed Lapwing.

Few species appear to be declining in population size, but many species do have what may be naturally small populations. There are also many species for which population estimates are imprecise.

3.6.3 Improved estimates and knowledge of sites

This review has identified 400 internationally important sites and has provided population estimates, or population ranges, for 54 shorebird species of the EAA Flyway. Management for the conservation of shorebirds in the Flyway requires this baseline information, but a major finding of the review is that there are deficiencies in information that need to be addressed. Many species are data-deficient and therefore only very broad population ranges could be proposed, while even for species with sufficient data to propose an estimate, there is some uncertainty. It is difficult to be confident about population trends when, for many species, estimates have risen simply because more data are available. There is also uncertainty due to inadequate coverage in many countries and some habitats, and due to lack of data in some periods.

The representation of species at sites identified as internationally important provides a measure of the potential to protect migratory shorebirds in the EAA Flyway (Table 3.5). For example, in any one period, a substantial proportion of a species' population should be in known important sites if the identification of those sites is adequate for conservation of that species.

This question was examined for the non-breeding period using the sum of highest counts at important sites for comparison with population estimates. Species were grouped according to the proportion of their population recorded in identified important sites during the non-breeding period.

Almost two thirds of the species are poorly represented in important sites, with <33% of their estimated population recorded (Table 3.5).

Many of these species are known to disperse across inland wetlands and therefore may not

Table 3.4. The number of species with internationally important sites in each country of the EAA Flyway and within that country in each period.

Country	Number of species with important sites	Number of species with important sites - each period			
		SM	NB	NM	B
Alaska (USA)	4	4			
Russia	41	24		40	
Mongolia	0				
Japan	20	15	3	17	
North Korea	1			1	
South Korea	22	20	2	21	
China	47	34	24	37	1
Philippines	15		12	8	
Cambodia	2		2		
Laos	0				
Vietnam	12	1	4	8	
Myanmar	13		13		
Bangladesh	7		7	1	
India	1		1		
Thailand	18	4	17	6	
Malaysia	20	10	15	7	
Brunei	3	3			
Singapore	1			1	
Indonesia	17	11	12	6	
Timor Leste	1	1			1
PNG	6	2	2	3	
Australia	27	20	27	14	10
New Zealand	4		4	1	2

aggregate sufficiently for important sites to be identified. The conservation of these species will require broad habitat management as opposed to an important site approach.

For other species, however, it is more likely that data are inadequate and that important sits have not been documented. There were 15 species which can be expected to aggregate in the non-breeding period but which are under-represented on important sites.

This analysis indicates that for at least 28% of the shorebird species of the EAA Flyway, a substantial proportion of important sites in the non-breeding period have not been identified.

A major conclusion of this review therefore is that much more information is needed on the distribution and abundance of a number of shorebird populations in the EAA Flyway.

Table 3.5. Representation of the populations in internationally important sites during the non-breeding season.

<33% of the population	33 - 66% of the population	>66% of the population
Common Greenshank (31%)	Far Eastern Curlew (65%)	Little Curlew (156%)
Sanderling (31%)	Oriental Plover (59%)	Sharp-tailed Sandpiper (137%)
Eurasian Curlew (29%)	Kentish Plover (57%)	Australian Pratincole (129%)
Pintail Snipe (28%)	Ruddy Turnstone (55%)	Oriental Pratincole (103%)
Little Ringed Plover (27%)	Grey-tailed Tattler (43%)	Spotted Redshank (98%)
Eurasian Oystercatcher (23%)	Broad-billed Sandpiper (40%)	Red-necked Stint (94%)
Greater Sand Plover (23%)	Double-banded Plover (39%)	Curlew Sandpiper (87%)
Northern Lapwing (22%)	Spotted Greenshank (39%)	Pied Avocet (83%)
Whimbrel (21%)	Black-tailed Godwit (37%)	Lesser Sand Plover (79%)
Black-winged Stilt (19%)	Common Redshank (36%)	Bar-tailed Godwit (74%)
Marsh Sandpiper (17%)	Terek Sandpiper (35%)	Red Knot (66%)
Asian Dowitcher (14%)		
Great Knot (12%)		
Long-toed Stint (12%)		
Common Sandpiper (11%)		
Spoon-billed Sandpiper (11%)		
Pacific Golden Plover (10%)		
Grey-headed Lapwing (10%)		
Common Snipe (8%)		
Asian Painted-snipe (7%)		
Pheasant-tailed Jacana (7%)		
Green Sandpiper (4%)		
Temminck's Stint (4%)		
Long-billed Plover (4%)		
Grey Plover (3%)		
Solitary Snipe (3%)		
Dunlin (3%)		
Eurasian Woodcock (2%)		
Japanese Snipe (1%)		
Wood Sandpiper (1%)		

Table 3.2a. Summary of Country Count data and Population Estimates for the non-breeding period (China, North Korea, South Korea and Japan)

Country	China		North Korea		South Korea		Japan	
Species	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Common Snipe	9 892				8		449	
Swinhoe's Snipe	269							
Solitary Snipe	200							
Pintail Snipe	6 390							
Eurasian Woodcock	758						12	
Black-tailed Godwit	4 344	10 050					35	
Bar-tailed Godwit	3 036	5 050			2		293	300
Little Curlew	1 856	1 550					3	
Whimbrel	2 548				232		806	
Eurasian Curlew	13 725	19 700		250	3 545	4 000	851	1 000
Far Eastern Curlew	1 022	2 050			33		233	300
Spotted Redshank	17 323				2		11	
Common Redshank	7 791	20 150					44	100
Marsh Sandpiper	10 582						7	
Common Greenshank	6 306	20 700			9		522	600
Spotted Greenshank	36						1	
Green Sandpiper	1 782						53	
Wood Sandpiper	962						50	
Terek Sandpiper	297	1 050					757	1 000
Common Sandpiper	2 544				1		354	
Grey-tailed Tattler	219	300					151	200
Ruddy Turnstone	3 029	4 500					666	700
Asian Dowitcher	217	510						
Great Knot	7 300	10 050					180	200
Red Knot	6 075	10 050						
Sanderling	1 890	3 100	120	200	33	150	2 495	2 500
Red-necked Stint	4 541	12 000			10		1 308	1 500
Long-toed Stint	3 170	11 000					73	100
Temminck's Stint	2 163						10	
Sharp-tailed Sandpiper	1 235	4 100					8	
Dunlin	98 133		25		12 047		40 909	
Curlew Sandpiper	1 761	15 350					23	
Spoon-billed Sandpiper	42						46	
Broad-billed Sandpiper	1 352	2 100					2	
Red-necked Phalarope	34						17	
Asian Painted-snipe	847						11	
Pheasant-tailed Jacana	26							
Eurasian Oystercatcher	325				3 425		24	
Black-winged Stilt	3 479						228	
Pied Avocet	14 496						1	
Pacific Golden Plover	4 253				9		991	
Grey Plover	5 332				5 450		3 543	
Little Ringed Plover	2 276	4 500					403	500
Kentish Plover	75 405				227		7 472	
Lesser Sand Plover	4 596	8 550			30		1 113	1 000
Greater Sand Plover	1 912	3 000					253	300
Long-billed Plover	39						51	
Grey-headed Lapwing	1 503						318	
Northern Lapwing	28 327				359		1 038	
Oriental Pratincole	88	110					2	

Table 3.2b. Summary of Country Count data and Population Estimates for the non-breeding period (Philippines, Vietnam, Cambodia and Laos)

Country	Philippines		Vietnam		Cambodia		Laos	
Species	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Common Snipe	411		26		2		55	
Pintail Snipe			3					
Black-tailed Godwit	595	1 000	4 450	5 000	3			100
Bar-tailed Godwit	701	2 000	1	100	252	1 500		
Little Curlew	82	100						
Whimbrel	1 603		2		97			
Eurasian Curlew	256	300	330	400	40			
Far Eastern Curlew	127	150						
Spotted Redshank	254		1 605				51	
Common Redshank	3 056	3 500	964	2 000	90	1 000	2	
Marsh Sandpiper	3 108		393		6			
Common Greenshank	2 781	3 000	482	1 000	241	500	7	
Spotted Greenshank	6		3		13			
Green Sandpiper	186		28		5		54	
Wood Sandpiper	368		160		10		160	
Terek Sandpiper	740	1 000	103	150	65	150		
Common Sandpiper	2 332		8		10		40	
Grey-tailed Tattler	1 149	1 500						
Ruddy Turnstone	360	400			3			
Asian Dowitcher	214	300	2		12			
Great Knot	2 267	2 500	57	100				
Red Knot	153	500						
Sanderling	94	200	21					
Red-necked Stint	7 747	12 000	759	2 000	6			
Long-toed Stint	8	100	12	500		100		100
Temminck's Stint	79							
Sharp-tailed Sandpiper	58	100						
Dunlin	119		650					
Curlew Sandpiper	3 392	5 000	831	2 000	84	500		
Spoon-billed Sandpiper			1					
Broad-billed Sandpiper			43	500	400	500		
Asian Painted-snipe	68		1				1	
Pheasant-tailed Jacana	406				280			
Black-winged Stilt	748		174		98			
Pied Avocet	9							
Pacific Golden Plover	4 381		70		13			
Grey Plover	2 941		164		51			
Little Ringed Plover	1 471	4 000	36	500	4		26	300
Kentish Plover	6 879		1 211		4			
Lesser Sand Plover	5 496	7 000	212	5 000	222	1 500		
Greater Sand Plover	4 615	5 000	670	1 000	254	1 000		
Long-billed Plover	41							
Oriental Plover	53	100						

Table 3.2b (cont.) Summary of Country Count data and Population Estimates for the non-breeding period (Philippines, Vietnam, Cambodia and Laos)

Country	Philippines		Vietnam		Cambodia		Laos	
Species	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Grey-headed Lapwing	9		8		130		67	
Northern Lapwing	6							
Oriental Pratincole	1 380	1 500	37					

Table 3.2c: Summary of Country Count data and Population Estimates for the non-breeding period (Thailand, Myanmar, Bangladesh and India)

Country	Thailand		Myanmar		Bangladesh		India	
Species	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Common Snipe	675		178					
Solitary Snipe					175			
Pintail Snipe	351		13					
Black-tailed Godwit	1 857	2 000	1 284	5 000				
Bar-tailed Godwit	753	1 500	241	1 000				
Little Curlew	1		80	100				
Whimbrel	748		1 472					
Eurasian Curlew	324	400	13	500				
Far Eastern Curlew	1		193					
Spotted Redshank	1 645		65					
Common Redshank	2 997	3 000	1 983	10 000				
Marsh Sandpiper	2 545		48					
Common Greenshank	2 030	4 000	747	2 500				
Spotted Greenshank	26		24		200		7	
Green Sandpiper	1		4					
Wood Sandpiper	3 424		359					
Terek Sandpiper	313	1 000	211	500				
Common Sandpiper	337		599					
Grey-tailed Tattler	6		310	100				
Ruddy Turnstone	193	200	140	250				
Asian Dowitcher	601	600	8	100	15		137	150
Great Knot	454	500	9					
Red Knot	106	200	74	100	70	100		
Sanderling	14	100	56	100				
Red-necked Stint	2 670	4 000	281	500				
Long-toed Stint	1 167	5 000	394	1 000				
Temminck's Stint	434		115					
Sharp-tailed Sandpiper	2							
Dunlin	6							
Curlew Sandpiper	2 948	4 000	4	100				
Spoon-billed Sandpiper	5				202		120	
Broad-billed Sandpiper	915	2 000	65	500	1 200	2 000	510	1 000

Table 3.2c (cont.) Summary of National Count data and Population Estimates for the non-breeding period (Thailand, Myanmar, Bangladesh and India)

Country	Thailand		Myanmar		Bangladesh		India	
Species	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Red-necked Phalarope	7							
Asian Painted-snipe	5		38					
Pheasant-tailed Jacana	21		790		630			
Black-winged Stilt	3 166		671					
Pied Avocet	3							
Pacific Golden Plover	4 482		88					
Grey Plover	1 112		105					
Little Ringed Plover	1 713	5 000	1 144	5 000				
Kentish Plover	1 899		3 921					
Lesser Sand Plover	6 678	10 000	6 162	10 000	19 400	20 000		
Greater Sand Plover	984	1 000	2 590	3 000				
Long-billed Plover	1		370		50			
Grey-headed Lapwing	172		106		1 084		246	
Northern Lapwing	11		14					
Oriental Pratincole	10 585	1 000	85	100				

Table 3.2d. Summary of National Count data and Population Estimates for the non-breeding period (Malaysia, Singapore. Brunei and Indonesia)

Country	Malaysia		Singapore		Brunei		Indonesia	
Species	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Common Snipe	58		12		12		4	
Swinhoe's Snipe	274		1		1		2	
Pintail Snipe	71		22		3			
Eurasian Woodcock							4	
Black-tailed Godwit	791	4 000	13			500	38 215	62 000
Bar-tailed Godwit	2 799	4 000	1			500	9 342	22 000
Little Curlew							4 009	4 000
Whimbrel	2 341		140				3 620	
Eurasian Curlew	1 237	3 000					5 958	10 000
Far Eastern Curlew	9	300			2		3 008	5 000
Spotted Redshank	350						25	
Common Redshank	3 571	7 000	505	600	19		12 246	25 000
Marsh Sandpiper	5 314		600		23		1 029	
Common Greenshank	2 010	3 000	186	200	26		334	2 500
Spotted Greenshank	21							
Green Sandpiper					2		2	
Wood Sandpiper	1 247		62		400		618	
Terek Sandpiper	4 789	10 000	60	100		100	4 694	15 000
Common Sandpiper	551		130		40		1 254	
Grey-tailed Tattler	4	100			1		334	1 000
Ruddy Turnstone	222	1 000	14				766	1 500

Table 3.2d (cont.). Summary of National Count data and Population Estimates for the non-breeding period (Malaysia, Singapore. Brunei and Indonesia)

Country	Malaysia		Singapore		Brunei		Indonesia	
Species	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Asian Dowitcher	16	1 000			1		7 579	20 000
Great Knot	709	1 000					652	2 000
Red Knot	4	500					572	5 000
Sanderling	39	100	19		1		266	5 000
Red-necked Stint	2 794	6 000	140	150	72	100	1 695	5 000
Long-toed Stint	166	1 000	45		189	500		5 000
Temminck's Stint	301				2		32	
Sharp-tailed Sandpiper							658	5 000
Dunlin	32						114	
Curlew Sandpiper	7 958	10 000	400	500			8 770	20 000
Spoon-billed Sandpiper								
Broad-billed Sandpiper	897	2 000	11				155	4 000
Red-necked Phalarope							884	
Asian Painted-snipe	10		1					
Pheasant-tailed Jacana	10		2					
Black-winged Stilt	46						531	
Pacific Golden Plover	2 955		954		208		1 076	
Grey Plover	1 675		27		1		1 004	
Little Ringed Plover	306	2 000	53	100	124	200	167	2 000
Kentish Plover	191		30		63		201	
Lesser Sand Plover	6 246	10 000	419	500	128	150	18 272	45 000
Greater Sand Plover	5 205	10 000	5		100	100	464	5 000
Long-billed Plover	1				1			
Grey-headed Lapwing	5							
Oriental Pratincole	18	100	1		8		58	100

Table 3.2e Summary of National Count data and Population Estimates for the non-breeding period (Timor, Papua New Guinea, Australia and New Zealand)

Country	Timor	Papua New Guinea		Australia		New Zealand	
Species	Est.	Max. Count	Est.	Max. Count	Est.	Max. Count	Est.
Japanese Snipe				761			
Swinhoe's Snipe		9		27			
Black-tailed Godwit	100	265	3 000	76 249	70 000	4	
Bar-tailed Godwit		230	1 500	107 897	185 000	101 771	102 000
Little Curlew		131	200	236 461	175 000		
Whimbrel		65		7 268		178	
Far Eastern Curlew		344	2 000	13 770	28 000	46	
Common Redshank	100	5	100	200	200		
Marsh Sandpiper		24		5 095		3	
Common Greenshank	200	215	1 500	8 335	19 000	6	
Wood Sandpiper		14		515			
Terek Sandpiper		1 024	5 000	12 632	23 000	9	
Common Sandpiper		133		661			
Grey-tailed Tattler	200	90	500	20 008	45 000	13	
Ruddy Turnstone		23	500	9 512	20 000	5 915	6 000
Asian Dowitcher		4	500	424	450		
Great Knot		552	3 000	303 909	360 000		
Red Knot		2		181 803	135 000	67 367	68 000
Sanderling		10	100	4 903	10 000	8	
Red-necked Stint	1 000	716	4 000	220 068	270 000	231	250
Long-toed Stint	100		100	111	1 000		
Sharp-tailed Sandpiper	100	882	5 000	117 361	140 000	173	200
Curlew Sandpiper		8	100	182 899	118 000	136	150
Broad-billed Sandpiper			500	7 965	10 000		
Black-winged Stilt		8					
Pacific Golden Plover		28		6 561		1 120	
Grey Plover		54		8 048		8	
Little Ringed Plover		5	500				
Double-banded Plover				5 627		1 378	
Lesser Sand Plover		47	250	13 837	25 000	2	
Greater Sand Plover		1 730	5 000	37 895	73 000	5	
Oriental Plover				31 666	70 000		
Oriental Pratincole		15		63 831	2 880 000		
Australian Pratincole		285	300	31 737	60 000		