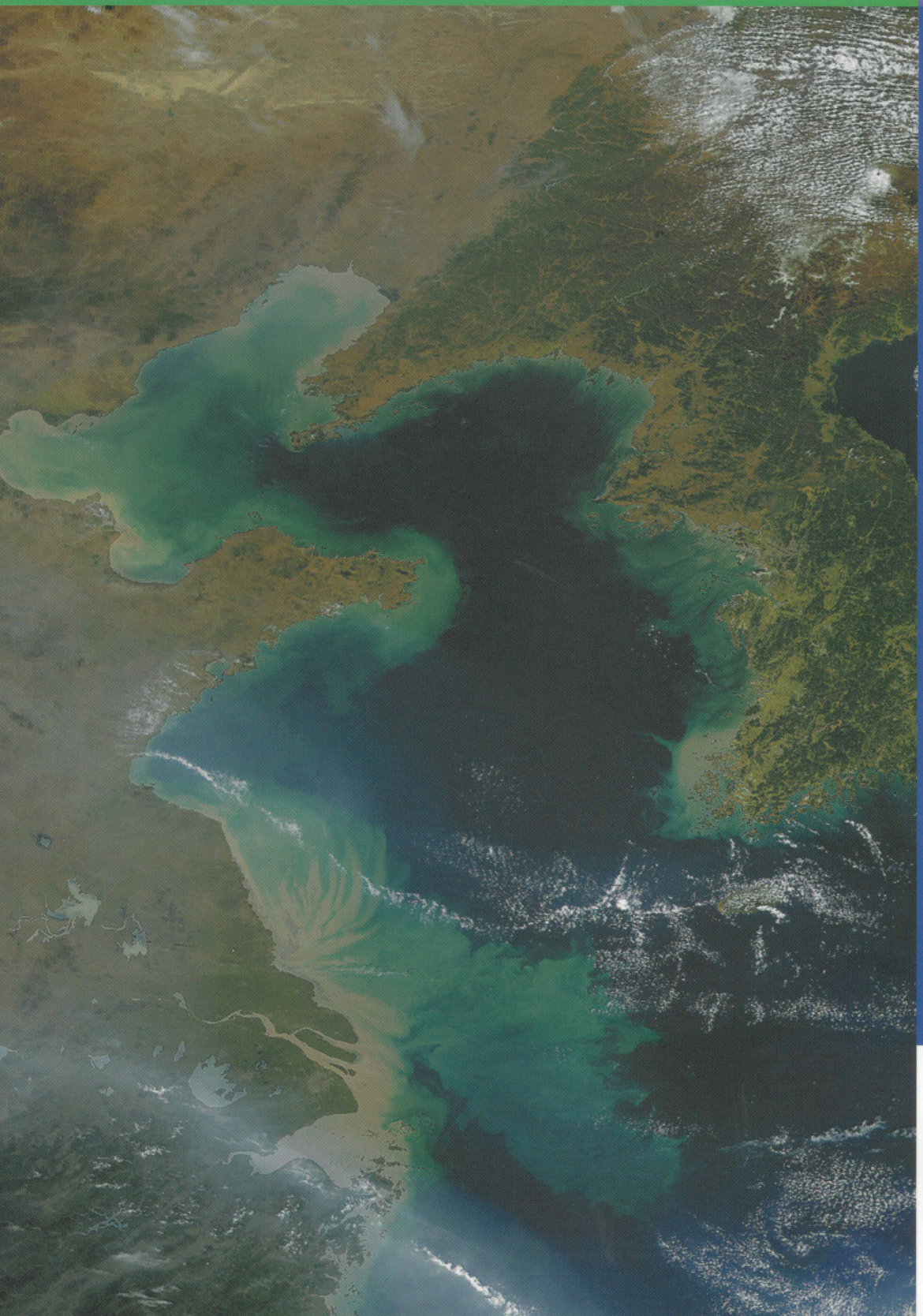
Shorebirds of the Yellow Sea

Importance, Threats and Conservation Status

Mark Barter



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FOREWORD

I first became interested in shorebirds in the early 1950s and since then have spent countless hours watching and studying them in numerous wetlands around the world. Over that period I've often asked myself the question "Why do shorebirds fascinate me so much?" - especially when there's a gale blowing and I'm up to my ankles in mud!

The best answer I've come up with is because they are such free spirits living in some of the most beautiful places on earth; moving endlessly to feed and roost as the moon dictates the ebb and flow of the tide, and migrating from one side of the earth to the other to breed in harmony with the sun. Heavenly birds in heavenly places!

Since I retired I've been very fortunate to have spent much of the last seven northward migration periods in a number of wetlands spread around the Yellow Sea coastline of China. I went there to train nature reserve staff in shorebird ecology and management, and counting shorebirds formed an important part of the training programmes. What I've seen during this period almost defies belief! Every coastal wetland I've visited has had large, sometimes enormous, numbers of shorebirds. The counts have been the first ever made at some of the sites. At the same time as the surveys were being conducted on the Chinese side, the South Koreans were counting shorebirds on the extensive intertidal areas of the west and south coasts of their country.

It soon became very obvious that the Yellow Sea is an extremely important staging area for migratory shorebirds. It also supports large numbers of birds during the non-breeding season.

Unfortunately for the shorebirds, the wetlands they use around the Yellow Sea are very much reduced in area compared to 50 years ago and are continuing to be significantly threatened by ongoing reclamation, pollution, human disturbance and the insidious effects of reduced river flows.

I decided to write this monograph because I believe it is very important to tell the story of the seemingly countless shorebirds of the Yellow Sea and the very serious threats to the habitats they use. I hope that the documented information provided in this monograph will lead to better informed policy and decision making by governments and provide conservationists with the necessary data to press governments to take effective action to protect the shorebirds and their habitats.

Inaction will inevitably lead to serious problems for migratory shorebirds and the very real danger that there won't be any "heavenly birds in heavenly places" for future generations to enjoy. The world would be a very much poorer place if that should ever happen.

As I intend to update the monograph when significant new information becomes available, I would be very grateful for advice of additional count and site data that should be included in future reports and of any corrections to the existing information. Suggestions on ways in which the monograph can be improved will also be gratefully received.

Mark Barter
June 2002

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A document such as this depends greatly on input and assistance from many people and organisations – including those planning and organising surveys, nature reserve managers, shorebird counters, data base managers, reviewers of the various drafts and funding agencies.

I wish to gratefully acknowledge those who've assisted with the fieldwork in China. Firstly, the Chinese nature reserve and university staff who spent countless hours on, and in, the mudflats counting shorebirds – in total more than 100 people over the years. Secondly, the nature reserve managements who welcomed us and helped greatly in the planning and organising of the surveys. Finally, the staff at Wetlands International – China, especially Chen Kelin and David Li, who performed the vital role of working with the nature reserves to "make it all happen". They performed miracles. Here I should also thank colleagues from Australia and New Zealand who accompanied me at various times – Dale Tonkinson, Jim Wilson and Adrian Riegen. Their skills and companionship helped enormously.

The inclusion of count information from South Korea has allowed the analysis to be expanded to include most of the Yellow Sea. I am indebted to the staff of the Avian Laboratory, Ministry of Environment, for making their very comprehensive data set available and I also thank them for allowing me to join them on one of their surveys during which I was able to get a good understanding of the shorebirds and the sites they use in that country. Nial Moores, of Wetlands and Birds Korea, has also been very helpful with both count data and comment on conservation issues in South Korea.

Additional unpublished count information for the Chang Jiang Estuary was supplied by Dr Lu Jian Jian of East China Normal University, for the Tianjin region by Ms. Zhang Shu Pin of Beijing Normal University and for Shi Jiu Tuo (Happy Island) by a number of visiting bird watchers. I thank them all for making their data available. I'm also very grateful for the assistance from staff at the United Nations Development Programme and the Asian Development Bank with provision of project documents which provided much useful information on environmental issues in the Yellow Sea and on the ways they are being addressed.

I am particularly grateful to all those who provided comments on drafts of this monograph – Dave Allen, Axel Braunlich, Geoff Carey, Mike Crosby, Jason Ferris, Bob Gill, Ken Gosbell, David Melville, Trixi Madon, Nial Moores, Theunis Piersma, Adrian Riegen, Danny Rogers, Pavel Tomkovich, Lew Young, Wang Tian Hou and Jim Wilson. Their contributions helped immensely in improving the document in many ways.

I hope that the Chinese and Korean summaries will be of assistance in communicating the main outcomes of the analysis to non-English speakers around the Yellow Sea, and I am very grateful to David Li and Ms. Kim Su Kyung for their translations.

Doug Watkins, of Wetlands International – Oceania, has been a tower of strength all the way through – from project conception at the 1995 Consultative Meeting of the China-Australia Migratory Bird Agreement, when the idea of providing training in shorebird ecology in Chinese nature reserves was first mooted, through continuing logistical and moral support during the ensuing years and, finally, to his assistance in reviewing various drafts of the document and playing the pivotal role in laying out and organising the final publication.

My wife, Terry, has been very understanding of the many, many hours that have been spent in the production of this monograph. I thank her for her forbearance. Also, I am very grateful to our daughter, Karen, whose word processing skills helped greatly in improving the layout of the document

And finally, but no means least, thanks to the Australian Government (through Environment Australia and AusAID) for funding all the training and survey activities in China via the Action Plan for the Conservation of Migratory Shorebirds in the East Asian-Australasian Flyway (Shorebird Action Plan). They also funded the South Korean report that collated the count data from that country. Without their support this document could not have been produced.

I hope that everybody involved, in whatever way, is satisfied that this monograph is a constructive outcome from their combined efforts.

SUMMARY

Surveys conducted during the last 12 years in China and Korea show that the extensive intertidal areas and near-coastal wetlands of the Yellow Sea support very large numbers of migratory shorebirds. It is estimated that at least 2 000 000 shorebirds use the region during northward migration, this number being approximately 40% of all the migratory shorebirds in the East Asian-Australasian Flyway. Large numbers are also present during southward migration when perhaps 1 000 000 shorebirds pass through the region.

A total of 36 shorebird species have so far been found to occur in internationally important numbers at one or more sites in the Yellow Sea, representing 60% of the migratory shorebird species occurring in the Flyway. Two of the species are classified as globally threatened, the Spotted Greenshank *Tringa guttifer* and Spoon-billed Sandpiper *Eurynorhynchus pygmeus*, whilst two are near-threatened, the Eastern Curlew *Numenius madagascariensis* and Asian Dowitcher *Limnodromus semipalmatus*.

Whilst the majority of birds use the region's wetlands as migration staging areas, seven species also occur in internationally important concentrations during the non-breeding season and five species breed in internationally important numbers.

The importance of the Yellow Sea is demonstrated by the fact that it supports more than 30% of the estimated flyway breeding populations of 18 shorebird species during northward migration; for six of the species the region carries almost the whole flyway breeding population at this time. It is highly likely that the great majority of Spotted Greenshank and Spoon-billed Sandpiper use the Yellow Sea during both northward and southward migrations. Approximately 80% of the estimated flyway population of the Eastern Curlew uses the Yellow Sea on northward migration and 40% of the Asian Dowitcher population.

Whilst the South Korean coastline has been well covered, both spatially and temporally, only about one-third of the Chinese intertidal area has been surveyed at least once, with most of the counting having been conducted during northward migration. Very little information is available from North Korea. Improved coverage of the Chinese and North Korean coasts would probably lead to increases in the estimates of the numbers of shorebirds using the Yellow Sea at different times of the year. Additional surveys would certainly lead to the identification of more internationally important species and sites. Thus, improved coverage of the unsurveyed parts of the coastline should be a high priority.

Shorebirds employ a wide variety of strategies in their use of the Yellow Sea. Some occur in high concentrations at a relatively limited number of sites, whilst others are distributed over a large number of sites with few major concentrations. The strategies of most species lie in between these extremes. Conservation management of the different species will need to take into account the varying ways in which shorebirds use the Yellow Sea wetlands.

Twenty seven sites have been identified around the Yellow Sea coastline at which at least one shorebird species has been recorded in internationally important numbers. Ten of these sites are located in China, one in North Korea and sixteen in South Korea. Six of the ten Chinese sites and the North Korean site are within Protected Areas, whilst a small part of one of the 16 South Korean sites is a Protected Area.

The sites exhibit a great diversity in the shorebirds they hold. Half of the sites support at least five species in internationally important numbers, whilst six sites carry 15 or more. Five sites have shorebird counts greater than 100 000 on northward migration, whilst one supports almost 250 000 shorebirds on southward migration.

The rapid growth of the human populations and economies of China and South Korea is causing serious loss and degradation of coastal habitats.

Approximately 37% of the intertidal areas existing in the Chinese portion of the Yellow Sea in 1950 and 43% of those in the South Korean part in 1917 have been reclaimed to date. China has plans to reclaim a further 45% of its current mudflats and South Korea an additional 34%. The two largest rivers flowing into the Yellow Sea, the Huang He (Yellow River) and Chang Jiang (Yangtze River), are undergoing significant changes that will greatly reduce the amount of sediment input and it is predicted that future loss of intertidal areas will occur at an increasing rate due to the combined effects of reclamation and reduced accretion.

The declining river flows and high levels of pollution are leading to reduced benthic productivity and, thus, a decline in food supplies for shorebirds. Human disturbance, by affecting feeding and roosting birds, and competition, through unsustainable harvesting of benthic fauna, may also have a serious impact on shorebirds.

The adverse effects of the various threats being encountered by shorebirds in the Yellow Sea are most significant during northward migration when shorebirds are not only preparing for their final long flight into the breeding grounds but also gaining additional reserves to sustain them during the period

immediately after arrival, when feeding conditions may be poor.

Of particular concern is the ongoing reclamation of the Mangyeung and Dongjin estuaries as part of the 401 km^2 Saemangeum Reclamation Project. These estuaries are the most important sites in South Korea during both northward and southward migration in terms of both maximum counts and numbers of internationally important species supported. During the northward migration period, the two estuaries jointly carry 30% of the Great Knot *Calidris tenuirostris* breeding population. The estuaries also support the most significant concentrations within the Yellow Sea of the endangered Spotted Greenshank and vulnerable Spoon-billed Sandpiper during southward migration. Between them the two estuaries support the highest recorded concentrations in the Yellow Sea during northward migration of three species, and during southward migration of seven.

Achieving effective conservation of migratory shorebirds and their wetland habitats will be particularly challenging around the Yellow Sea coastline. The traditional approach to nature conservation of creating a network of Protected Areas, with restrictions on human activities, is inappropriate due to the very extensive nature of the intertidal areas in the region and the high dependence of the local communities on intertidal resources.

Successful shorebird conservation will depend on the adoption of harmonised national policies and plans for the wise and sustainable use of the intertidal and sub-coastal areas of the Yellow Sea. Local community support will be an essential factor in the successful development and implementation of these policies and plans.

The exceptional importance of the Yellow Sea biodiversity, both on a global scale and as a resource shared by China, North Korea and South Korea, makes it highly desirable that conservation should be implemented on an ecoregion-basis. The challenge is to facilitate a process in which a Yellow Sea ecoregion management plan is adopted and implemented by the three Governments. Only then will the future for the globally important biodiversity of the Yellow Sea become brighter and the prospects of the millions of shorebirds passing through the region more promising.

SUMMARY IN CHINESE

中文摘要

过去 12 年间开展的涉禽调查证实了黄海海岸广阔的滩涂和沿海湿地支持着大量的迁徙涉禽。据估计，至少有 200 万只涉禽在北迁期间利用这里，这个数字大概是东亚－澳大利亚迁徙路线上迁徙涉禽总数的 40%。而南迁期间也有大量的涉禽经过这里，数量大约至少有 100 万只。

迄今统计共有 36 种涉禽在黄海地区的一块或多块湿地达到具有国际意义的数量标准（迁徙种群总数量的 1%），占整个迁徙路线涉禽种类数量的 60%。其中 2 种为国际濒危物种，小青脚鹬和勺嘴鹬；2 种为近危物种，大杓鹬和半蹼鹬 。

大部分的涉禽利用这一地区湿地作为迁徙的停歇地，但也有 7 种涉禽在非繁殖期的数量达到国际重要意义的数量标准，5 种涉禽在繁殖期的数量达到这一标准。

黄海地区对于涉禽的重要性表现在北迁期间，这一地区支持了 18 种涉禽的超过 30%的种群数量；6 种涉禽的数量甚至是其迁徙种群的全部数量。极有可能大部分的小青脚鹬和勺嘴鹬在南迁和北迁期间利用这里。大约 80%的大杓鹬和 40%的半蹼鹬迁徙种群在北迁期间利用黄海地区。

韩国的海岸湿地曾进行过非常全面的调查，中国的海岸带湿地只有 1/3 的地区开展过调查，且大部分调查是在北迁期间进行的，而朝鲜则只有很少的资料。扩大中国和朝鲜海岸湿地的涉禽调查范围将会增加黄海地区一年中不同时间的涉禽数量。更多的调查将能够确定更多达到国际重要意义数量标准的涉禽种类和确定更多的国际重要湿地。因此，扩大海岸调查范围是非常重要和优先的。

涉禽对黄海地区的利用是多种形式的。一些种类的涉禽在几个有限的湿地内高度集中分布，一些种类则分布在许多湿地范围内，很少集中分布。因此保护和管理这些不同的种类将需要采取不同的应对方式。

在黄海地区的海岸湿地中，27 块湿地至少有一种涉禽种类达到了国际重要意义的数量标准。其中 10 块位于中国，1 块位于朝鲜，16 块位于韩国。中国的 10 块湿地中有 6 块为保护区，朝鲜的 1 块也为保护区。而韩国的 16 块湿地中，只有 1 块湿地中的一部分为保护区。

这些湿地具有多种涉禽种类。一半以上的这些湿地有至少 5 种涉禽达到国际重要意义数量标准，6 块湿地甚至有 15 种以上的涉禽达到国际重要意义数量标准。5 块湿地在北迁期间的涉禽总数量超过 10 万只，其中一块在南迁期间的涉禽数量几乎达到 25 万只。

中国和韩国高速的人口和经济增长导致了海岸湿地的严重丧失和退化。同 1950 年相比，中国黄海地区丧失了大约 37%的潮间带面积，而韩国则丧失了 1917 年潮间带总面积的 43%。中国计划继续开垦现有滩涂面积的 45%，韩国则计划继续开垦 34%。两条流入黄海的最大的河流，黄河和长江正在面临巨大的变化，这将会大大减少其携带的黄海的沉积物。由于围垦和滩涂面积负增长的双重影响，估计未来黄海滩涂面积丧失的速度将会加剧。

江河水流量的减少和高水平的水质污染将导致海产品产量的减少，从而也会减少了涉禽的食物供应。人为干扰对正在取食和停歇的鸟类的影响，过度利用和捕捞海产品及由此导致的人鸟争食，可能也对涉禽有严重的影响。

这些多种威胁造成的负面影响对于黄海地区的北迁涉禽尤为严重，这些涉禽不但需要准备抵达繁殖地之前的最后长途飞行，而且它们还需要储备额外的能量以备抵达繁殖地后的一段时期，那里刚开始的取食条件可能会很差。

特别令人耽心的是韩国万顷湾（Mangyeung）和东津湾（Dongjin）正在进行的面积达 401km^{2}的 Saemangeum 围垦项目。这一地区是涉禽在北迁和南迁期间在韩国最重要的涉禽栖息地，具有最高的涉禽统计数量及最多种类的涉禽达到国际重要意义数量标准。在北迁期间，这一地区拥有 30%的大滨鹬迁徙种群。在南迁期间，这一地区支持着很高数量的小青脚鹬和勺嘴鹬。此外，该地区还拥有黄海地区北迁期间 3 种涉禽种类的最高数量记录和南迁期间 7 种涉禽的最高数量记录。

有效的保护迁徙涉禽及其湿地栖息地，黄海海岸地区将会是一个特殊的挑战。仅仅用自然保护的传统方式来建立一个保护区网络来限制人们的生产活动在这一地区是不适当的。由于这里潮间带面积广阔，当地的居民的生活严重的依赖于潮间带的海产资源。

成功的涉禽保护将取决于采用相称的国家政策和计划，合理的、可持续的开发和利用黄海地区的潮间带和海岸自然资源。当地社区的支持和合作将会是成功落实和实施这些国家政策和计划的重要因素。

无论从全球价值还是中、朝、韩三国共同拥有的资源的角度，黄海地区的生物多样性都具有极其重要的意义，非常需要在生态区域的基础上来开展保护活动。挑战在于推动一个黄海生态区域的管理计划，使之能够被三个国家的政府所接收和实施。只有这样，具有全球重要价值的黄海生物多样性的未来才会是光明的！千百万通过这里的涉禽的前景才会更有希望！

SUMMARY IN KOREAN

요약글

황해 생태권의 국제적으로 중요한 생태적 가치와 보전 방안

황해에서 지난 12년 동안 실시된 도요 물떼새류 조사는 동아시아 –호주 지역 도요·물떼새류의 이동 경로를 이용하는 개체군의 상당수가 황해의 광범위한 조간대 지역과 인근 해안 습지를 이용하고 있다는 것을 확실히 말해주고 있다. 북상 이동 시기에는 약 2백만 마리(동아시아-호주 이동 경로의 전체 개체군의 약 40%), 남하 이동시기에는 약 1백만 마리의 도요 물떼새류가 황해를 이용하는 것으로 나타났다. 그리고 동아시아-호주 간 이동 경로의 전체 도요 물떼새류 종 수의 약 60%인 36종이 황해의 한 개 이상의 지역에서 국제적으로 중요한 개체수가 기록되었다.

그 중에 청다리도요사촌 *Tringa guttifer*, 넓적부리도요 *Eurynorhynchus pygmeus* 는 국제적으로 위협종(threatened species)으로 분류되며, 알락꼬리마도요 *Numenius madagascariensis*, 큰부리도요 *Limnodromus semipalmatus* 는 취약종(near threatened species)으로 분류되어 있다. 표 3과 section 5.3.2는 36종의 도요 물떼새류를 각 조류 종이 국제적으로 중요한 개체수로 도래하는 지역의 수에 따라 나열한 목록이다.

대부분의 도요 물떼새류는 이동 시기의 중간 기착지로서 황해 내의 각 해안 습지를 이용하지만, 7종의 도요 물떼새류는 비번식 시기인 겨울철에 국제적으로 중요한 개체수로 황해에서 월동을 하며, 5종의 도요 물떼새류는 번식 개체군이 국제적으로 중요한 개체수로 도래한다. 동아시아-호주 간 이동 경로를 이용하는 18종의 도요 물떼새류의 번식 개체군의 약 30%이상이 북상 이동 시기에 황해를 거쳐가고 있으며, 6종의 도요 물떼새류는 북상 이동 시기에 전체 번식 개체군이 황해를 이용하는 것으로 나타났다. 청다리도요사촌 *Tringa guttifer* 과 넓적부리도요 *Eurynorhynchus pygmeus* 의 대부분은 북상 및 남하 이동 시기에 황해를 이용하는 것으로 보인다. 알락꼬리마도요 *Numenius madagascariensis* 의 동아시아-호주 이동 경로의 전체 개체군의 약 80% 와 큰부리도요 *Limnodromus semipalmatus* 의 약 40%가 북상 이동 시기에 황해를 이용하고 있다.

한국 측은 전체 해안선을 따라 조사가 충실히 이루어져 왔지만, 중국 측의 전체 해안선은 시간적·공간적 제약으로 인해 약 30%만이 조사가 되었으며, 대부분의 조사는 북상 이동 시기에 실시되었다. 그리고 북한 측의 조사 자료는 매우 부족한 실정이었다. 중국과 북한 지역의 조사를 보완한다면 연중 다양한 시기에 황해에 도래하는 도요· 물떼새류의 전체 개체수가 증가될 것으로 예상된다. 이 후에 실시될 조사에서는 황해에서 국제적으로 중요한 가치를 가지는 종과 지역을 구별하고, 아직 조사가 되지 않은 해안선을 우선적으로 조사하는데 중점을 두고자 한다.

황해의 도요· 물떼새류는 넓은 조간대 지역을 다양한 전략으로 이용하고 있다. 어떤 종들은 몇몇 지역에 큰 무리로 집중하여 도래하는 반면, 어떤 종들은 넓은 지역에 소수로 흩어져서 분포한다. 따라서 도요 물떼새의 효과적인 보전 관리를 위해서는 그들의 다양한 서식지 이용 전략을 충분히 고려하여야 한다.

황해의 27개 지역에서 1종 이상의 도요· 물떼새류가 국제적으로 중요한 개체수로 도래하는 것으로 나타났다. 표 6과 section 6.2의 지역 목록은 국제적으로 중요한 개체수가 도래하는 조류 종 수와 각 종의 최고 도래 개체수에 따라 나열한 것이다. 그 중 10개 지역이 중국 측에 위치하고 있고, 1개

지역이 북한 측에 속하며, 16개 지역이 한국 측에 위치하고 있다. 중국 측의 10개 지역 중 6개 지역과 1개의 북한 측 해안 지역은 보호 구역으로 지정되어 보호를 받고 있는 반면, 한국 측의 16개 지역 중 1개 지역의 일부분만이 보호 구역으로 지정되었다. 이 지역들에서는 공통적으로 종 다양도가 높게 나타났다. 그 지역들 중 50%의 지역들에서는 5종 이상이 국제적으로 중요한 개체수로 도래하며, 6개 지역에서는 15종 이상이 국제적으로 중요한 개체수로 도래한다. 그리고 북상 이동 시기에는 5개 지역에서 각각 10만 개체 이상이 도래하고, 남하 이동 시기에는 1개 지역에서 25만 개체의 도요· 물떼새류가 도래한다.

인구의 급속한 증가와 중국 및 한국 경제의 급성장은 해안 습지의 심각한 소실과 황폐화를 일으키고 있다. 황해에서 1950년대까지 남아 있었던 중국의 갯벌의 약 37%, 1917년까지 존재했었던 한국의 갯벌의 43%는 지금은 매립되어 이미 사라졌다. 더군다나 중국은 현재 갯벌의 45%를, 한국은 34%를 더 매립할 계획을 가지고 있다. 황해로 흘러 드는 2개의 큰 강 양쯔강과 황하강은 심각한 하천 유역의 변화로 퇴적물 유입이 감소되고, 매립 사업과 퇴적률의 감소로 인해 조간대 면적이 점차적으로 감소될 것으로 예상된다.

황해로 흘러 드는 하천의 유량이 감소되고, 하천 오염이 심각해지면서 저서 생물량이 감소되고, 그에 따라서 저서 생물을 먹이로 섭취하는 도요· 물떼새류의 수가 감소하고 있다. 도요·물떼새류의 또 다른 생존 위협요인으로 채식 지역과 휴식 지역에서의 인간에 의한 교란과 먹이 부족으로 인한 경쟁률 증가를 들 수 있다.

도요·물떼새류에게는 북상 이동시기에 번식지까지의 먼 여정을 준비하고, 번식지에 도착한 후 먹이가 부족할 경우에도 견딜 수 있기 위해 황해에서의 풍부한 먹이 섭취가 중요하다. 그러나 서식지 소실, 먹이원 감소 등의 위협 요인들은 개체군 유지에 부정적인 영향을 줄 것이다.

만경강과 동진강 하구에서 현재 진행 중인 40,100ha 면적의 새만금 간척 사업은 황해에서 가장 심각한 위협 요인이다. 만경강과 동진강 하구가 이루는 새만금 갯벌은 북상 및 남하 이동 시기에 도요· 물떼새류의 도래 개체수가 한국에서 가장 많이 기록된 곳이며, 국제적으로 중요한 가치를 가지는 조류의 종 수가 가장 높게 나타나는 곳이다.

그리고 북상 이동 시기에 붉은어깨도요 *Calidris tenuirostris*의 번식 개체군의 약 30%가 새만금 갯벌을 거쳐가는 것으로 조사되었다. 남하 이동 시기에는 멸종 위기종인 청다리도요사촌 *Tringa guttifer*과 감소 추세종인 넓적부리도요 *Eurynorhynchus pygmeus*가 새만금 갯벌에서 가장 많은 개체수가 관찰되었다.

황해 전역을 통틀어 북상 이동 시기에는 3종, 남하 이동 시기에는 7종의 도요· 물떼새류의 도래 개체수가 새만금 갯벌에서 가장 높게 나타났다.

 도요· 물떼새류와 그들의 서식지인 해안 습지를 효율적으로 보전하는 것은 쉽지 않은 일일 것이다. 황해는 넓은 조간대가 형성되어 있으며, 지역 주민들이 집약적으로 조간대의 자연 자원을 채취하는 인문·사회적 특성을 가지고 있으므로 인간 활동 규제를 위해 보호 구역으로 지정하고 네트워크를 조직하는 과거의 방식은 부적절하다고 여겨진다.

결론적으로 도요· 물떼새류를 성공적으로 보전하기 위해서는 조간대와 조하대의 현명하고 지속적인 이용을 목표로 하는 조화로운 국가 정책과 계획이 뒷받침되어야 할 것이다. 그리고 정책과 계획이 성공적으로 이행되기 위해서는 보전 계획을 통해 지역 경제를 지원하고 지역 주민의 적극적인 참여를 유도하여야 할 것이다.

황해는 국제적으로 중요한 가치를 가지는 독특한 생물 다양성을 보유하고 있을 뿐만 아니라 중국, 북한, 한국 3국이 공유하는 자연 자원을 공급해 주는 식량 창고로서 중요한 가치를 가진다. 따라서 보전 정책은 3국이 협력하여 황해 생태권의 통합적 개념으로 계획되고 이행되어야 할 것이다. 3국이 공동으로 황해 생태지역 관리 계획을 채택하고 이행한다면 황해의 독특한 생물 다양성을 보전하며, 황해를 거쳐가는 수 백만 마리의 도요·물떼새류의 안전한 미래를 보장할 수 있을 것이다.

1 INTRODUCTION

At the height of migration they arrive in flocks that at times seem to fill the sky. They spread out as they land, bills probing almost before their feet touch the ground. They stitch the mud again and again at each low tide, turning the seemingly inexhaustible invertebrate inventory into shorebird tissue. They refuel for some days and then, swaddled in sustaining fat, are on their way again to north or south.

Dennis Paulson (1993)

1.1 Shorebirds and the conservation challenge

Shorebirds, or waders, are small- to medium-sized birds of the water's edge. They have a variety of bill shapes and sizes, and legs which vary from short to very long. Typically, they are gregarious and often occur together in very large numbers. Shorebirds have two important characteristics that provide significant conservation challenges.

Firstly, most shorebirds are highly dependent on wetlands, both coastal and inland, for their food – shellfish, crabs, shrimps, and worms. Unfortunately, much wetland habitat has already been destroyed on a worldwide scale and a high proportion of the remaining area is under serious threat from a wide variety of human activities (Finlayson & Spiers 1999).

Secondly, many species of shorebird undertake annual migrations of thousands of kilometres between their breeding and non-breeding areas, often stretching from the coasts and islands of the high arctic to the southernmost wetlands of the globe. Northward migration to the breeding grounds typically takes place from March to early June, whilst the return migration to the non-breeding areas occurs between July and October. During their migrations, shorebirds move through networks of wetland sites, spread across many countries, at which they prepare for the next stage of their journey by building up stores of fat to fuel their onward flight.

The international nature of shorebird migrations and the ubiquitous threats to wetlands requires that any effective conservation programme will need coordinated multinational support that is based on good knowledge and understanding of shorebird annual life cycles and of the important habitats that are used during the breeding, migration and non-breeding periods (Davidson *et al.* 1998; Rose 1998).

The need for international action in the Asia Pacific region has been recognized in the development of a conservation strategy for migratory water birds (Asia-Pacific Migratory Waterbird Conservation Committee 2001), which includes a shorebird action plan that calls for the building of an extensive network of well-managed shorebird sites of international importance, improved knowledge of migration routes and identification of key staging areas (www.ea.gov.au/water/wetlands/mwp/infosrn1.html).

1.2 The East Asian-Australasian Shorebird Flyway and the Yellow Sea

There are eight shorebird flyways around the world, each of which consists of a geographical grouping of similar routes used by many individual species. The East Asian-Australasian Flyway, stretching from Siberia and Alaska, southwards through east and south-east Asia, to Australia and New Zealand (Figure 1), supports over 7 million shorebirds, of which some 5 million are migratory (Bamford *et al*. in prep.).

Shorebirds share the East Asian-Australasian Flyway with more than 45% of the world's human population, many of whom live in countries that have some of the fastest developing economies in the world. The resulting economic and social pressures are posing major threats to wetlands, with more than 80% of the significant wetlands in east and south-east Asia being classified as threatened in some way; 51% of these are under serious threat (Scott & Poole 1989). Within the East Asian-Australasian Flyway, only Mongolia and Papua New Guinea have less than 20% of their wetlands moderately or seriously threatened. It is estimated that China and South Korea have already reclaimed 37% and 43%, respectively, of their intertidal areas (Yuan *et al.* 2001; Moores *et al.* 2001; MOMAF 1998).

Much has been learnt about the breeding and non-breeding portions of shorebirds' lives within the Flyway, with considerable work on their breeding biology and distribution having been carried out, especially in Russia and Alaska (e.g. Rogacheva 1992; Tomkovich 1996; Gill 1996), and a substantial counting and banding programme being conducted in Australia, New Zealand and Japan during the last 20 years which has provided much information on flyway population sizes, non-breeding distributions and biometrics (e.g. Lane 1987; Watkins 1993; Higgins & Davies 1996; Robertson 1999; JAWAN 1998, 1999). However, relatively little is known of the migration strategies of the individual species – a deficiency which is particularly serious given that the key wetlands used during migration in east and south-east Asia are the most threatened in the Flyway (Melville 1997).

The need for greatly improved information on important shorebird staging sites has led to

extensive survey and counting activity during the last 10 years, particularly along the coastline of the Yellow Sea. Since 1996, Wetlands International, building on earlier work by East China Normal University (Wang & Tang 1990a, 1990b; Wang *et al.* 1991, 1992), has been active around the Yellow Sea coastline of China (Chen *et al.* 1998, 1999, 2000a, 2000b). In South Korea, following a preliminary survey by the East Anglia and Kyung Hee Universities in 1988 (Long *et al*. 1988), staff of the Avian Laboratory, Ministry of Environment, have been conducting intensive counts of important Yellow Sea sites on both northward and southward migration since 1993 (Yi & Kim in prep.). Non-government organisations in South Korea have also made a major contribution in recent years (Moores 1999a, 1999b).

The information collected has significantly improved our understanding of shorebird abundance and distribution in the Yellow Sea and of how the different species use the region. The results to date show clearly that the coastal regions of the Yellow Sea provide key migration staging sites for many shorebird species and also support important concentrations of some species during the non-breeding season. Some species also breed in significant numbers. The Yellow Sea staging sites are particularly important during northward migration, as birds are preparing for their final flights into the breeding grounds, when it is essential that they depart from the Yellow Sea in good condition so that they can withstand the often adverse weather conditions after arrival and then breed successfully.

1.3 Purpose and Contents of the Monograph

The purpose of this monograph is to provide up-to-date information from the Yellow Sea on:

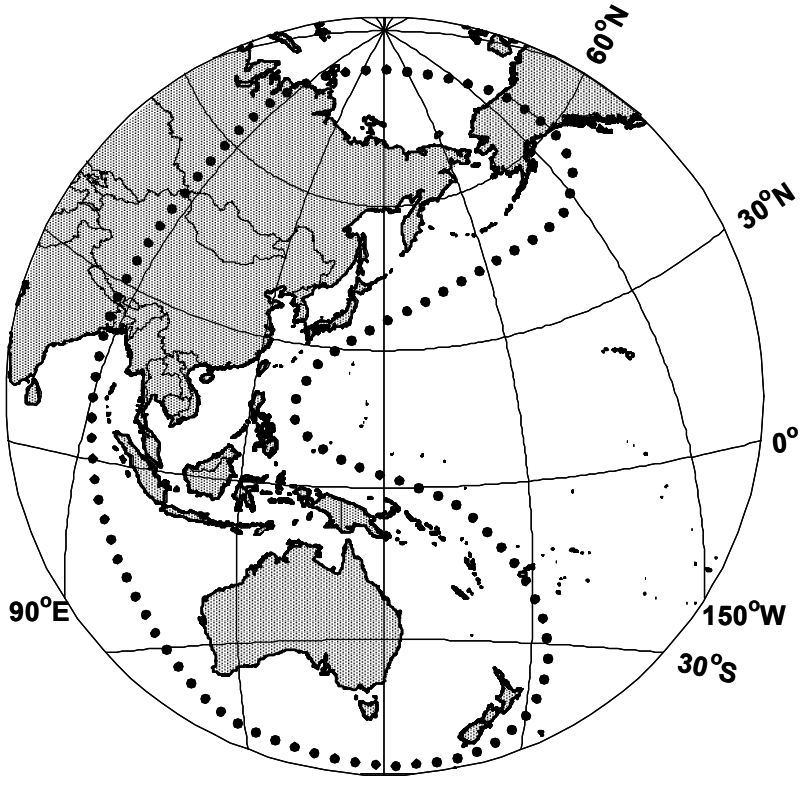
- its importance for migratory shorebirds;
- key shorebird sites; and
- threats to shorebird habitat;

in order to assist governments and non-government organisations to develop effective conservation policies and plans for shorebirds and their habitats.

The monograph:

- describes the physical geography of the Yellow Sea and its shorebird habitats;
- provides detailed information on the abundance and distribution of those shorebird species which occur at Yellow Sea sites in internationally important numbers;
- identifies the sites currently known to support internationally important shorebird concentrations;
- lists the threats to, and discusses the conservation status of, shorebirds and their habitats in the Yellow Sea;
- in addition to a list of cited references, also provides a selected listing of shorebird-related papers which are based on work carried out in the Yellow Sea.

Figure 1 East Asian-Australasian Flyway



2 THE YELLOW SEA

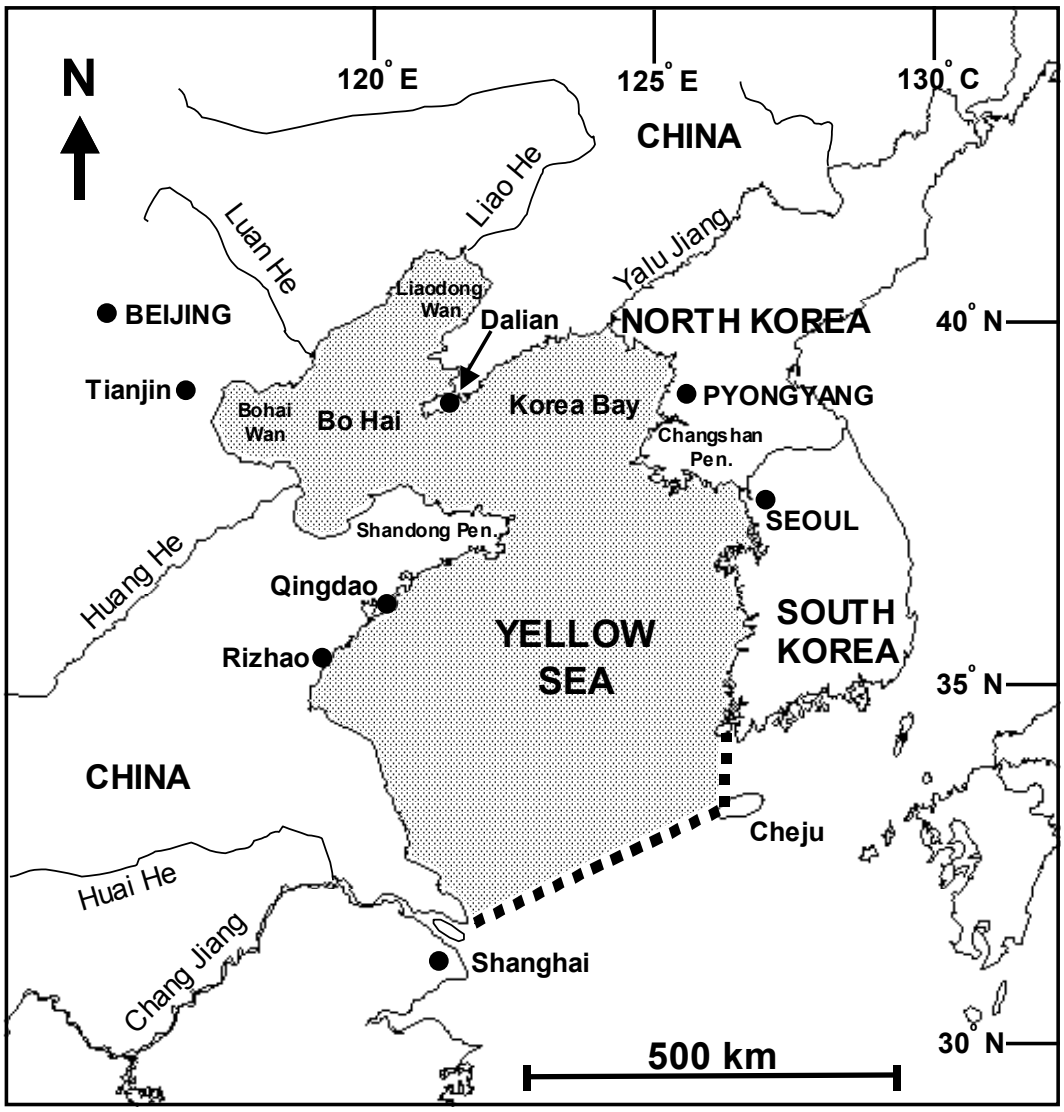
2.1 Location and size

The Yellow Sea is a semi-enclosed shallow sea, with extensive intertidal areas, located between the Korean Peninsula in the east and China to the west (Figure 2). The southern boundary of the Sea is a line drawn from the northern side of the Chang Jiang (Yangtze River) Estuary eastwards to the island of Cheju and then northwards to the south-west coast of South Korea (UNDP 2000a).

The Yellow Sea is situated between longitudes 117° 35' E and 126° 50' E and latitudes 31° 40' N and 41° 00' N, is about 1 000 km from north to south and 700 km from east to west and has an area of 458 000 km^2. The average depth is 46 m, but is only 26 m in the Bo Hai (Yuan *et al*. 2001).

For the purposes of this report, shorebird data from the Chang Jiang Estuary, and its islands, and from the south coast of South Korea have been included in the analysis.

Figure 2 The Yellow Sea: location, national boundaries, constituent parts, major cities and rivers



2.2 Climate

The Yellow Sea climate varies from cold temperate in the north to warm temperate in the south, being controlled by cold, dry northerly winds in the northern winter and warm, moist southerlies in the northern summer.

Most rain falls in the May-September period, with total precipitation varying from 600-900 mm in the north to 1 100-1 300 mm in the south (PRC CDB; Park *et al.* 2000).

Mean air temperatures on the north coast of the Yellow Sea are about –8° C in January, increasing to 1° C in March, 16° C in May and 24° C in July, whilst in Shanghai mean temperatures in the same months are 4° C, 8° C, 19° C and 28° C (PRC CDB). Mean temperatures in Seoul are –4° C in January and 25° C in July (Park *et al.* 2000).

Average sea surface temperatures in the north are between –2 °C and 0 °C in January and February, 2 °C in March and 4 °C in April (Meteorological Office 1947; Moores *et al.* 2001). Normally, Liaodong Wan, Bohai Wan and the region around the Yalu Jiang mouth freeze for 2-4 months during winter, with thawing occurring in mid- to late March. Drift ice up to 35 cm in thickness is found throughout the Bo Hai, in north Korea Bay and around the Changshan Peninsula (Lanzhou Institute of Glaciology and Geocryology 1988; UNDP 2000a; ADB 2000b; Yuan *et al.* 2001).

2.3 Rivers

Information on important rivers flowing into the Yellow Sea is given in Table 1 (UNDP 2000a; ADB 2000b; Yuan *et al.* 2001; Moores *et al.* 2001). All have peak run off in the northern summer and minimum discharge in the northern winter (UNDP 2000a).

The Huang He (Yellow River), which is the second longest river in China, has the highest sediment loading of any river in the world (Li 1995), but the annual water volume is relatively low, especially when compared with the Chang Jiang (Yangtze River) which has by far the highest flow of any Chinese river.

The Huang He and Chang Jiang account for almost all of the annual input from Chinese rivers of 1.6 x 10^9 tonnes of sediment into the Yellow Sea. Silt discharge from the Huang He can reach Laoshan Bay, north of Qingdao, whilst the plume from the Chang Jiang significantly affects the southern Yellow Sea (UNDP 2000a). It has been suggested that the great majority of silt forming the extensive intertidal areas of the west coast of South Korea has come from the Huang He (Koh 1997), but there is evidence from South Korean work that these sediments are derived from Korean rivers (N. Moores in litt.).

2.4 Intertidal shorebird habitat

The Chinese coast consists of extensive stretches of tidal flats separated by the rocky regions of the Shandong and Liaoning Peninsulas and north-west Liaodong Wan. Deltas occur at the mouths of the Chang Jiang, Huang He, Luan He and Liao He. The west coast of South Korea consists of extensive tidal flats, which are contained in broad estuaries in the north and surround islands in the south-west. The south coast has deep bays with large mudflats. The main tidal flat distribution, with regional areas in km^2 and average tidal ranges for a number of

Table 1 Data on important rivers flowing into the Yellow Sea, ranked by annual silt discharge

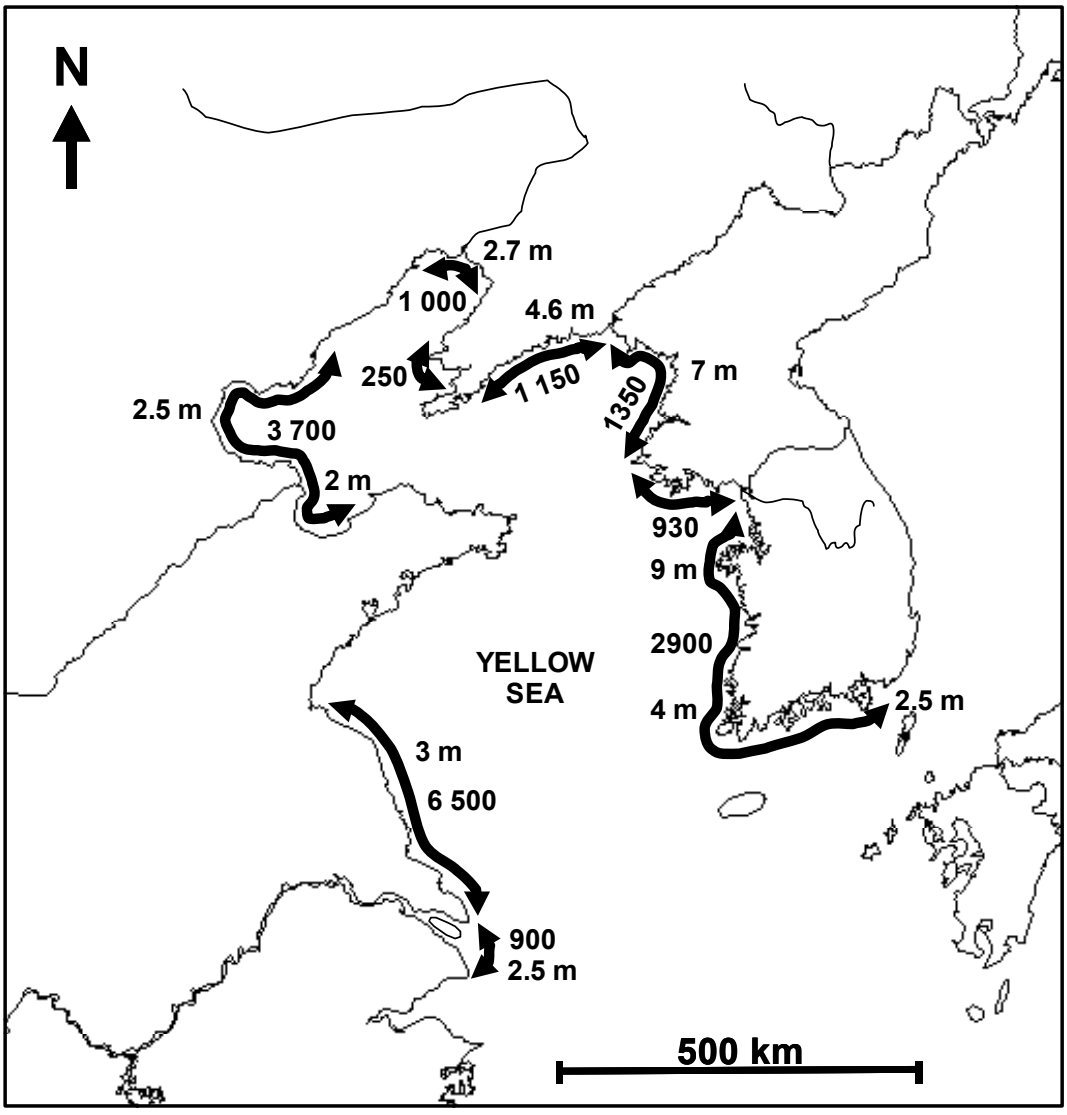
River	Length (km)	Catchment area (km^2)	Flow rate (10^9 m^3 y^{-1})	Silt discharge (10^6 t y^{-1})
Huang He	4 845	745 100	36.0[1]	911.0[2]
Chang Jiang	6 300	1 808 500	921.0	500.0
Liao He	1 430	219 000	17.0	35.0
Daling He	379	17 687	4.9	35.0
Luan He	877	44 900	4.5	27.0
Huai He	1 000	269 150	26.0	13.0
Yalu Jiang	790	61 889	29.0	2.0
Nakdong River	450	240 000	15.0	1.0
Hun He	415	7 944	2.0	0.9
Wulong He	124	2 653	0.6	0.8
Guan He	75	640	3.5	0.7
Dagu He	179	4 631	0.7	0.6
Geum River	396	99 000	7.0	0.6

[1] Long term average (1919 – 1997); predicted to fall to 19 x 10^9 m^3y^{-1} in 2010-2019 (YRCC 2000). [2] Long term average (1919 - 1997); predicted to fall to 328 x 10^6 t y^{-1} in 2010-2019 (YRCC 2000).

coastal areas, is shown in Figure 3 (Moores *et al.* 2001; Yuan *et al.* 2001). The total area of intertidal flats in the Yellow Sea, including the Chang Jiang Estuary and the south coast of South Korea, is about 20 000 km^2, which also includes 1 350 km^2 in numerous bays and estuaries around the Shandong Peninsula (Wilson & Barter 1998; Yuan *et al.* 2001; Moores *et al.* 2001; Scott 1989). The tidal ranges of the central west coast of the Korean peninsula are amongst the highest in the world.

The intertidal areas of the northern Yellow Sea are frozen during winter and are unlikely to support shorebirds at this time of the year (Melville & Li 1998). However, air and water temperatures rise quickly from March onwards (see above) and the mudflats then become available to shorebirds during the northward migration period.

Figure 3 Main intertidal areas (km^2) and selected average tidal ranges in the Yellow Sea



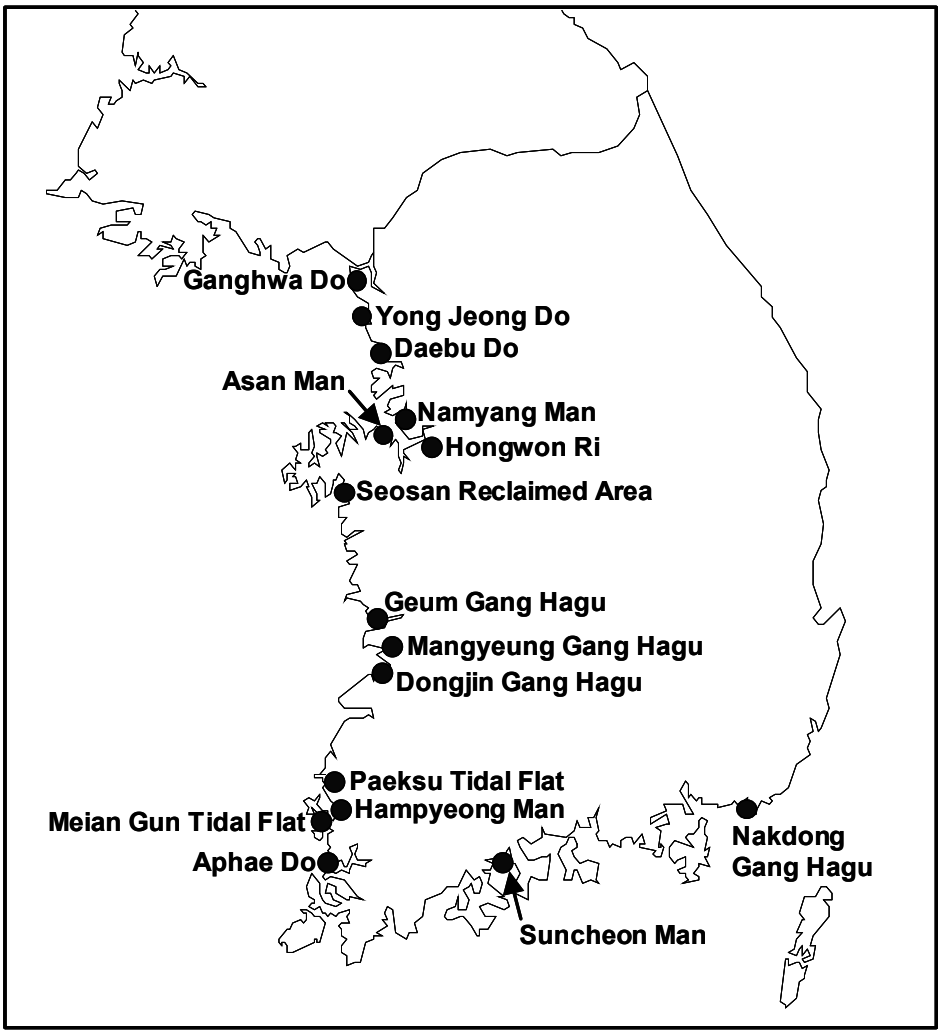
3 METHODS

3.1 Survey locations, frequency and coverage

Regular shorebird surveys have been conducted in South Korea since 1993. Most counting has been concentrated at nine major sites along the west and south coasts (Ganghwa Do, Yong Jeong Do, Namyang Man, Asan Man, Mangyeung Gang Hagu, Dongjin Gang Hagu, Seosan Reclaimed Area, Geum Gang Hagu and Suncheon Man) (Yi & Kim in prep.). Fewer counts have been made at a number of other sites (Yi & Kim in prep., Moores 1999a). From 1993 to 1996, counts were conducted once or twice during both northward and southward migration at the first six major sites. From 1997 onwards, count coverage was expanded to include the last three major sites and the count frequency was increased to at least once a month during each migration period (Yi & Kim in prep.). A limited amount of counting has been conducted during the non-breeding season (Moores 1999a). Coverage of the South Korean coastline, both spatially and temporally, is considered to be good. The locations of the major South Korean sites that have been surveyed for shorebirds are shown in Figure 4. No shorebird count data is available from North Korea, except for limited information from the Mundok Migratory Bird Wetland Reserve.

The coverage and frequency of shorebird surveys in China have been considerably less than in South Korea. Most recent shorebird counting has been conducted in conjunction with shorebird ecology training courses held at a number of coastal nature reserves (Barter *et al*. 1997a, 2000b, 2000h, 2000i, 2001, 2002); Zhu et al. 2000), but earlier counts at Chongming Dao and in the Huang He Delta were carried out by the East China Waterbird Ecology Group (Wang & Tang 1990a, 1990b; Wang *et al*. 1991, 1992), and at the Yancheng National Nature Reserve by nature reserve staff (Wang & Liu 1994; Wang 1997; Wang & Barter 1998). Visiting overseas birdwatchers have made numerous counts at Shi Jiu Tuo (Happy Island) and their data have been obtained either directly from them or via web sites.

Figure 4 Locations of the major sites surveyed in South Korea



Most count data from China are for the northward migration period when it is estimated that approximately one-third of the intertidal areas have been surveyed at least once; the southward migration and the non-breeding periods have received much less coverage (Figure 5).

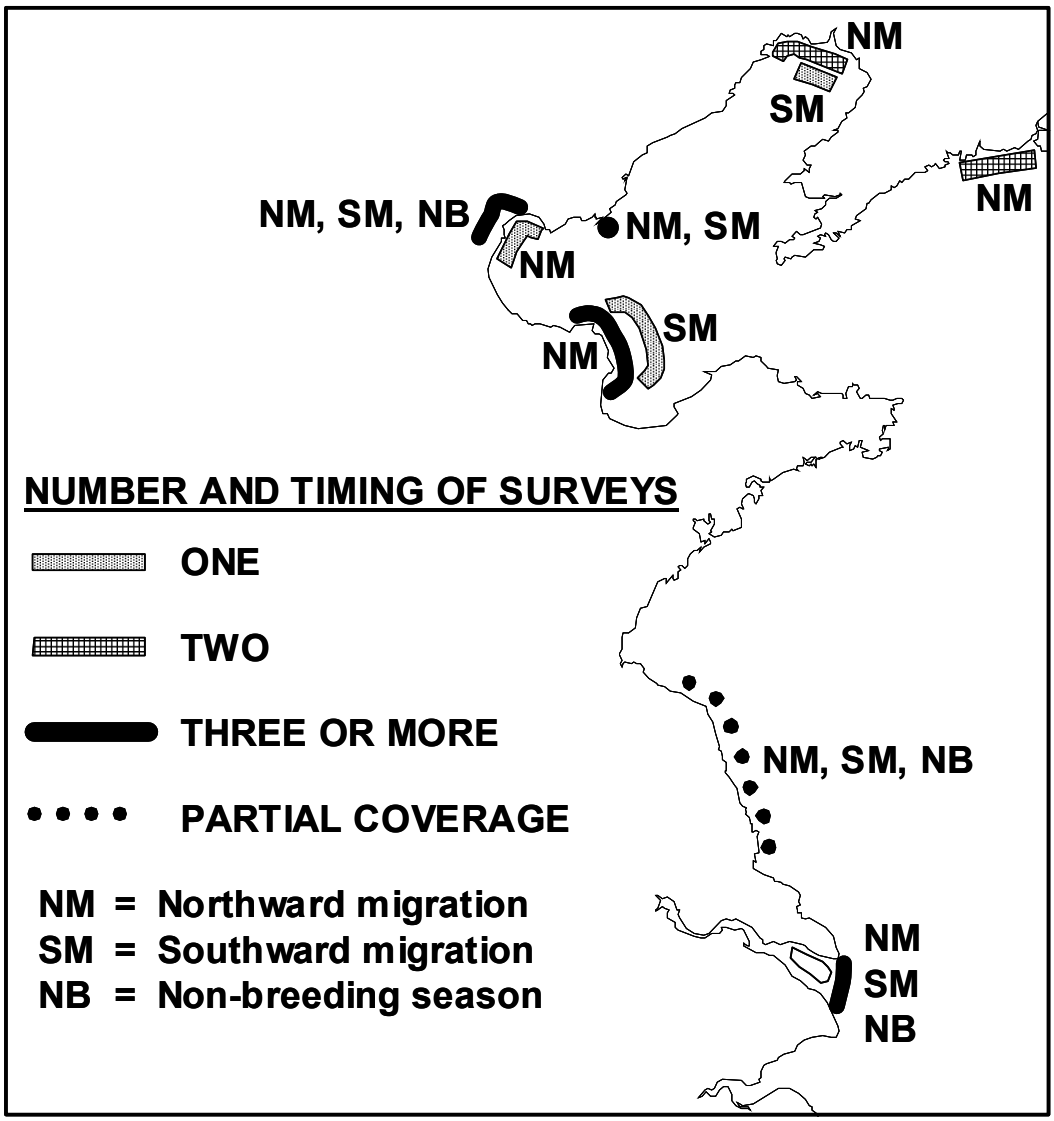
3.2 Count methods

Counts in South Korea were mostly carried out when birds were concentrated at high tide roosts, which are generally easily accessible by vehicle. In China, shorebird surveying was complicated by the extensive nature of the intertidal flats, which are often inaccessible to vehicles, and the fact that the intertidal flats, at most sites, were rarely completely covered at high tide. Typically, counting was carried out by a number of teams that each covered an assigned section of the coastline, often walking many kilometres to reach the tide edge and the birds. Counts were made at all stages of the tide. The exceptions were Yalu Jiang NNR and Tianjin Municipality, where counts were made from the seawall of birds pre-roosting before they flew into shrimp and fish ponds at high tide.

3.3 Count accuracy

Estimates of species numbers obtained from high tide counts are generally assumed to accurately reflect actual numbers present. However, this may not be true. Colwell & Cooper (1993) have shown that the optimal stage of the tide for counting can vary for different species. Rappoldt *et al.* (1985) found that underestimation of numbers occurs during counting of roosts. It seems that high tide counts are more likely to result in conservative estimates of numbers present rather than overestimates.

Figure 5 Extent of shorebird surveys in China



In a study carried out in the UK that compared high and low tide counts in 39 estuaries (Musgrove 1998), it was shown that low tide counts recorded 85% of the total number obtained at high tide, with most species being undercounted during low tide conditions. However, some species, such as Bar-tailed Godwit, Dunlin and Grey Plover, exhibited little difference, whilst Red Knot and Greenshank were counted in significantly higher numbers at low tide. It was found that there was a greater difference between high and low tide counts when larger intertidal areas were being counted, presumably due to detectability problems at long distances. Rappoldt *et al.* (1985) make the point that missing of birds during wide-scale counting often leads to significant underestimates.

Therefore, the counting conditions in China could be expected to result in underestimates of numbers, especially for those species which were distributed widely across the intertidal areas (e.g. Eurasian and Eastern Curlews, and Kentish and Lesser Sand Plovers). The focus on counting intertidal areas would also lead to undercounting of species that use coastal non-tidal wetlands, e.g. Black-tailed Godwit, the *Tringa* sandpipers, Pied Avocet, Black-winged Stilt and Grey-headed Lapwing.

There is no measure of the precision of the count estimates, as replicate counts were not made during the South Korean and Chinese surveys.

3.4 Criteria for identifying the presence of internationally important numbers of a species

The Ramsar Convention (Convention on Wetlands [Ramsar, Iran, 1971]) has developed eight criteria to identify internationally important wetlands (Ramsar Convention Bureau 2000). Two of these (Criteria 5 and 6) specifically relate to assessing whether a wetland supports internationally important numbers of waterbirds:

"A wetland should be considered internationally important if it regularly supports 20 000 or more waterbirds.

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 objective nature of these particular criteria makes them easy to apply to the identification of internationally important shorebird sites in the Yellow Sea, although the "1% criterion" does require an estimate of population numbers for the East Asian-Australasian Flyway.

The Convention acknowledges that these criteria will be applied to wetlands of varying size and provides the guideline that "wetlands identified as being of international importance …. should form an ecological unit, and may thus be made up of one big area or a group of smaller wetlands" (Ramsar Convention Bureau 2000).

The *ecological unit* concept is relatively easy to apply in South Korea, as count sites generally comprise bays and estuaries.

The application of the concept in China is often difficult because of the large extent of the intertidal areas and the "open-ended" nature of the wetlands surveyed. Thus, in China administrative regions have been used to delimit a site as the great majority of count data was collected during surveys of nature reserves or municipalities. The exception was the island of Shi Jiu Tuo.

The term "*regularly supports*" is used in both criteria and the Convention provides the following guidance in the interpretation of this phrase (Ramsar Convention Bureau 2000):

"a wetland regularly supports a population of a given size if:
i) the requisite number of birds is known to have occurred in two thirds of the seasons for which adequate data are available, the total number of seasons being not less than three; or

ii) the mean of the maxima of those seasons in which the site is internationally important, taken over at least five years, amounts to the required level (means based on three or four years may be quoted in provisional assessments only)."

In its guidance the Bureau also adds that:

"In some instances, however, for species occurring in very remote areas or which are particularly rare, or where there are particular constraints on national capacity to undertake surveys, areas may be considered suitable on the basis of fewer counts. For some countries or sites where there is very little information, single counts can help establish the relative importance of the site for a species."

In China, most sites have been counted less than five times, some only once. Where sites have been visited more than once the objective has normally been to get a better understanding of migration strategies, rather than to obtain an estimate of total numbers of a species using a site during the migration or non-breeding periods. South Korean sites have been counted more frequently, but some only once or twice.

Due to these data limitations, it has been decided to use the highest recorded count to determine whether a site holds internationally important numbers of a particular species.

The use of the highest count is likely to provide a conservative estimate of the total numbers of a species using a staging site due to:

- underestimation of numbers present (see above);
- the fact that birds are often continuously moving through a site, with the result that the total number of individuals of a species using the site during a defined period, e.g. northward migration, will exceed the highest count (Howes & Bakewell 1989; Wetlands International - Oceania 2000). This effect is often called “migration turnover”.

It is considered to be very unlikely that additional count data would lead to any of the identified sites losing their internationally important status; in many cases shorebirds occur in concentrations far in excess of the 1% level and it highly improbable that these are exceptional counts.

The availability of population estimates for shorebird species in the East Asian-Australasian Flyway (Bamford *et al*. in prep.) means that the 1% criterion is the most appropriate one to use in assessing the importance of wetlands in the Yellow Sea. The employment of this criterion has the significant advantage that it enables identification of suites of sites that are important for individual shorebird species. The numerical values of the 1% criteria used for the 36 species covered in the species accounts are listed in Table 2.

3.5 Determining the importance of the Yellow Sea for individual species

The importance of the Yellow Sea for a particular species is best measured by the proportion of its flyway population that uses the region. This can be calculated from estimates of the numbers using the Yellow Sea and the flyway population of each species.

As northward migration is the only period for which there is sufficient data, estimates of the number of individuals of a species using the Chinese and South Korean coasts of the Yellow Sea have only been made for this time. The following steps were used:

1. Calculation of the number of individuals of a species occurring in each of the different regions of the Chinese coastline by multiplying the species density (shorebirds/km^2), obtained from the site survey in the region, by the regional intertidal area (see Figure 3). A weighted average density was calculated when more than one site had been surveyed in a region. The regional estimates were added together to obtain an estimate of the total number of individuals of a species using the Chinese coastline. In order to avoid the possibility of overestimation, allowances were made in situations where a species concentrated in exceptionally large numbers at a particular site. The average density for China was used for the Shandong Peninsula.
2. Addition of the South Korean estimate (from Yi & Kim in prep.) to the Chinese estimate obtained in step 1.

The resulting estimate of the total number of individuals of a species passing through the Yellow Sea is likely to be conservative because:

- counts probably underestimate actual numbers present at a site;
- the maximum species count at a site is an underestimate of the total number passing through the site because it does not take migration turnover into account;
- North Korea, whose intertidal flats represent approximately 11% of the Yellow Sea area, is not included in the calculation.

Double-counting of the same bird at more than one site will lead to inflation of estimates but the resulting amount is probably outweighed by the underestimation resulting from the effect of the three factors listed above.

The true importance of the Yellow Sea for a species on northward migration is most appropriately measured by the proportion of the flyway breeding population it is supporting, as immature birds mostly remain on or near the non-breeding areas during the migration periods and breeding season. The flyway breeding population for a species has been approximately calculated by assuming that breeding adults comprise 80% of the species estimated flyway population. This follows Wilson & Barter (1998) who used the 80% factor to calculate the sizes of the Great Knot, Red Knot and Bar-tailed Godwit flyway breeding populations. The factor is probably too high for most species and its use will result in an underestimate of the proportion of the flyway breeding population using the Yellow Sea; this will be compounded by the probably conservative estimate of the species numbers (see above). A factor of 100% has been used for species that may breed in their first year (e.g. Black-tailed Godwit, Marsh Sandpiper, Dunlin and Kentish Plover) (del Hoyo *et al.* 1996).

Table 2 The 1% criteria used to identify internationally important sites for shorebirds

Species	1% criterion
Black-tailed Godwit *Limosa limosa*	1 600
Bar-tailed Godwit *Limosa lapponica*	3 250
Little Curlew *Numenius minutus*	1 800
Whimbrel *Numenius phaeopus*	550
Eurasian Curlew *Numenius arquata*	350
Eastern Curlew *Numenius madagascariensis*	380
Spotted Redshank *Tringa erythropus*	400
Common Redshank *Tringa totanus*	650
Marsh Sandpiper *Tringa stagnatilis*	900
Common Greenshank *Tringa nebularia*	550
Spotted Greenshank *Tringa guttifer*	10
Terek Sandpiper *Xenus cinereus*	500
Grey-tailed Tattler *Heteroscelus brevipes*	400
Ruddy Turnstone *Arenaria interpres*	310
Asian Dowitcher *Limnodromus semipalmatus*	230
Great Knot *Calidris tenuirostris*	3 800
Red Knot *Calidris canutus*	2 200
Sanderling *Calidris alba*	220
Red-necked Stint *Calidris ruficollis*	3 150
Sharp-tailed Sandpiper *Calidris acuminata*	1 600
Dunlin *Calidris alpina*	9 500
Curlew Sandpiper *Calidris ferruginea*	1 800
Spoon-billed Sandpiper *Eurynorhynchus*	40
Broad-billed Sandpiper *Limicola falcinellus*	180
Red-necked Phalarope *Phalaropus lobatus*	1 000
Eurasian Oystercatcher *Haematopus ostralegus*	100
Black-winged Stilt *Himantopus himantopus*	200
Pied Avocet *Recurvirostra avosetta*	300
Grey-headed Lapwing *Vanellus cinereus*	100
Northern Lapwing *Vanellus vanellus*	600
Grey Plover *Pluvialis squatarola*	1 250
Kentish Plover *Charadrius alexandrinus*	950
Little Ringed Plover *Charadrius dubius*	250
Lesser Sand Plover *Charadrius mongolus*	600
Oriental Plover *Charadrius veredus*	700
Oriental Pratincole *Glareola maldivarum*	750

3.6 Abbreviations used in the species and site accounts

NM	northward migration
SM	southward migration
B	breeding
L	Lake
R	River
EAAF	East Asian-Australasian Flyway
PNR	Provincial Nature Reserve
NNR	National Nature Reserve
MBWR	Migratory Bird Wetland Reserve
>	greater than
<	less than
>>	much greater than

Compass directions
n., ne…..w., sw. Also, when used as an adjective, e.g. s. Yakutia.

4 SHOREBIRDS OCCURRING IN INTERNATIONALLY IMPORTANT NUMBERS AT YELLOW SEA SITES

4.1 Organisation of Species Accounts

Accounts have been prepared for all species that occur in **internationally important numbers** at one or more sites in the coastal regions of the Yellow Sea. Species are listed according to the taxonomic order given in Christidis & Boles (1994), with guidance from Hayman *et al.* (1986) for species which have not been recorded in Australia.

Each species account contains:
1. Sections on:
   - **Subspecies** – worldwide and for the Yellow Sea. Recently, there has been much discussion about the taxonomy of a number of species that occur in the East Asian-Australasian Flyway (see, for example, Engelmoer & Roselaar 1998 and Tomkovich & Serra 1999). However, it has been decided to adopt a conservative approach to taxonomy and employ the widely recognized subspecies nomenclature used in major reference works, such as Higgins & Davies (1996), Cramp & Simmons (1983), Rose & Scott (1997) and del Hoyo *et al.* (1996). For two species (Red Knot and Dunlin) mention is made of potential additional subspecies where these seem to be gaining wider acceptance.
   - **Distribution:**
     - *Breeding* – core areas.
     - *Non-breeding* – main regions.
   - **Usage and importance of the Yellow Sea:**
     - *Occurrence* – habitat used in the Yellow Sea, most important regions for the species during the breeding season (**B**), northward migration (**NM**), southward migration (**SM**) and non-breeding (**NB**) season, and comment on the accuracy of species number estimates.
     - *Movements* – timing of passage and information, where it is available from banding data, on the non-breeding locations of populations passing through the Yellow Sea.
     - *Significance of the Yellow Sea* – an estimate of the proportion of flyway population passing through the Yellow Sea on northward migration is given when sufficient information is available. This estimate is mainly based on the China and South Korea data, but some allowance is made for North Korea where it is believed to be appropriate. Where possible, comments are also made on numbers during southward migration and at other times of the year.
     - *Key sites* – number of sites of international importance in the Yellow Sea, total and by country, listings of sites which are important in more than one period (i.e. northward migration, southward migration and the non-breeding season), and of those sites which support >5% of the estimated species flyway population.
     - *Status of key sites* - number of sites in Protected Areas. Protected Areas comprise National (NNR) and Provincial (PNR) Nature Reserves in China, a Migratory Bird Wetland Reserve (MBWR) in North Korea and the Dongjin Shorebird Network Site in South Korea. The fact that a site lies within a Protected Areas does not necessarily imply that shorebirds and their habitats are effectively conserved (see Section 7 for more information on shorebird conservation status in Protected Areas).
     - *Major gaps in knowledge*

2. Tables listing internationally important sites and maximum counts at these sites during the northward and southward migration periods, and in the non-breeding season. Maps show locations of the sites and a list of references for the counts is provided at the end of each account. N.B. With the exception of Common Redshank and Oriental Pratincole, maps are not given for important breeding locations as these are covered in the relevant species text under *Occurrence*.

3. A box containing key summary information - conservation status (if the species is threatened or near-threatened), flyway population estimate, status of the species in the Yellow Sea, estimates of minimum numbers occurring in South Korea and China, and information on the number of internationally important sites and their Protected Area status. The South Korean number estimates have been taken from Yi & Kim (in prep.); those for China are for northward migration only, as there are insufficient count data to make estimates for other periods.

The individual species accounts have been mostly compiled from the sources listed below. In order to simplify the text, these sources are not cited within the Species Accounts. Less frequently used references have been included within the text.

4.2 Major sources of information for the Species Accounts

4.2.1 Subspecies and distribution

Higgins & Davies 1996.
Cramp & Simmons 1983.
Rose & Scott 1997.
del Hoyo *et al.* 1996.
P.S. Tomkovich in litt.

4.2.2 Yellow Sea count and migration information

China count data

Jiu Duan Sha: J.J. Lu in litt.
Chongming Dao PNR: Wang & Tang 1990a, 1990b Barter *et al.* 1997a, 1998a; J.J. Lu in litt.
Dong Sha: Wang & Barter 1998
Yancheng NNR: Wang & Liu 1994; Wang 1997 Barter *et al*. in prep.
Huang He NNR: Wang *et al.* 1991, 1992; Barter *et al.* 1999; Zhu *et al.* 2000
Tianjin Municipality: Barter *et al.* 2001; S.P. Zhang in litt.
Shi Jiu Tuo: J. Kriegs, G. Carey, C. Doughty, F. Heintzenberg, J. Hornskov, Regulus Travel, all in litt.
Linghekou: Barter *et al.* 2000b
Shuangtaizihekou NNR: Brazil 1992; Barter *et al.* 2000d; Y.X. Li in litt.
Yalu Jiang NNR: Barter *et al.* 2000c, 2000i

South Korea count data

Yi & Kim in prep., plus additional data for 1999 supplied by the authors.
Moores 1999a

Japan count data

JAWAN 1998, 1999

Banding data

Australia - Australian Bird and Bat Banding Scheme unpub. data.
New Zealand - Riegen 1999; A.C. Riegen in litt.

4.3 Species Accounts summary

4.3.1 Introduction

A total of 36 shorebird species has so far been found to occur in internationally important numbers at one or more sites in the Yellow Sea. This number represents 60% of the migratory shorebird species in the East Asian-Australasian Flyway. Two of the species are classified as globally threatened, the Spotted Greenshank (Endangered) and Spoon-billed Sandpiper (Vulnerable), whilst two are near-threatened, the Eastern Curlew and Asian Dowitcher (BirdLife International 2001).

The shorebirds using the Yellow Sea have breeding ranges which are spread across a wide area ranging from the Taimyr Peninsula, in central north Siberia, eastwards to the Russian Far East and Alaska, and southwards to Mongolia, northern China and the Yellow Sea, itself. Their non-breeding distributions occur within the region stretching from Bangladesh through Indochina and southern China to Japan, and southwards through South East Asia to Australasia.

Most of the shorebirds using the Yellow Sea feed on the vast intertidal flats, but many birds also use near-coastal non-tidal wetlands, particularly mariculture ponds and saltpans. These inland areas also provide particularly important roosting sites in locations where reclamation has resulted in the removal of typical roosting habitat on spits, saltmarsh and mudflats. A few species are found in grassland and arable areas.

It is highly probable that numbers of some species have been significantly underestimated. Potential reasons for this include:

- dispersed distribution of shorebirds over tidal flats and mariculture ponds;
- inadequate surveying of non-tidal wetlands, grasslands and arable areas;
- timing of surveys may not have coincided with the occurrence of maximum numbers during the migration periods or the non-breeding season;
- identification problems.

It is very likely that more thorough surveying would result in a significant increase in the estimated abundances of many species and in the identification of additional internationally important sites.

4.3.2 Usage of the Yellow Sea

Table 3 lists the 36 shorebird species recorded in internationally important numbers at sites in the Yellow Sea. It also gives details on the number of sites at which they occur in significant numbers during the migration and non-breeding periods, and the breeding season. The locations of the internationally important sites are shown in Figure 6 (see 5.2).

Thirty-five species (i.e. all except the Oriental Pratincole) use the Yellow Sea wetlands in internationally important concentrations during the migration periods, with 20 of these occurring at more sites during northward migration than on southward passage - however this could be an artefact caused by the relative lack of information from China during southward migration. Despite this potential bias, some species have been found to occur at more sites during southward migration than northward (Kentish Plover, Eurasian Curlew, Terek Sandpiper and Common Greenshank). Significant proportions of some species, such as Bar-tailed Godwit, Whimbrel, Great Knot and Grey Plover, appear to bypass the region during southward migration and fly across the Pacific directly to their

non-breeding grounds, but it is possible that high numbers of these species may yet be found at Yellow Sea sites not yet surveyed during southward passage.

Seven species occur in internationally important concentrations in the southern part of the Yellow Sea during the non-breeding season (Eurasian Curlew, Spotted Redshank, Common Greenshank, Sanderling, Eurasian Oystercatcher, Pied Avocet and Kentish Plover). The great majority of the estimated flyway population of the Eurasian Oystercatcher appears to spend the non-breeding season in the Yellow Sea, and more than 50% of the population occurs at one site on the west coast of South Korea (Geum Gang Hagu).

Five species breed at Yellow Sea sites in internationally important numbers, i.e. Common Redshank, Eurasian Oystercatcher, Black-winged Stilt, Kentish Plover and Oriental Pratincole. Table 4 lists sites at which species counts have exceeded 5%, 10% or 20% of their estimated flyway

Table 3. Species ranked according to the number of sites at which they occur in internationally important numbers, with details on seasonality

	Number of sites of international importance				
Species	**Total**	**Northward migration**	**Southward migration**	**Non-breeding season**	**Breeding season**
Kentish Plover	21	11	16	4	2
Eurasian Curlew	15	7	11	6	-
Terek Sandpiper	14	9	13	-	-
Eastern Curlew	13	12	7	-	-
Grey Plover	13	12	7	-	-
Great Knot	12	11	3	-	-
Black-tailed Godwit	12	7	6	-	
Dunlin	11	10	5	-	-
Lesser Sand Plover	11	10	7	-	-
Common Greenshank	11	4	8	1	-
Whimbrel	9	9	-	-	-
Spotted Greenshank	9	4	6	-	-
Bar-tailed Godwit	8	8	1	-	-
Eurasian Oystercatcher	7	3	4	2	2
Red-necked Stint	5	5	2	-	-
Black-winged Stilt	5	4	3	-	2
Marsh Sandpiper	5	3	4	-	-
Red Knot	5	3	2	-	-
Broad-billed Sandpiper	5	2	4	-	-
Asian Dowitcher	4	4	3	-	-
Spotted Redshank	4	4	2	1	-
Little Ringed Plover	4	4	2	-	-
Ruddy Turnstone	3	3	1	-	-
Sanderling	3	1	3	1	-
Common Redshank	2	2	1	-	2
Sharp-tailed Sandpiper	2	2	1	-	-
Curlew Sandpiper	2	2	-	-	-
Northern Lapwing	2	1	2	-	-
Grey-tailed Tattler	2	1	1	-	-
Pied Avocet	2	1	-	1	-
Spoon-billed Sandpiper	2	-	2	-	-
Grey-headed Lapwing	2	-	2	-	-
Little Curlew	1	1	-	-	-
Oriental Plover	1	1	-	-	-
Red-necked Phalarope	1	-	1	-	-
Oriental Pratincole	1	-	-	-	1

Table 4 Species occurring in concentrations >20%, >10% and >5% of their estimated flyway population and the sites at which they occur on a seasonal basis

Species	>20%	>10%	>5%
Black-tailed Godwit		Asan Man (NM)	Mangyeung Gang Hagu (SM)
Bar-tailed Godwit		Yalu Jiang NNR (NM)	
Little Curlew		Huang He NNR (NM)	
Eurasian Curlew	Huang He (NM) Shi Jiu Tuo (SM)		Tianjin Municipality (NM, SM & NB) Shi Jiu Tuo (NM) Namyang Man (NM & SM) Geum Gang Hagu (SM)
Eastern Curlew			Yalu Jiang NNR (NM) Ganghwa Do (NM)
Spotted Redshank		Yancheng NNR (SM)	Yancheng NNR (NM)
Marsh Sandpiper		Yancheng NNR (NM)	Yancheng NNR (SM)
Spotted Greenshank			Namyang Man (NM) Mangyeung Gang Hagu (SM) Dongjin Gang Hagu (SM)
Asian Dowitcher			Dong Sha (SM)
Great Knot		Dongjin Gang Hagu (NM) Mangyeung Gang Hagu (NM) Yalu Jiang NNR (NM)	Asan Man (NM) Shuangtaizihekou NNR (NM) Namyang Man (NM)
Red Knot			Tianjin Municipality (NM)
Sanderling		Yancheng NNR (NM)	Yancheng NNR (NB)
Dunlin			Yancheng NNR (NM) Mangyeung Gang Hagu (NM)
Curlew Sandpiper			Tianjin Municipality (NM)
Eurasian Oystercatcher	Geum Gang Hagu (NB)	Geum Gang Hagu (SM)	
Black-winged Stilt		Tianjin Municipality (NM)	Shi Jiu Tuo (SM)
Grey-headed Lapwing			Shi Jiu Tuo (SM)
Northern Lapwing			Shi Jiu Tuo (SM)
Grey Plover		Huang He NNR (NM)	Yalu Jiang NNR (NM) Tianjin Municipality (NM)
Kentish Plover	Huang He NNR (NM)	Mangyeung Gang Hagu (SM)	Chongming Dao (NM) Dongjin Gang Hagu (SM) Shi Jiu Tuo (SM) Yancheng NNR (SM)
Little Ringed Plover		Yancheng NNR (SM)	
Lesser Sand Plover			Dongjin Gang Hagu (NM & SM) Mangyeung Gang Hagu (NM & SM)

(Key: For site location see Figure 6 on Page 69.
NM = northward migration, SM = southward migration, NB = non-breeding season)

population during northward migration, southward migration or the non-breeding season. It can be seen that many species occur in site concentrations that greatly exceed the 1% threshold used for determining international importance. These sites are of prime conservation significance.

Shorebirds employ a wide variety of strategies in their use of the Yellow Sea. Some, such as Great Knot, Spotted Redshank and Asian Dowitcher, occur in high concentrations at a relatively limited number of sites, whilst others, such as Terek Sandpiper and Dunlin, spread themselves over a large number of sites with few major concentrations. The strategies of many species lie in between these extremes and they can occur in high numbers at a limited number of sites, whilst still having a generally widespread distribution (e.g. Eurasian Curlew, Eastern Curlew, Grey Plover and Kentish Plover). Conservation management of the different species will need to take into account the varying ways in which they use the Yellow Sea wetlands.

4.3.3 Importance of the Yellow Sea

Table 5 provides a summary of the estimated numbers using the Chinese and South Korean portions of the Yellow Sea during northward migration for those species for which sufficient count data are available. An estimate is also given of the

proportion of the flyway breeding populations being supported at this time of the year. See Section 3.5 for information on how northward migration numbers and the size of flyway breeding populations have been calculated.

The very great importance of the Yellow Sea for shorebirds during northward migration is demonstrated by the fact that it supports 30% or more of the flyway breeding populations of 18 species; for six of these species the region supports almost their whole flyway breeding population.

Table 5 Proportion of the breeding populations supported by the Yellow Sea during northward migration

Species	Population estimate	% breeding pop.
Great Knot	290 000	>90
Bar-tailed Godwit	230 000	>90
Grey Plover	110 000	>90
Kentish Plover	90 000	>90
Eastern Curlew	32 000	>90
Eurasian Curlew	32 000	>90
Dunlin	660 000	70
Whimbrel	33 000	70
Lesser Sand Plover	32 000	65
Spotted Redshank	20 000	60
Asian Dowitcher	9 300	50
Red Knot	67 000	40
Marsh Sandpiper	39 000	40
Red-necked Stint	87 000	35
Common Greenshank	15 000	35
Terek Sandpiper	14 000	35
Broad-billed Sandpiper	5 100	35
Black-tailed Godwit	48 000	30
Ruddy Turnstone	4 500	20
Little Curlew	>>17 000	>10
Sharp-tailed Sandpiper	17 000	10
Curlew Sandpiper	18 000	<10

The Yellow Sea is particularly important for four species of special concern, i.e. the endangered Spotted Greenshank and vulnerable Spoon-billed Sandpiper, and the near-threatened Eastern Curlew and Asian Dowitcher, which are all endemic to the East Asian-Australasian Flyway.

It is highly likely that the great majority of Spotted Greenshank and Spoon-billed Sandpiper use the Yellow Sea during both northward and southward migrations. Both these species are difficult to separate from their congeners and many birds are probably missed. Nonetheless, eight internationally important sites have been identified for the Spotted Greenshank and two for the Spoon-billed Sandpiper.

Approximately 80% of the estimated flyway population of the Eastern Curlew uses the Yellow Sea on northward migration and 40% of the Asian Dowitcher. These percentages rise to >90% and about 50%, respectively, when only the breeding portions of the flyway populations are considered.

In total, it is estimated that a minimum of 2 000 000 shorebirds use the Yellow Sea wetlands during northward migration, i.e. approximately 40% of the estimated flyway population of migratory shorebirds. Perhaps 1 000 000 shorebirds pass through the region on southward migration.

4.3.4 "Missing" and undercounted species

Only small numbers have been recorded of a number of species that could be expected to occur in significant concentrations in the Yellow Sea. Examples of such "missing" species are Ruddy Turnstone, Red Knot, Sanderling, Red-necked Stint, Sharp-tailed Sandpiper, Curlew Sandpiper and Broad-billed Sandpiper. It is possible that some of these species occur in large numbers in parts of the Yellow Sea that have not yet been surveyed. However, the evidence to date indicates that many Red-necked Stint, Sharp-tailed Sandpiper and Curlew Sandpiper are using inland routes through China (see individual Species Accounts). The Red Knot is an obligate coastal species which traditionally uses a very small number of staging sites during migration and it is probable that it is occurring in high numbers in some of the intertidal areas yet to be visited.

There are other species that almost certainly occur in the Yellow Sea in significant concentrations, e.g. Pin-tailed Snipe, Swinhoe's Snipe, Common Snipe, Green Sandpiper, Wood Sandpiper, Common Sandpiper, Temminck's Stint and Long-toed Stint. It is likely that intensive surveying of suitable habitat would lead to some of these species being recorded in internationally important numbers.

It is important to survey intensively for breeding shorebirds such as Common Redshank, Eurasian Oystercatcher, Black-winged Stilt, Kentish Plover and Oriental Pratincole. Important breeding concentrations of these species have already been identified and it is very probable that more exist.

4.4 Species Accounts

The following pages contain accounts for all 36 species that occur in **internationally important numbers** at one or more sites in the coastal regions of the Yellow Sea.

4.4.1 Black-tailed Godwit *Limosa limosa*

Subspecies Worldwide 3 (*limosa*, *islandica* and *melanuroides*); Yellow Sea 1 (*melanuroides*).

Distribution of *L. l. melanuroides*

Breeding: L. Baikal area, e. Mongolia, ne. China, Primorye, e. Yakutia and Kamchatka.

Non-breeding: Mainly coastal, but also inland. Bangladesh, Myanmar, Thailand, Indochina, s. China, se. Asia, New Guinea and n. Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **NM** and **SM** Widespread and common; particularly numerous on nw. coast of South Korea, often in coastal rice fields and marshes. Numbers are probably underestimated, as this species often occurs on non-tidal wetlands which were generally less well surveyed than intertidal areas.

Movements: **NM** In South Korea, main passage occurs in May; in n. China, arrivals commence in late March (Y.X. Li in litt.), with numbers appearing to build up through April and then declining in early May. **SM** In South Korea, mainly during August. Birds from both nw. and e. Australia migrate through South Korea.

Significance of Yellow Sea: The Yellow Sea is important for this species and supports about 30% of the estimated flyway population on NM. The remainder of the population probably migrates through inland areas of China. Numbers may be lower during SM.

Key sites: 12 sites of international importance have been identified, 4 in China and 8 in South Korea; 7 of the sites are important during NM and 6 during SM (see site location maps below), with Asan Man being important during both NM and SM. Asan Man is of particular importance in supporting >10% of the estimated flyway population during NM, whilst 5% use the Mangyeung Gang Hagu during SM.

EAAF POPULATION ESTIMATE: 160 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 31 000; China:17 000.
SM: South Korea: 17 000.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 8 *(part of 1)*
China: 4 *(3)*

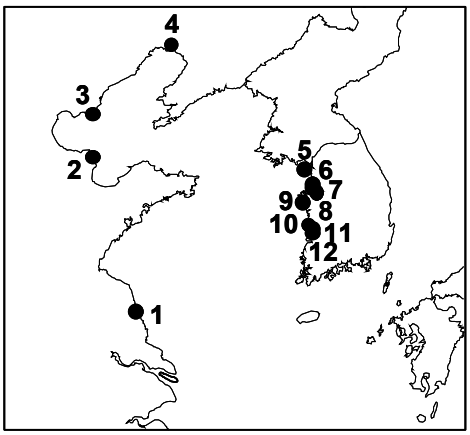
Status of key sites: The 3 Chinese sites and a small part of 1 site in South Korea (Dongjin Gang Hagu) are in Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Usage of coastal non-tidal wetlands in w. South Korea. Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands. No information from North Korea.

Site count references

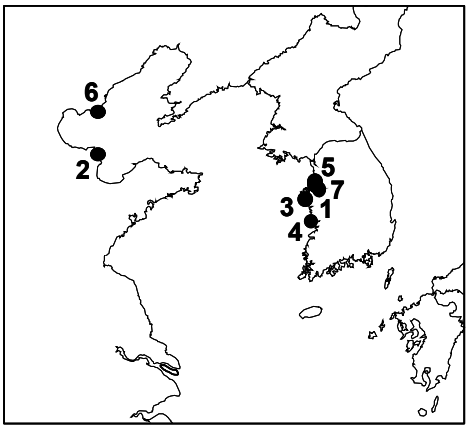
1. Yi & Kim in prep.
2. Zhu *et al.* 2000
3. Moores 1999a
4. RSPB Sabbatical Report 2002
5. Y.X. Li in litt.
6. Wang 1997

Sites of international importance for Black-tailed Godwit



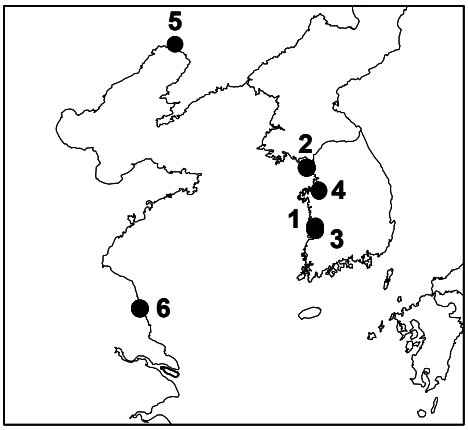
	China		South Korea
1	Yancheng NNR	5	Ganghwa Do
2	Huang He NNR	6	Namyang Man
3	Shi Jiu Tuo	7	Hongwon Ri
4	Shuangtaizihekou NNR	8	Asan Man
		9	Seosan Reclaimed Area
		10	Geum Gang Hagu
		11	Mangyeung Gang Hagu
		12	Dongjin Gang Hagu

Sites of international importance for Black-tailed Godwit during northward migration



	Site	Country	Count	Ref
1	Asan Man	South Korea	18 282	1
2	Huang He NNR	China	7 197	2
3	Seosan Reclaimed Area	South Korea	6 006	1
4	Geum Gang Hagu	South Korea	2 049	3
5	Namyang Man	South Korea	2 020	1
6	Shi Jiu Tuo	China	1 994	4
7	Hongwon Ri	South Korea	1 701	1

Sites of international importance for Black-tailed Godwit during southward migration



	Site	Country	Count	Ref
1	Mangyeung Gang Hagu	South Korea	8 008	1
2	Ganghwa Do	South Korea	2 915	1
3	Dongjin Gang Hagu	South Korea	2 750	1
4	Asan Man	South Korea	2 650	1
5	Shuangtaizihekou NNR	China	2 070	5
6	Yancheng NNR	China	1 686	6

4.4.2 Bar-tailed Godwit *Limosa lapponica*

Subspecies Worldwide 3 (*lapponica, menzbieri* and *baueri*); Yellow Sea 2 (*menzbieri* and *baueri*).

Distribution of *L. l. baueri* and *L. l. menzbieri* in the EAAF

Breeding: L. l. baueri, ne. Siberia, e. of R. Kolyma, and w. Alaska; *L. l. menzbieri*, n. Siberia, between R. Khatanga and Kolyma Delta.

Non-breeding: Coastal. *L. l. baueri*, mostly New Zealand and e. Australia, some on sw. Pacific Is.; *L. l. menzbieri*, mostly nw. Australia, also in se. China, Indonesia and Thailand.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** Widespread; very common along w. coast South Korea and in China from Huang He Delta n. and e. to North Korea. **SM** Much less common in South Korea and, probably, China. Numbers counted are probably realistic estimates of birds present in surveyed areas.

Movements: **NM** Peak passage of both subspecies occurs in second-half of April and early May. Both sub-species commence arriving in early April after non-stop flights from the non-breeding areas; *L. l. menzbieri* appears to have a more westerly migration route than *L. l. baueri*, although there is much overlap along the west coast of South Korea (J.R. Wilson in litt.). Leg-flag sightings in South Korea and at Yalu Jiang NNR, and observations of plumage differences at Yalu Jiang NNR, indicate a difference in timing of the two subspecies' migratory movements, with *L. l. baueri* passing through South

EAAF POPULATION ESTIMATES:
L. l. baueri: 155 000
L. l. menzbieri: 170 000
YELLOW SEA
Status: Passage migrant and uncommon non-breeding visitor
Estimated minimum numbers:
NM: South Korea: 35 000; China:190 000.
SM: South Korea: 12 000.
INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 5 *(part of 1)*
China: 3 *(3)*

Korea earlier than *L. l. menzbieri* and departing from Yalu Jiang for the breeding grounds by mid-May, and then being replaced at Yalu Jiang by *L. l. menzbieri*. This suggestion is consistent with *L. l. baueri*'s reported arrival on the core Alaskan breeding areas in early to mid-May (McCaffery & Gill 2001). **SM** Peak passage takes place from mid-August to early September. All band recoveries and leg-flag sightings during this period have been of the *menzbieri* subspecies, confirming that few *L. l. baueri*, if any, use the Yellow Sea on SM and this subspecies probably flies non-stop across the Pacific to New Zealand and e. Australia (Piersma & Gill 1998).

Significance of Yellow Sea: The Yellow Sea is extremely important for this species as it supports about 80% of the combined estimated flyway populations of the two subspecies during NM; few godwits have been reported from elsewhere during this period (e.g. in Japan, the maximum count is 3 453 at 271 sites). Whilst the Yellow Sea does not seems to be important for *L. l. baueri* on SM, a significant portion of the *menzbieri* population appears to return through the region.

Key sites: 8 sites of international importance have been identified, 3 in China and 5 in South Korea; all 8 sites are important during NM and 1 during SM (see site location maps below), with the Dongjin Gang Hagu being important during both NM and SM. Yalu Jiang NNR is of particular importance, supporting 10% of the combined estimated flyway populations during NM.

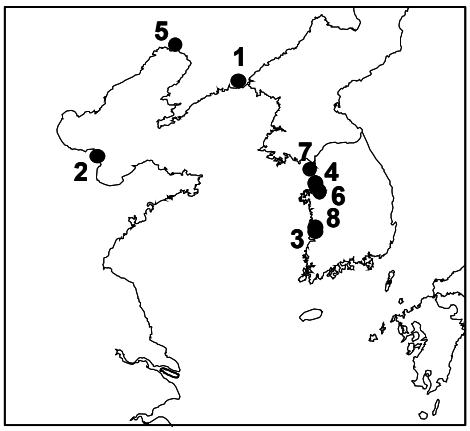
Status of key sites: The 3 Chinese sites and a small part of 1 site in South Korea (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: More data on the migration strategies of the 2 subspecies. Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count references

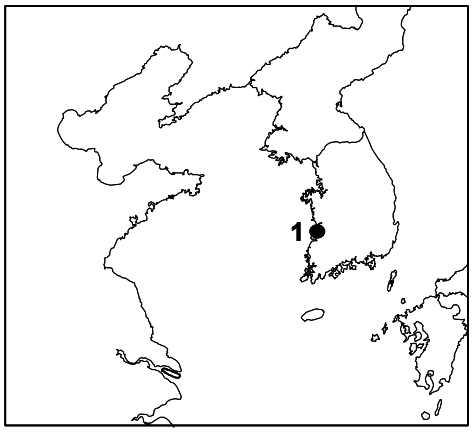
1. Barter *et al.* 2000e
2. Zhu *et al.* 2000
3. Yi & Kim. in prep.
4. Barter *et al.* 2000d

Sites of international importance for Bar-tailed Godwit (all used during northward migration)



	Site	Country	Count	Ref
1	Yalu Jiang NNR	China	51 918	1
2	Huang He NNR	China	10 678	2
3	Dongjin Gang Hagu	South Korea	8 430	3
4	Namyang Man	South Korea	5 800	3
5	Shuangtaizihekou NNR	China	3 738	4
6	Asan Man	South Korea	3 500	3
7	Yeong Jong Do	South Korea	3 500	3
8	Mangyeung Gang Hagu	South Korea	3 350	3

Site of international importance for Bar-tailed Godwit during southward migration



	Site	Country	Count	Ref
1	Dongjin Gang Hagu	South Korea	4 845	3

4.4.3 Little Curlew *Numenius minutus*

Subspecies None; entire global population confined to the EAAF.

Distribution

Breeding: n. Siberia, from s. of Taimyr across Yakutia to w. central Chukotka.

Non-breeding: Almost wholly in grasslands in n. Australia and New Guinea.

EAAF POPULATION ESTIMATE: 180 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
No estimates; rare in South Korea

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 1 *(part)*

Usage and importance of Yellow Sea

Occurrence: Near-coastal grasslands and arable areas. **NM** Generally recorded in small numbers (<100) in China from Chang Jiang Estuary n. to n. Liaodong Wan, except for the Huang He and Luan He deltas. In the Huang He Delta in early May 1998 it was estimated that 17 000 were present in only a small part of the preferred grassland and fallow rice field habitat (Barter *et al.* 1999). It is very likely that the total numbers using the Delta region are considerably higher than the May 1998 estimate. The cryptic nature of this species, especially in its preferred grassland habitat, means that it is easily overlooked. Little Curlew were frequently recorded in the Luan He Delta in April-May 2001, with the largest flock comprising 500 birds (RSPB Sabbatical Report 2002); it is believed that systematic counts could lead to large numbers of birds being found in this region (D. Allen in litt.). However, it is unlikely that Little Curlew are present in large numbers in the other coastal areas recently surveyed in China, implying that many may migrate through inland China. Rare in South Korea. **SM** Recorded in small numbers in China from Shi Jiu Tuo southwards. Rare in South Korea.

Movements: **NM** Arrivals appear to occur after early April, with birds probably flying non-stop from Australia (Lane 1987). No information is available on departure dates from the Yellow Sea, but birds arrive on breeding grounds in last ten days of May (Labutin *et al.* 1982). **SM** Reported to pass along Chinese coast in September (la Touche 1931-34), following staging in e. Mongolia (Ostapenko *et al*. 1980).

Significance of Yellow Sea: There is insufficient information to allow an estimate to be made of numbers occurring in the Yellow Sea.

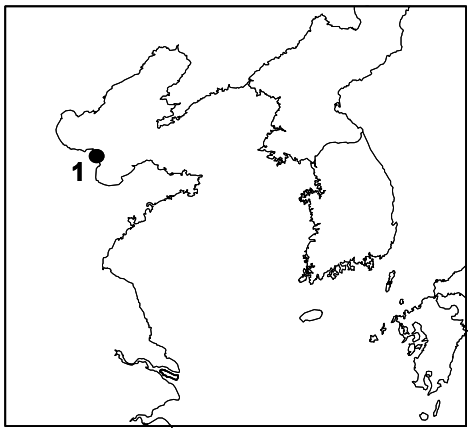
Key sites: 1 site of international importance has been identified, during NM (see site location map below). This site supports at least 10% of the world population at this time. *Status of key sites:* Part of the Huang He Delta is within a Protected Area (Huang He NNR).

Major gaps in knowledge: Inland areas with suitable habitat need surveying from the Chang Jiang Estuary n. during both NM and SM. The full role of the Huang He and Luan He deltas during NM needs to be established.

Site count reference

1. Barter *et al.* 1999

Site of international importance for Little Curlew (used during northward migration)



	Site	Country	Count	Ref
1	Huang He Delta	China	17 000	1

4.4.4 **Whimbrel** *Numenius phaeopus*

Subspecies Worldwide 4 (*phaeopus, alboaxillaris, variegatus* and *hudsonicus*); Yellow Sea 1 (*variegatus*).

Distribution of *N. p. variegatus*

Breeding: n. central and e. Yakutia, and Chukotka.

Non-breeding: Coastal. Thailand, Indochina, s. China, se. Asia, New Guinea, w. Pacific Islands and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal and near-coastal areas. **NM** Widespread and common in China and South Korea. **SM** Much less common than during NM. Numbers are probably significantly underestimated, as this species is often spread thinly over upper tidal flats and around banks of mariculture ponds both of which are difficult to count effectively.

Movements: **NM** In China, numbers build up from mid-April onwards, peaking in late April and May. Maximum numbers occur in South Korea during first-half of May. **SM** Maximum numbers occur in South Korea during August. Lower numbers on SM indicate that some birds may return non-stop across Pacific to w. Pacific, se. Asia and Australia.

Significance of Yellow Sea: The Yellow Sea is very important for this species as it probably supports about 50% of the estimated flyway population during NM. Lower numbers occur during SM.

EAAF POPULATION ESTIMATE: 55 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 7 600; China: 22 000.
SM: South Korea: 1 900.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 5 *(part of 1)*
China: 4 *(3)*

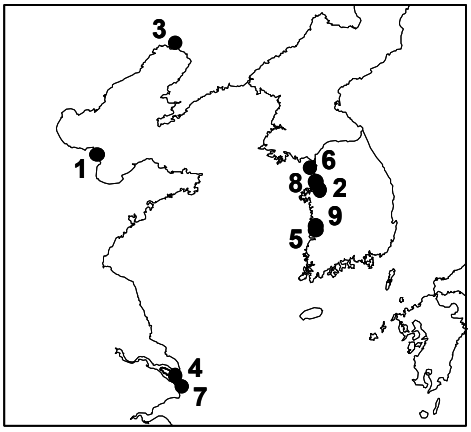
Key sites: 9 sites of international importance have been identified, 5 in South Korea and 4 in China, all during NM (see site location map below).

Status of key sites: 3 of the Chinese sites and a small part of 1 of the South Korean sites (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands. No information from North Korea.

Site count references
1. Zhu *et al.* 2000
2. Yi & Kim in prep.
3. Barter *et al.* 2000d
4. J.J. Lu in litt.

Sites of international importance for Whimbrel (all used during northward migration)



	Site	Country	Count	Ref
1	Huang He NNR	China	2 626	1
2	Asan Man	South Korea	1 310	2
3	Shuangtaizihekou NNR	China	1 306	3
4	Chongming Dao PNR	China	1 200	4
5	Dongjin Gang Hagu	South Korea	1 070	2
6	Yeong Jong Do	South Korea	825	2
7	Jiu Duan Sha	China	800	4
8	Namyang Man	South Korea	740	2
9	Mangyeung Gang Hagu	South Korea	620	2

4.4.5 Eurasian Curlew *Numenius arquata*

Subspecies Worldwide 2 (*arquata* and *orientalis*); Yellow Sea 1 (*orientalis*).

Distribution of *N. a. orientalis* in the EAAF

Breeding: e. and w. of L. Baikal.

Non-breeding: Coastal. se. and e. Asia, including e. and s. China, Japan and South Korea.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Widespread, particularly common in China from the Bo Hai to the North Korean border, and in nw. South Korea. **NB** Common in China in Tianjin Municipality and s. from Yancheng NNR, and along w. and s. coasts of South Korea. Numbers are probably underestimated, as this species is often spread thinly over upper tidal flats which are difficult to count effectively.

Movements: **NM** Main passage in April. **SM** Extended passage period from August to October, peaking in South Korea during October when migrants and non-breeding birds occur together. Large numbers (15 000) present in mid-August in Bohai Wan, declining to 1 350 by mid-September. Many of birds seen on both NM and SM in South Korea are believed to be those spending non-breeding period there.

Significance of Yellow Sea: The Yellow Sea is extremely important for this species as it supports about 80% of the estimated flyway population during NM. Large numbers also occur on SM and during the NB season.

Key sites: 15 sites of international importance have been identified, 8 in South Korea and 7 in China; 7 of the sites are important during NM, 11 during SM and 6 in the NB season (see site location maps below). 5 sites are important during both NM and SM (Huang He NNR, Tianjin Municipality, Shi Jiu Tuo, Shuangtaizihekou NNR and Namyang Man). The Bo Hai region supports particularly large concentrations during both NM and SM (probably >50% of the estimated flyway population); whilst Namyang Man during both NM and SM, and Geum Gang Hagu during SM, support >5% of the population.

EAAF POPULATION ESTIMATE: 35 000

YELLOW SEA

Status: Passage migrant and non-breeding visitor

Estimated minimum numbers:

NM: South Korea: 2 400; China: 30 000.
SM: South Korea: 5 900.
NB: South Korea: 2 700.

INTERNATIONALLY IMPORTANT SITES

(and Protected Area status)

South Korea: 8 *(part of 1)*
China: 7 *(4)*

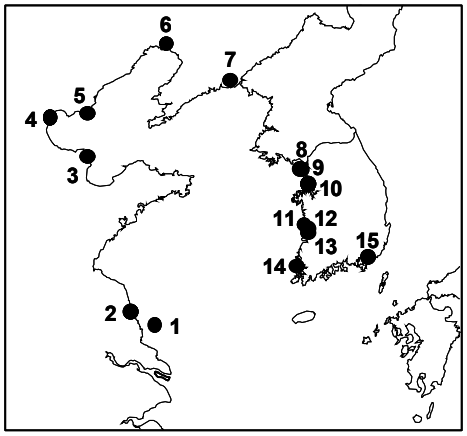
Status of key sites: 4 of the Chinese sites and a small part of 1 of the South Korean sites (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: More data is needed on distribution and abundance in Bohai Wan, which appears to be the key staging region on both NM and SM. Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count references

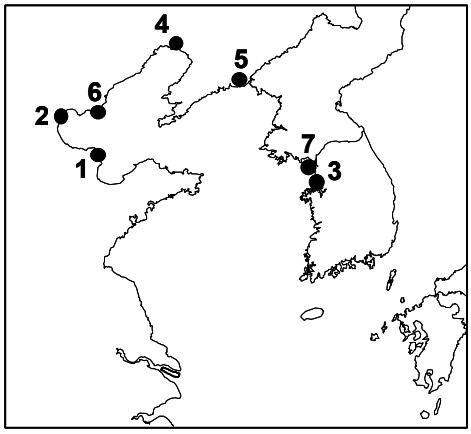
1. Zhu *et al.* 2000
2. RSPB Sabbatical Report 2002
3. S.P Zhang in litt.
4. Yi & Kim in prep.
5. Barter *et al.* 2000d
6. Barter *et al.* 2000c
7. F. Heintzenberg in litt.
8. Wang *et al*. 1991
9. Brazil 1992
10. Wang 1997
11. Moores 1999a
12. Wang & Barter 1998

Sites of international importance for Eurasian Curlew



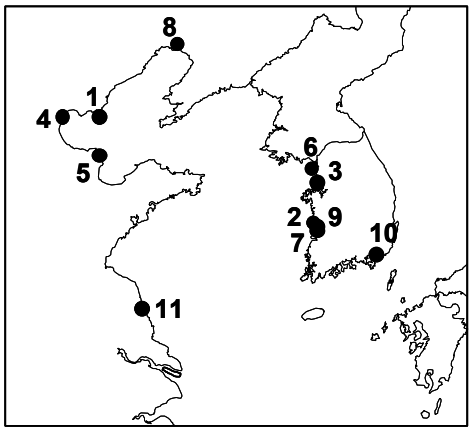
	China		South Korea
1	Dong Sha	8	Ganghwa Do
2	Yancheng NNR	9	Yeong Jong Do
3	Huang He NNR	10	Namyang Man
4	Tianjin Municipality	11	Geum Gang Hagu
5	Shi Jiu Tuo	12	Mangyeung Gang Hagu
6	Shuangtaizihekou NNR	13	Dongjin Gang Hagu
7	Yalu Jiang NNR	14	Aphae Do
		15	Nakdong Gang Hagu

Sites of international importance for Eurasian Curlew during northward migration



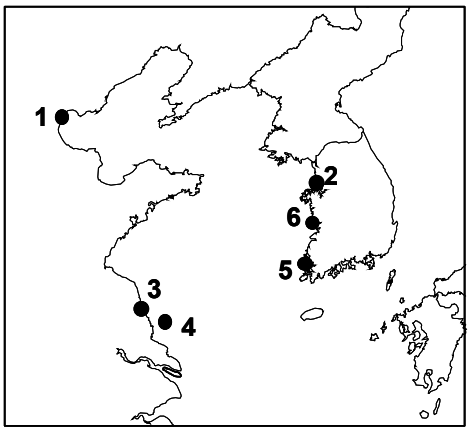
	Site	Country	Count	Ref
1	Huang He NNR	China	9 766	1
2	Shi Jiu Tuo	China	3 400	2
3	Tianjin Municipality	China	2 000	3
4	Namyang Man	South Korea	1 880	4
5	Shuangtaizihekou NNR	China	1 535	5
6	Yalu Jiang NNR	China	563	6
7	Ganghwa Do	South Korea	363	4

Sites of international importance for Eurasian Curlew during southward migration



	Site	Country	Count	Ref
1	Shi Jiu Tuo	China	15 000	7
2	Geum Gang Hagu	South Korea	2 800	4
3	Namyang Man	South Korea	2 451	4
4	Tianjin Municipality	China	2 000	3
5	Huang He NNR	China	912	8
6	Yeong Jong Do	South Korea	852	4
7	Dongjin Gang Hagu	South Korea	775	4
8	Shuangtaizihekou NNR	China	700	9
9	Mangyeung Gang Hagu	South Korea	530	4
10	Nakdong Gang Hagu	South Korea	479	4
11	Yancheng NNR	China	379	10

Sites of international importance for Eurasian Curlew in the non-breeding season



	Site	Country	Count	Ref
1	Tianjin Municipality	China	2 000	3
2	Namyang Man	South Korea	1 148	11
3	Yancheng NNR	China	697	10
4	Dong Sha	China	400	12
5	Aphae Do	South Korea	397	11
6	Geum Gang Hagu	South Korea	350	11

4.4.6 Eastern Curlew *Numenius madagascariensis*

Subspecies None; entire global population confined to the EAAF.

Distribution

Breeding: Yakutia, central and e. Amur Region, ne. China and Kamchatka.

Non-breeding: Coastal. Great majority in n., e. and se. Australia; few in South Korea, se. China and Taiwan.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Common on coasts of China and South Korea. **NB** Few s. from Yancheng NNR and on w. coast of South Korea. **B** Large numbers of immature birds (1718 max.) are present at Yancheng NNR in the northern summer. Numbers are probably underestimated, as this species is often spread thinly over upper tidal flats which are difficult to count effectively.

Movements: **NM** Arrive early March onwards after long non-stop flights from the non-breeding areas (Driscoll 2000), with main passage on e. and w. coasts of Yellow Sea during March and April. High numbers at Yalu Jiang NNR in early May could indicate that many birds relocate to n. Yellow Sea before leaving for breeding grounds. **SM** Return passage commences in early July, with peak passage during August and September. Birds from nw. and se. Australia occur in Yellow Sea on both NM and SM, but se. Australian birds seem to have a more easterly migration route on NM, including through Japan.

Significance of Yellow Sea: The Yellow Sea is extremely important for this near-threatened species as it supports about 80% of the estimated flyway population on NM. Fewer appear to occur during SM. Relatively few pass through Japan on either migration (e.g. 486 max.).

Key sites: 13 sites of international importance have been identified, 6 in China, 6 in South Korea and 1 in North Korea; 12 of the sites are important during NM and 7 during SM (see site location maps below). 6 sites are important during both NM and SM (Dong Sha, Shuangtaizihekou NNR, Ganghwa Do, Yeong Jong Do, Mangyeung Gang Hagu and Dongjin Gang Hagu). Yalu Jiang NNR supports almost 10% and Ganghwa Do >5% of the estimated flyway population during NM.

Status of key sites: 4 of the Chinese sites, the North Korean site and a small part of 1 of the South Korean sites (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

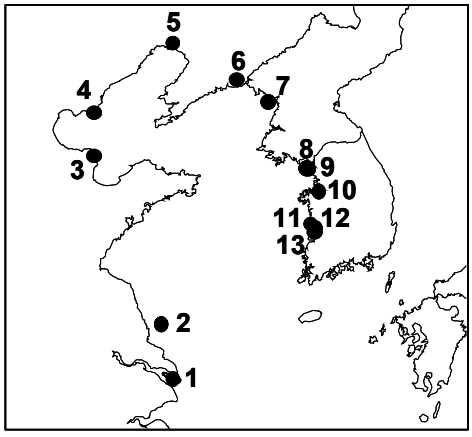
Major gaps in knowledge: Incomplete geographical and temporal coverage in China. Little information from North Korea.

CONSERVATION STATUS: Near threatened
EAAF POPULATION ESTIMATE: 38 000
YELLOW SEA
Status: Passage migrant and uncommon non-breeding visitor
Estimated minimum numbers:
NM: South Korea: 6 500; China: 25 000.
SM: South Korea: 3 800.
INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 6 *(part of 1)*
North Korea: 1 *(1)*
China: 6 *(4)*

Site count references

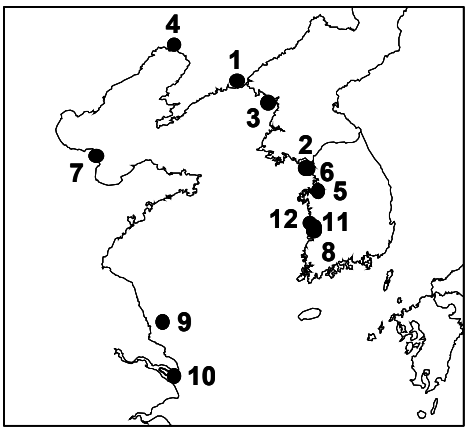
1. Barter *et al*. 2000e
2. Yi & Kim in prep.
3. UNDP 2000c
4. Barter *et al*. 2000d
5. Zhu *et al*. 2000
6. Wang & Barter 1998
7. Barter *et al*. 1997a
8. Y.X. Li in litt.
9. J. Kriegs in litt.

Sites of international importance for Eastern Curlew



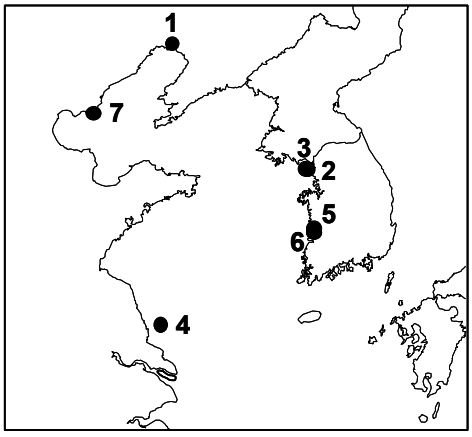
	China		South Korea
1	Chongming Dao PNR	8	Ganghwa Do
2	Dong Sha	9	Yeong Jong Do
3	Huang He NNR	10	Asan Man
4	Shi Jiu Tuo	11	Geum Gang Hagu
5	Shuangtaizihekou NNR	12	Mangyeung Gang Hagu
6	Yalu Jiang NNR	13	Dongjin Gang Hagu
	North Korea		
7	Mundok MBWR		

Sites of international importance for Eastern Curlew during northward migration



	Site	Country	Count	Ref
1	Yalu Jiang NNR	China	3 744	1
2	Ganghwa Do	South Korea	2 120	2
3	Mundok MBWR	North Korea	1 890	3
4	Shuangtaizihekou NNR	China	1 803	4
5	Asan Man	South Korea	1 170	2
6	Yeong Jong Do	South Korea	1 140	2
7	Huang He NNR	China	1 125	5
8	Dongjin Gang Hagu	South Korea	1 045	2
9	Dong Sha	China	819	6
10	Chongming Dao PNR	China	794	7
11	Mangyeung Gang Hagu	South Korea	625	2
12	Geum Gang Hagu	South Korea	422	2

Sites of international importance for Eastern Curlew during southward migration



	Site	Country	Count	Ref
1	Shuangtaizihekou NNR	China	1 817	8
2	Yeong Jong Do	South Korea	1 620	2
3	Ganghwa Do	South Korea	1 535	2
4	Dong Sha	China	1 532	6
5	Mangyeung Gang Hagu	South Korea	1 100	2
6	Dongjin Gang Hagu	South Korea	680	2
7	Shi Jiu Tuo	China	500	9

4.4.7 Spotted Redshank *Tringa erythropus*

Subspecies None.

Distribution in the EAAF

Breeding: n. Yakutia, n. and nw. Chukotka and Kamchatka.

Non-breeding: Inland and coastal. Myanmar, Thailand, Indochina, s. and e. China, Taiwan and se. Asia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **NM** and **SM** Widespread, much more common in China than South Korea; particularly numerous at Yancheng NNR during SM. **NB** Common at Yancheng NNR. Numbers are probably underestimated, as this species often occurs on non-tidal wetlands which were generally less well surveyed than intertidal areas.

Movements: No information.

Significance of Yellow Sea: The Yellow Sea is important for this species during NM, when it

EAAF POPULATION ESTIMATE: 40 000

YELLOW SEA

Status: Passage migrant and non-breeding visitor

Estimated minimum numbers:

NM: South Korea: 640; China: 19 000.

SM: South Korea: 90.

INTERNATIONALLY IMPORTANT SITES

(and Protected Area status)

China: 4 *(2)*

supports about 50% of the estimated flyway population. Large numbers also occur on SM and the species is common in e. China during the NB season.

Key sites: 4 sites of international importance have been identified, all in China; all 4 sites are important during NM, 2 during SM and 1 in the NB season (see site location maps below), with Yancheng NNR and Tianjin Municipality being important during both NM and SM. Yancheng NNR supports almost 10% of the estimated flyway population on NM and >10% on SM.

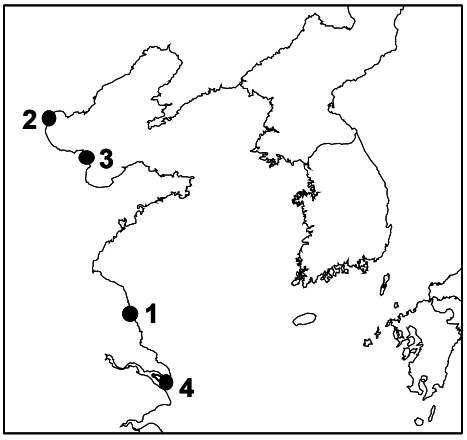
Status of key sites: 2 of the Chinese sites are in Protected Areas.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands. No information from North Korea.

Site count references

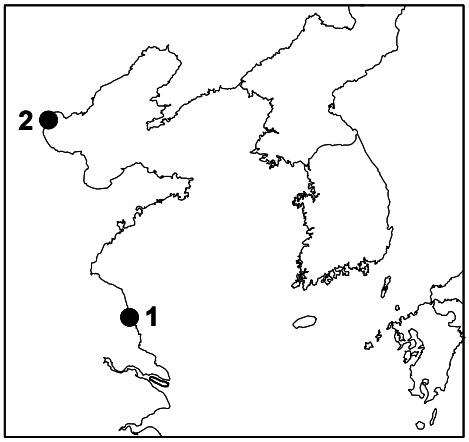
1. Barter *et al.* in prep.
2. S.P. Zhang in litt.
3. Zhu *et al.* 2000
4. J.J. Lu in litt.
5. Wang 1997

Sites of international importance for Spotted Redshank (all used during northward migration)



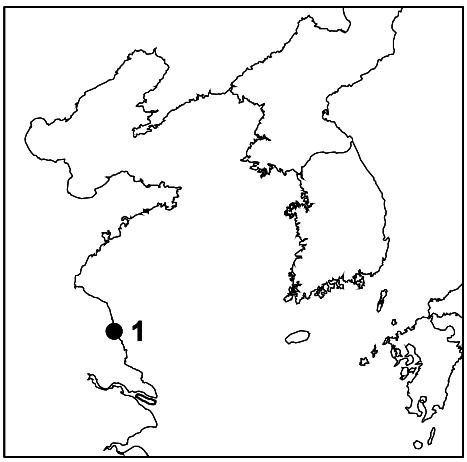
	Site	Country	Count	Ref
1	Yancheng NNR	China	3 834	1
2	Tianjin Municipality	China	1 000	2
3	Huang He NNR	China	594	3
4	Jiu Duan Sha	China	500	4

Sites of international importance for Spotted Redshank during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	7 150	5
2	Tianjin Municipality	China	1 000	2

Site of international importance for Spotted Redshank in the non-breeding season



	Site	Country	Count	Ref
1	Yancheng NNR	China	1 511	5

4.4.8 Common Redshank *Tringa totanus*

Subspecies Worldwide 6 (*totanus*, *ussuriensis*, *robusta*, *terrignotae*, *craggi* and *eurhinus*); Yellow Sea 2 (*terrignotae* and *craggi*).

Distribution of *T. t. terrignotae* and *T. t. craggi* in the EAAF

Breeding: T. t. terrignotae, ne. China and Amur R. region; *T. t. craggi*, nw. China and se. Siberia.

Non-breeding: Coastal and inland wetlands. *T. t. terrignotae,* se. and e. China; *T. t. craggi*, unknown, but probably e. China.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **B** Common breeder around Chinese part of Yellow Sea (pers. obs.), but little quantitative information. 400 pairs at Shuangtaizihekou NNR (Y.X. Li in litt.). Very common breeding bird (in the thousands) in Yancheng NNR (H. Wang pers. comm.) **NM** and **SM** Widespread in China but nowhere very common, with largest numbers from Chang Jiang Estuary to Liaodong Wan; uncommon in South Korea. **NB** Small numbers from Yancheng NNR s. Numbers are probably underestimated, as this species often occurs on non-tidal wetlands which were generally less well surveyed than intertidal areas.

Movements: No information.

Significance of Yellow Sea: There is insufficient information on numbers, subspecies population sizes and breeding numbers to allow an estimate to be made of numbers occurring in China.

EAAF POPULATION ESTIMATE: 65 000

YELLOW SEA
Status: Possibly resident, breeding visitor, passage migrant and non-breeding visitor
Estimated minimum numbers:
NM: South Korea: 200.
SM: South Korea: 120.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 4 *(2)*

Key sites: 4 sites of international importance have been identified, all in China; 2 of the sites are important during NM and 1 during SM (see site location maps below). Breeds in internationally important numbers at the Yancheng and Shuangtaizihekou NNRs (see map below for site locations). Tianjin Municipality is important during both NM and SM.

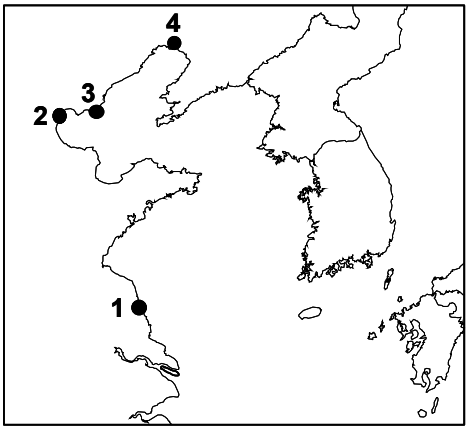
Status of key sites: 2 sites are in Protected Areas.

Major gaps in knowledge: Improved information on subspecies distribution. Identification of important breeding sites. Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands. No information from North Korea.

Site count references

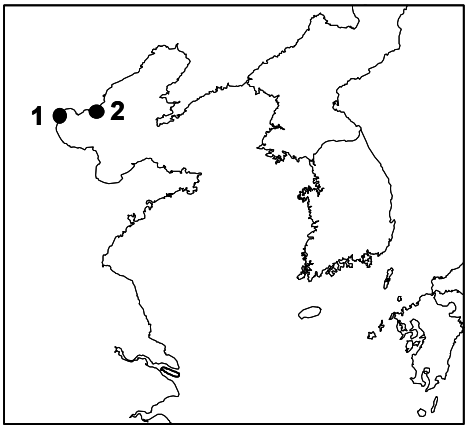
1. S.P. Zhang in litt.
2. C. Doughty in litt.

Sites of international importance for Common Redshank (including two breeding sites)



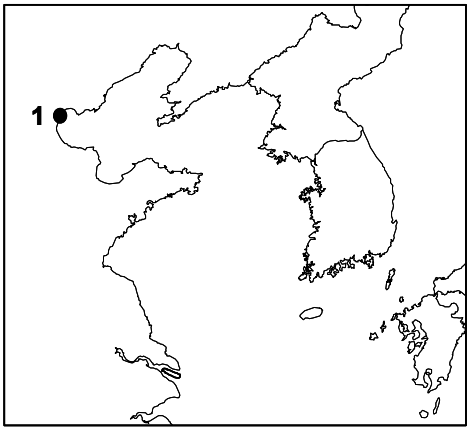
	China
1	Yancheng NNR (B)
2	Tianjin Municipality
3	Shi Jiu Tuo
4	Shuangtaizihekou NNR (B)

Sites of international importance for Common Redshank during northward migration



	Site	Country	Count	Ref
1	Tianjin Municipality	China	2 000	1
2	Shi Jiu Tuo	China	800	2

Site of international importance for Common Redshank during southward migration



	Site	Country	Count	Ref
1	Tianjin Municipality	China	2 000	1

4.4.9 Marsh Sandpiper *Tringa stagnatilis*

Subspecies None.

Distribution in the EAAF

Breeding range: w. and e of L. Baikal, central Yakutia and ne. China.

Non-breeding: Coastal and inland. Bangladesh, Myanmar, Thailand, Indochina, s. and e. China, Japan, se. Asia, New Guinea and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **NM** and **SM** Common in China from Chang Jiang Estuary to n. Liaodong Wan, with large numbers in Yancheng NNR and around Bohai Wan; none recorded at Yalu Jiang NNR and scarce in South Korea. **NB** Present in good numbers at Yancheng NNR. Numbers are probably underestimated, as this species often occurs on non-tidal wetlands which were generally less well surveyed than intertidal areas.

Movements: **NM** Limited information indicates that main arrivals occur in late April, with large numbers still present in mid-May. **SM** No information. Probably migrates on a broad front through inland China and along the Chinese coast.

Significance of Yellow Sea: The Yellow Sea is important for this species during NM when it supports about 40% of the estimated flyway population. Also common on SM.

Key sites: 5 sites of international importance have been identified, all in China; 3 of the sites are important during NM and 4 during SM (see site location maps below), with Yancheng NNR and Huang He NNR being important during both NM and SM. Yancheng NNR supports 10% of the estimated flyway population during NM and >5% during SM.

Status of key sites: 2 of the 5 sites are in Protected Areas.

Major gaps in knowledge: Incomplete geographical and temporal information from China, particularly from Bohai Wan and non-tidal areas.

EAAF POPULATION ESTIMATE: 90 000

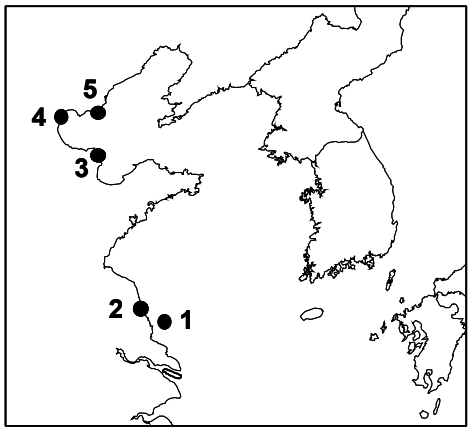
YELLOW SEA
Status: Passage migrant and non-breeding visitor
Estimated minimum numbers:
NM: South Korea: Scarce; China:39 000.
SM: South Korea: Scarce.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 5 *(2)*

Site count references

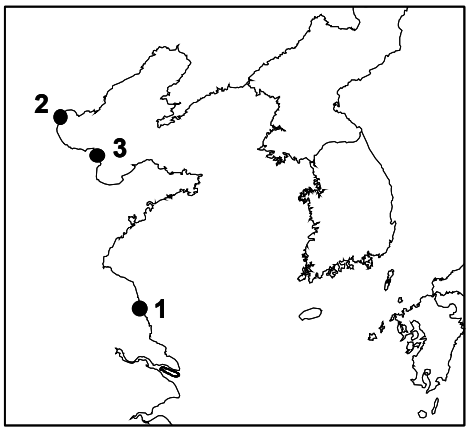
1. Barter *et al.* in prep.
2. Barter *et al*. 2001
3. Zhu *et al*. 2000
4. Wang 1997
5. Wang *et al*. 1991
6. F. Heintzenberg in litt
7. Wang & Barter 1998

Sites of international importance for Marsh Sandpiper



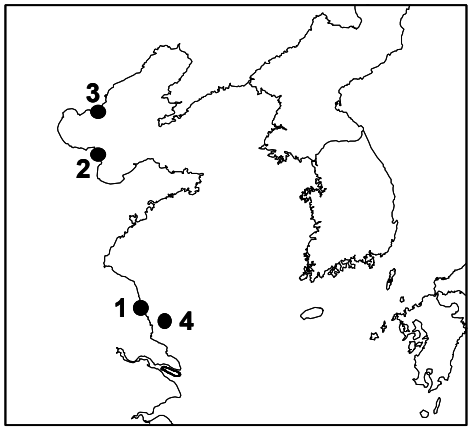
	China
1	Dong Sha
2	Yancheng NNR
3	Huang He NNR
4	Tianjin Municipality
5	Shi Jiu Tuo

Sites of international importance for Marsh Sandpiper during northward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	9 026	1
2	Tianjin Municipality	China	2 425	2
3	Huang He NNR	China	1 135	3

Sites of international importance for Marsh Sandpiper during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	6 022	4
2	Huang He NNR	China	4 246	5
3	Shi Jiu Tuo	China	3 500	6
4	Dong Sha	China	1 140	7

4.4.10 Common Greenshank *Tringa nebularia*

Subspecies None.

Distribution in the EAAF

Breeding: Yakutia, w. and central Chukotka, Kamchatka Magadan and L. Baikal region.

Non-breeding: Coastal and inland. Bangladesh, Myanmar, Thailand, Indochina, s. China, se. Asia, w. Melanesia, s. New Guinea and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **NM** and **SM** Widespread and common; particularly numerous in Yancheng NNR. **NB** Common south from Yancheng. Numbers are probably underestimated, as this species often occurs on non-tidal wetlands which were generally less well surveyed than intertidal areas.

Movements: Probably mainly a broad-front migrant using a variety of inland and coastal wetlands.

EAAF POPULATION ESTIMATE: 55 000

YELLOW SEA

Status: Passage migrant and non-breeding visitor

Estimated minimum numbers:

NM: South Korea: 4 100; China: 10 400.

SM: South Korea: 6 800.

INTERNATIONALLY IMPORTANT SITES

(and Protected Area status)

South Korea: 6 *(part of 1)*

China: 5 *(3)*

Significance of Yellow Sea: The Yellow Sea is important for this species as it supports about 25% of the estimated flyway population during NM. Numbers may be higher during SM.

Key sites: 11 sites of international importance have been identified, 6 in South Korea and 5 in China; 4 of the sites are important during NM, 8 during SM and 1 in the NB season (see site location maps

below). Yancheng NNR is important during both NM and SM.

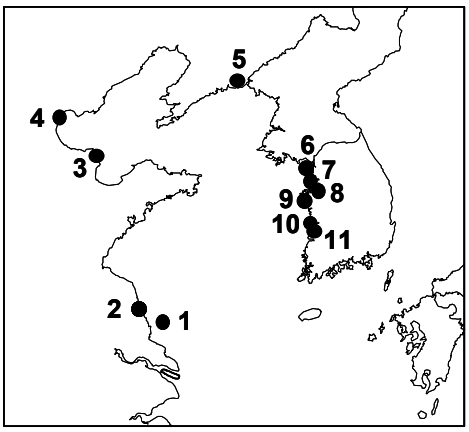
Status of key sites: 3 of the Chinese sites and a small part of 1 of the South Korean sites (Dongjin Gang Hagu) are in Protected Areas. Dongjin Gang Hagu is currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands. No information from North Korea.

Site count references

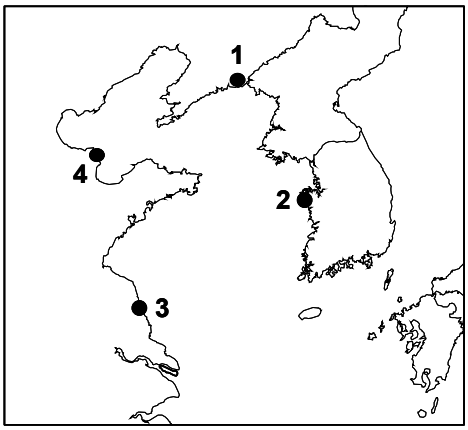
1. Barter *et al*. 2000c
2. Yi & Kim in prep.
3. Wang 1997
4. Zhu *et al*. 2000
5. S.P. Zhang in litt.
6. Moores 1999a
7. Wang & Barter 1998

Sites of international importance for Common Greenshank



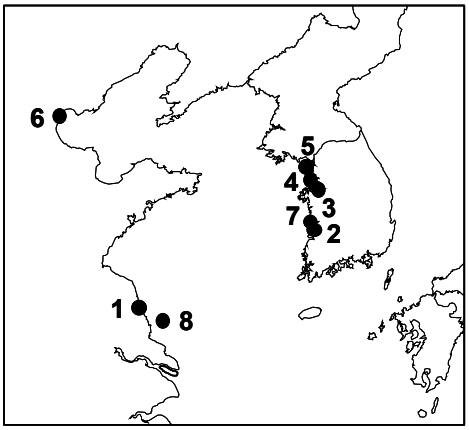
	China		South Korea
1	Dong Sha	6	Ganghwa Do
2	Yancheng NNR	7	Daebu Do
3	Huang He NNR	8	Asan Man
4	Tianjin Municipality	9	Seosan Reclaimed Area
5	Yalu Jiang NNR	10	Geum Gang Hagu
		11	Dongjin Gang Hagu

Sites of international importance for Common Greenshank during northward migration



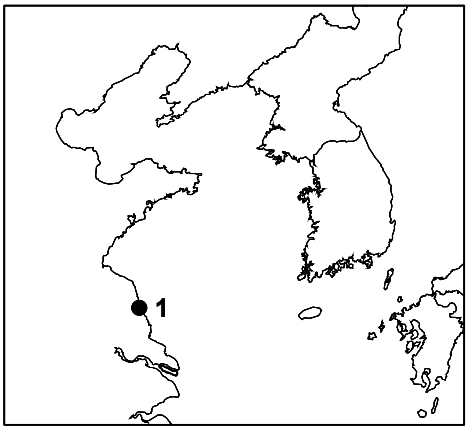
	Site	Country	Count	Ref
1	Yalu Jiang NNR	China	1 000	1
2	Seosan Reclaimed Area	South Korea	963	2
3	Yancheng NNR	China	955	3
4	Huang He NNR	China	585	4

Sites of international importance for Common Greenshank during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	2 325	3
2	Dongjin Gang Hagu	South Korea	1 585	2
3	Asan Man	South Korea	1 450	2
4	Daebu Do	South Korea	1 209	2
5	Ganghwa Do	South Korea	1 000	2
6	Tianjin Municipality	China	1 000	5
7	Geum Gang Hagu	South Korea	699	6
8	Dong Sha	China	615	7

Site of international importance for Common Greenshank during the non-breeding season



	Site	Country	Count	Ref
1	Yancheng NNR	China	803	3

4.4.11 Spotted Greenshank *Tringa guttifer*

Subspecies None; entire global population confined to the EAAF.

Distribution

Breeding: Sakhalin, w. Sea of Okhotsk, and, probably, Kamchatka.

Non-breeding: Coastal. Bangladesh, Myanmar, Thailand, Indochina and Malaysia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Recorded widely, but very rare. Largest concentrations in the Yancheng NNR-Dongsha region in China and on the nw. coast of South Korea. Apparently more common on SM. In South Korea, most consistently recorded in recent years (since 1993) at Namyang Man (9 times), Asan Man (7), Ganghwa Do (5), Yeong Jong Do (3), Dongjin Gang Hagu (3) and Mangyeung Gang Hagu (2). Significant undercounting may have occurred because of the difficulty of separating this species from the Common Greenshank.

CONSERVATION STATUS: Endangered
EAAF POPULATION ESTIMATE: 1 000
YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
No estimates, but probably supports most of the population on both NM and SM.
INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 6 *(part of 1)*
China: 3 *(2)*

Movements: **NM** Peak numbers occur in South Korea in May. **SM** Peak numbers in South Korea occur in the September-October period. Migrates on a narrow front across the Korean Peninsula during NM and on a broader front, including Japan, during SM (BirdLife International 2001).

Significance of Yellow Sea: The Yellow Sea is extremely important for this species on both NM and SM.

Key sites: 9 internationally important sites have been identified, 6 in South Korea and 3 in China; 4 of the sites are important during NM and 6 during SM (see site location maps below). Namyang Man is important during both NM and SM, and supports >5% of the estimated flyway population on NM, whilst the Mangyeung and Dongjin estuaries support >5% on SM. N.B. A record of 210 individuals at Yancheng NNR on SM has been treated as unconfirmed. The extreme rarity of this species means that any site at which the species has occurred in recent years is of conservation importance (see Site Accounts).

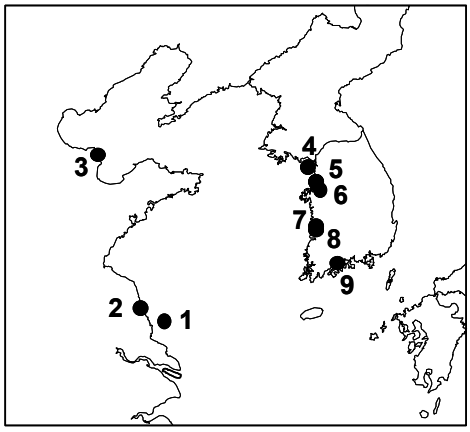
Status of key sites: 2 of the Chinese sites are within Protected Areas. Mangyeung Gang Hagu is currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Insufficient information on migration routes. Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count references

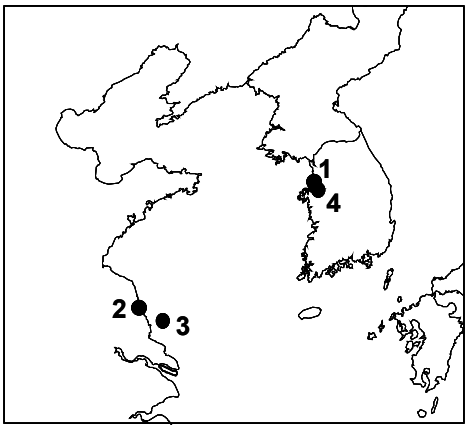
1. Yi & Kim in prep.
2. Wang 1997
3. Wang & Barter 1998
5. Moores 1999a
6. Wang *et al*. 1991
7. Wang & Barter 1998

Sites of international importance for Spotted Greenshank



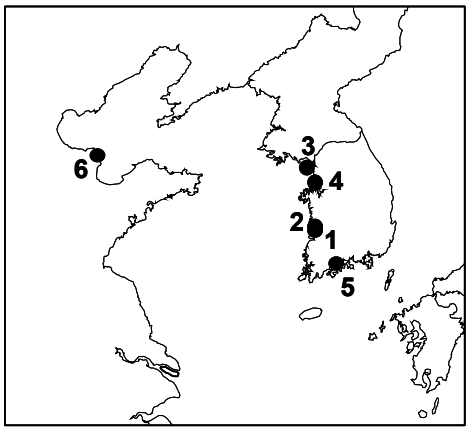
	China		South Korea
1	Dongsha	4	Ganghwa Do
2	Yancheng NNR	5	Namyang Man
3	Huang He NNR	6	Asan Man
		7	Mangyeung Gang Hagu
		8	Dongjin Gang Hagu
		9	Suncheon Man

Sites of international importance for Spotted Greenshank during northward migration



	Site	Country	Count	Ref
1	Namyang Man	South Korea	57	1
2	Yancheng NNR	China	35	2
3	Dong Sha	China	16	3
4	Asan Man	South Korea	12	1

Sites of international importance for Spotted Greenshank during southward migration



	Site	Country	Count	Ref
1	Dongjin Gang Hagu	South Korea	59	4
2	Mangyeung Gang Hagu	South Korea	52	1
3	Ganghwa Do	South Korea	40	1
4	Namyang Man	South Korea	28	1
5	Suncheon Man	South Korea	22	5
6	Huang He NNR	China	11	6

4.4.12 Terek Sandpiper *Xenus cinereus*

Subspecies None.

Distribution in the EAAF

Breeding: Yakutia, Chukotka and Koryak Highlands.

Non-breeding: Coastal. Bangladesh, Myanmar, Thailand, Indochina, se. Asia, New Guinea and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Widespread, but more numerous in South Korea. In China most common in the Bo Hai. Higher numbers during SM. Numbers are probably significantly underestimated, as this species often roosts in non-tidal ponds and along river banks both of which are difficult to count effectively.

Movements: **NM** Peak numbers in South Korea in mid-May. **SM** Peak numbers in South Korea in August. Insufficient data from China. Birds from nw. and n. Australia occur in the Yellow Sea.

Significance of Yellow Sea: The Yellow Sea is important for this species as it supports about 25% of the estimated flyway population during NM. Numbers are higher on SM.

Key sites: 14 sites of international importance have been identified, 11 in South Korea and 3 in China; 9 of the sites are important during NM and 13 during SM (see site location maps below). 8 sites are important during both NM and SM (Huang He NNR, Ganghwa Do, Yeong Jong Do, Namyang Man, Asan Man, Geum Gang Hagu, Dongjin Gang Hagu and Suncheon Man).

EAAF POPULATION ESTIMATE: 50 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 8 300; China: 5 400.
SM: South Korea:14 000.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 11 *(part of 1)*
China: 3 *(2)*

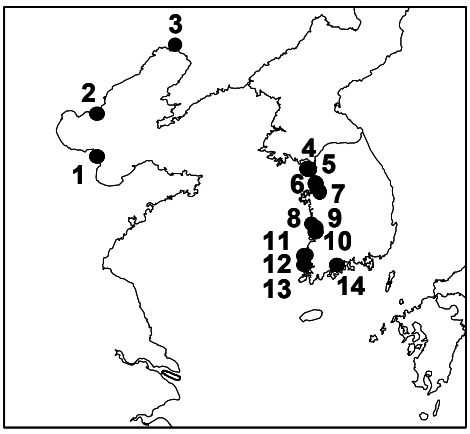
Status of key sites: 2 of the Chinese sites and a small part of 1 South Korean site (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands and river banks. No information from North Korea.

Site count references

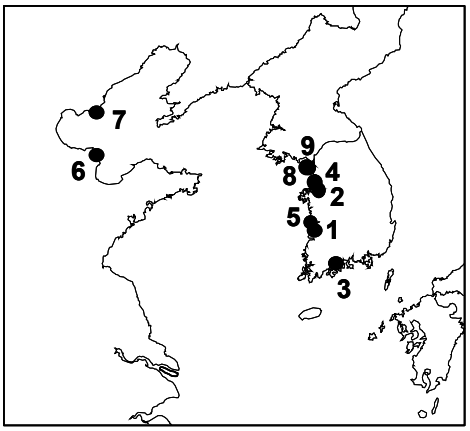
1. Yi & Kim in prep.
2. Moores 1999a
3. Zhu *et al.* 2000
4. G. Carey in litt.
5. Wang *et al.* 1991
6. Y.X. Li in litt

Sites of international importance for Terek Sandpiper



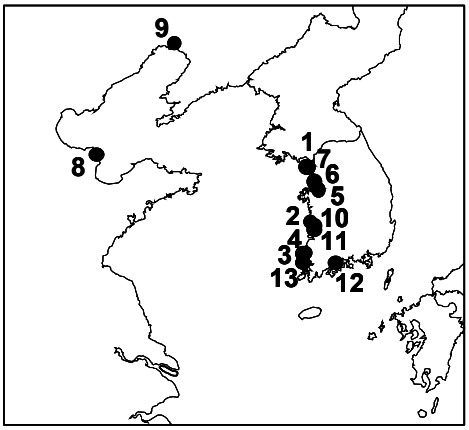
	China		South Korea
1	Huang He NNR	4	Ganghwa Do
2	Shi Jiu Tuo	5	Yeong Jong Do
3	Shuangtaizihekou NNR	6	Namyang Man
		7	Asan Man
		8	Geum Gang Hagu
		9	Mangyeung Gang Hagu
		10	Dongjin Gang Hagu
		11	Hampyeong Man
		12	Meian Gun Tidal Flat
		13	Aphae Do
		14	Suncheon Man

Sites of international importance for Terek Sandpiper during northward migration



	Site	Country	Count	Ref
1	Dongjin Gang Hagu	South Korea	1 600	1
2	Asan Man	South Korea	1 072	2
3	Suncheon Man	South Korea	1 046	2
4	Namyang Man	South Korea	997	2
5	Geum Gang Hagu	South Korea	761	1
6	Huang He NNR	China	724	3
7	Shi Jiu Tuo	China	700	4
8	Yeong Jong Do	South Korea	685	2
9	Ganghwa Do	South Korea	640	1

Sites of international importance for Terek Sandpiper during southward migration



	Site	Country	Count	Ref
1	Ganghwa Do	South Korea	2 300	1
2	Geum Gang Hagu	South Korea	1 653	2
3	Meian Gun Tidal Flat	South Korea	1 628	2
4	Hampyeong Man	South Korea	1 496	2
5	Asan Man	South Korea	1 420	1
6	Namyang Man	South Korea	1 420	1
7	Yeong Jong Do	South Korea	1 358	2
8	Huang He NNR	China	1 228	5
9	Shuangtaizihekou NNR	China	1 200	6
10	Mangyeung Gang Hagu	South Korea	1 040	1
11	Dongjin Gang Hagu	South Korea	964	1
12	Suncheon Man	South Korea	729	2
13	Aphae Do	South Korea	534	2

4.4.13 Grey-tailed Tattler *Heteroscelus brevipes*

Subspecies None; entire global population confined to the EAAF.

Distribution

Breeding: s. Taimyr, n. and central Yakutia, e. to Chukotka, and Kamchatka.

Non-breeding: Coastal. se. China, Taiwan, Vietnam, se. Asia and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Common along s. coast of South Korea on both migrations; elsewhere widespread in small numbers. Numbers counted are probably realistic estimates of birds present in surveyed areas.

Movements: **NM** and **SM** Peak passage occurs in South Korea during second-half of May and in August. Main migration route appears to include Japan, where 5 000 – 6 000 occur on both NM and SM, and common presence in s. South Korea is consistent with this suggestion.

Significance of Yellow Sea: It seems that the Yellow Sea is of minor importance as a migration staging region, except for the s. coast of South Korea.

EAAF POPULATION ESTIMATE: 40 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 1 400; China: Scarce.
SM: South Korea: 1 100.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 2 *(0)*

Key sites: 2 sites of international importance have been identified, both in South Korea; Suncheon Man is important during NM and Nakdong Gang Hagu during SM (see site location maps below).

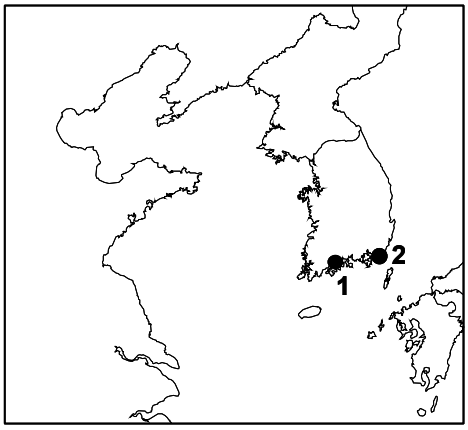
Status of key sites: Neither of the sites is in a Protected Area.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count references

1. Moores 1999a
2. Yi & Kim in prep.

Sites of international importance for Grey-tailed Tattler during northward and southward migrations



	Site	Country	Count	Ref
1	Suncheon Man (NM)	South Korea	429	1
2	Nakdong Gang Hagu (SM)	South Korea	463	2

4.4.14 Ruddy Turnstone *Arenaria interpres*

Subspecies Worldwide 2 (*interpres* and *morinella*); Yellow Sea 1 (*interpres*)

Distribution of *A. i. interpres* in the EAAF

Breeding: Continuous along n. coasts of Taimyr, Yakutia and Chukotka, and w. Alaska.

Non-breeding: Rocky coasts, coral reefs, gravel beaches and, occasionally, mudflats. Bangladesh, Myanmar, Thailand, se. China, Taiwan, se. Asia, New Guinea, Pacific Is. and Australasia

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **NM** and **SM** Widespread and generally thinly scattered along coasts, with concentrations in Yancheng NNR and on central w. coast of South Korea. Numbers are probably underestimated due to the dispersed distribution of the species, especially in mariculture ponds.

Movements: Migration is on a broad front, probably using both coastal and inland wetlands, with good numbers being seen in Japan (6 460 max. on NM and 2 202 max. on SM).

Significance of Yellow Sea: The Yellow Sea supports about 15% of the estimated flyway population during NM.

Key sites: 3 sites of international importance have been identified, 2 in South Korea and 1 in China; all 3 sites are important during NM (see site location maps below) and Yancheng NNR is important during both NM and SM.

EAAF POPULATION ESTIMATE: 31 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 1 100; China: 3 500.
SM: South Korea: 500.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 2 *(part of 1)*
China: 1 *(1)*

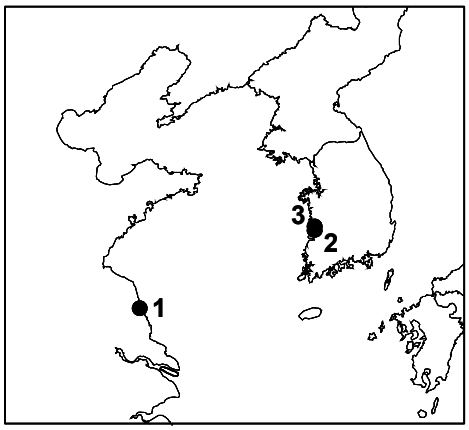
Status of key sites: The Chinese site and a small part of 1 South Korean site (Dongjin Gang Hagu) are in Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands. No information from North Korea.

Site count references

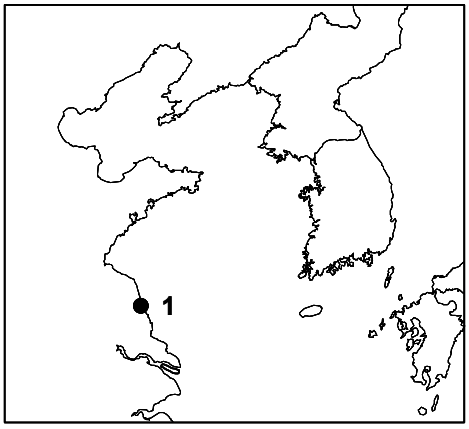
1. Wang & Liu 1994
2. Yi & Kim in prep.
3. Wang 1997

Sites of international importance for Ruddy Turnstone (all used during northward migration)



	Site	Country	Count	Ref
1	Yancheng NNR	China	860	1
2	Dongjin Gang Hagu	South Korea	450	2
3	Mangyeung Gang Hagu	South Korea	400	2

Site of international importance for Ruddy Turnstone during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	919	3

4.4.15 Asian Dowitcher *Limnodromus semipalmatus*

Subspecies None; entire global population confined to the EAAF.

Distribution

Breeding: s. Siberia, n. Mongolia and ne. China.

Non-breeding: Coastal. se. Asia, New Guinea and n. Australia; main stronghold is probably e. and se. Sumatra.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **NM** and **SM** n. from Chang Jiang Estuary to n. Liaodong Wan, with major concentrations in Bohai Wan and Yancheng NNR/Dongsha region. Absent from South Korea. Significant undercounting may have occurred because of the difficulty of separating this species from the godwits.

Movements: The e. Chinese coastline is the e. boundary of both NM and SM routes. Whilst good numbers have been reported from Chinese coastal sites, it is probable that many birds migrate along inland routes through China.

CONSERVATION STATUS: Near threatened
EAAF POPULATION ESTIMATE: 23 000
YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: Absent; China: 9 300
SM: South Korea: Absent.
INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 4 *(1)*

Significance of Yellow Sea: The Yellow Sea is important for this near-threatened species as it supports about 40% of the estimated flyway population during NM. Numbers may be similar on SM.

Key sites: 4 sites of international importance have been identified, all in China; all sites are important

during NM and 3 during SM (see site location maps below). Dong Sha supports >5% of the estimated flyway population during SM.

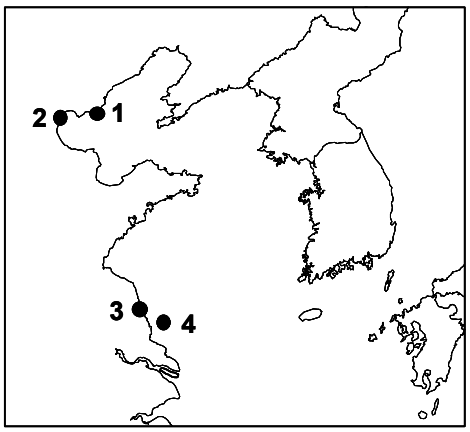
Status of key sites: 1 Chinese site is in a Protected Area.

Major gaps in knowledge: Incomplete geographical and temporal information from China, particularly Bohai Wan and the Jiangsu coast and islands.

Site count references

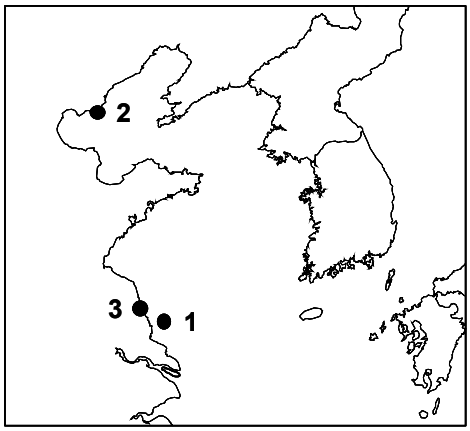
1. Regulus Travel in litt.
2. Barter *et al*. 2001
3. Barter *et al.* in prep.
4. Wang & Barter 1998
5. F. Heintzenberg in litt.
6. Wang 1997

Sites of international importance for Asian Dowitcher (all used during northward migration)



	Site	Country	Count	Ref
1	Shi Jiu Tuo	China	1 100	1
2	Tianjin Municipality	China	966	2
3	Yancheng NNR	China	945	3
4	Dong Sha	China	664	4

Sites of international importance for Asian Dowitcher during southward migration



	Site	Country	Count	Ref
1	Dong Sha	China	1 320	4
2	Shi Jiu Tuo	China	495	5
3	Yancheng NNR	China	285	6

4.4.16 Great Knot *Calidris tenuirostris*

Subspecies None.

Distribution in the EAAF

Breeding: ne. and e. Yakutia, Magadan and Chukotka.

Non-breeding: Coastal. Mostly in n. Australia, but small numbers in Bangladesh, Myanmar, Vietnam, se. Asia and e. Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** Very common, except on s. coast of South Korea; particularly large concentrations on n. Chinese and w. South Korean coasts. **SM** Widespread, but much less common than during NM. Numbers counted are probably realistic estimates of birds present in surveyed areas.

Movements: **NM** Arrive in late March-early April after non-stop flights from non-breeding grounds in n. Australia. There is strong evidence that birds are aiming to reach the w. coast of South Korea and only stop on the e. Chinese coast when encountering adverse weather (Barter *et al.* 1997b). There is some evidence, based on flag-sightings (J.Y. Park pers. comm.) and departure dates from Australia (Barter 1996; Driscoll 2001), that nw. Australian birds are passing through the South Korean coast before those from ne. Australia. The large increase in numbers between mid-April and early May in the n. Yellow Sea (Barter *et al.* 2000a) could be explained by the arrival of nw. Australian birds from South Korea, which have been replaced in South Korea by later arriving birds from ne. Australia, as the numbers are similar in South Korea in mid-April and early May. **SM** In South Korea two peaks from late August to early September and mid-September to mid-October, presumably comprising firstly adults followed by juvenile birds. The lower number of birds during SM, compared to NM, indicates that many birds probably return to Australia by flying non-stop across the Pacific.

Significance of Yellow Sea: The Yellow Sea is extremely important for this species as it supports about 80% of the estimated flyway population during NM. Much lower numbers occur on SM.

Key sites: 12 sites of international importance have been identified, 6 in China and 6 in South Korea; 11 of the sites are important during NM and 3 during SM (see site location maps below). The Dongjin and Mangyeung estuaries are important during both NM and SM. The Dongjin and Mangyeung estuaries and Yalu Jiang NNR support >10% and Asan Man, Shuangtaizihekou NNR and Namyang Man support >5% of the estimated flyway population during NM.

Status of key sites: 4 of the Chinese sites and a small part of 1 South Korean site (Dongjin Gang Hagu) are in Protected Areas. The 2 most important sites (the Mangyeung and Dongjin estuaries) are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Insufficient data on the comparative migration strategies of the populations from nw. and ne. Australia. Incomplete geographical and temporal coverage in China. No information from North Korea.

EAAF POPULATION ESTIMATE: 380 000

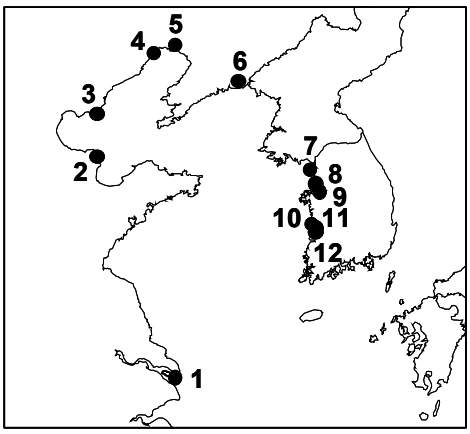
YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 176 000; China: 300 000.
SM: South Korea: 31 000.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 6 *(part of 1)*
China: 6 *(4)*

Site count references

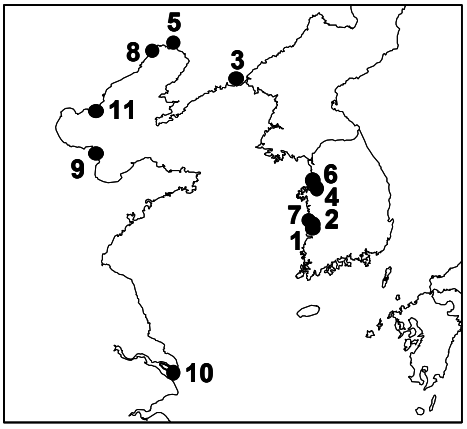
1. Yi & Kim in prep.
2. Barter *et al.* 2000e
3. Barter *et al.* 2000d
4. Barter *et al.* 2000b
5. Zhu *et al.* 2000
6. Barter *et al.* 1997a
7. Regulus Travel in litt.

Sites of international importance for Great Knot



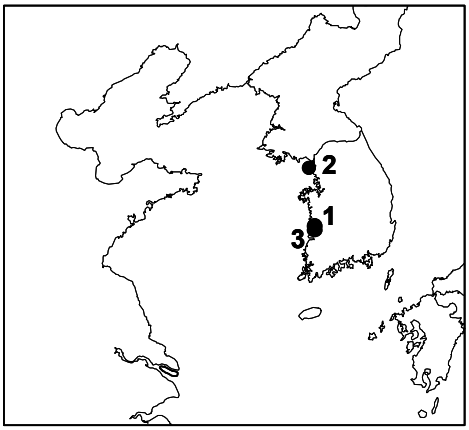
	China		South Korea
1	Chongming Dao PNR	7	Yeong Jong Do
2	Huang He NNR	8	Namyang Man
3	Shi Jiu Tuo	9	Asan Man
4	Linghekou	10	Geum Gang Hagu
5	Shuangtaizihekou NNR	11	Mangyeung Gang Hagu
6	Yalu Jiang NNR	12	Dongjin Gang Hagu

Sites of international importance for Great Knot during northward migration



	Site	Country	Count	Ref
1	Dongjin Gang Hagu	South Korea	60 000	1
2	Mangyeung Gang Hagu	South Korea	59 000	1
3	Yalu Jiang NNR	China	54 178	2
4	Asan Man	South Korea	34 000	1
5	Shuangtaizihekou NNR	China	24 915	3
6	Namyang Man	South Korea	21 000	1
7	Geum Gang Hagu	South Korea	18 850	1
8	Linghekou	China	17 540	4
9	Huang He NNR	China	12 816	5
10	Chongming Dao PNR	China	5761	6
11	Shi Jiu Tuo	China	4000	7

Sites of international importance for Great Knot during southward migration



	Site	Country	Count	Ref
1	Mangyeung Gang Hagu	South Korea	8 021	1
2	Yeong Jong Do	South Korea	6 000	1
3	Dongjin Gang Hagu	South Korea	5 200	1

4.4.17 Red Knot *Calidris canutus*

Subspecies Worldwide 5 (*canutus, rogersi, roselaari, islandica* and *rufa*), plus probably another *piersmai* (Tomkovich 2001); Yellow Sea 2 (*rogersi* and *piersmai*).

Distribution of *C. c. rogersi* **and** *C. c. piersmai*

Breeding: C. c. rogersi, Chukotka; *C. c. piersmai,* New Siberian Is.

Non-breeding: Coastal. Both subspecies mainly in Australasia, but small numbers in e. and se. Asia. However, the geographical distributions of the two subspecies are yet to be determined.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Widespread along Chinese and w. South Korean coasts, but common only in n. Bohai Wan and Yancheng NNR during NM, and at Dongsha and in Shuangtaizihekou NNR during SM. Numbers counted are probably realistic estimates of birds present in surveyed areas.

EAAF POPULATION ESTIMATE: 220 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea:4 300; China: 62 000.
SM: South Korea:1 200.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 5 *(2)*

Movements: Insufficient data. Birds from nw., e. and se. Australia, and from New Zealand occur in the Yellow Sea on NM.

Significance of Yellow Sea: The Yellow Sea is important for this species as it supports about 30% of the estimated flyway population during NM;

numbers appear to be lower on SM. The numbers of Red Knot counted is small considering the estimated flyway population size and the fact that this species is an obligate user of intertidal areas. The species is known to use only a small number of staging sites (Davidson & Piersma 1992) and it seems probable that some of the Yellow Sea areas yet to be surveyed, perhaps in North Korea, must support large numbers. It is possible that the birds using the e. Chinese coast are from the westerly-breeding *piersmai* population.

Key sites: 5 sites of international importance have been identified, all in China; 3 of the sites are important during NM and 2 during SM (see site location maps below). N. Bohai Wan is of particular importance during NM, supporting >5% of the combined flyway populations, and the Yancheng NNR-Dongsha region is important during both NM and SM.

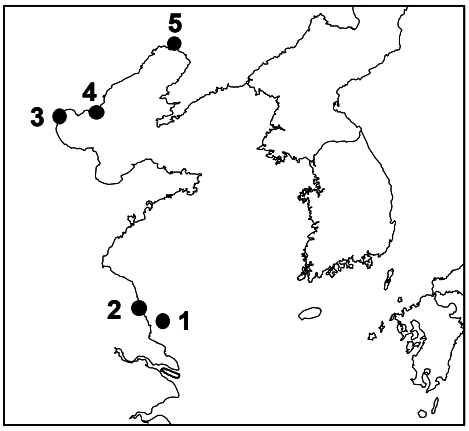
Status of key sites: 2 of the 5 sites are within Protected Areas.

Major gaps in knowledge: Insufficient knowledge of subspecies distribution and migration strategies. Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count references

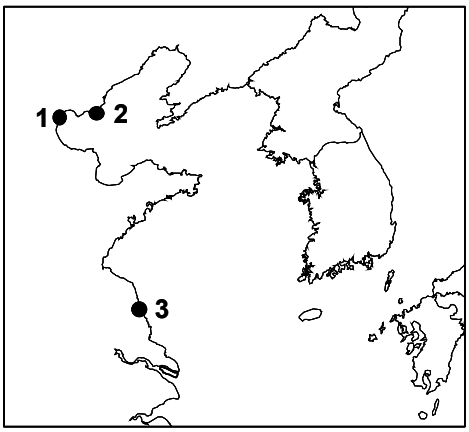
1. Barter *et al*. 2001
2. Regulus Travel in litt.
3. Wang 1997
4. Wang & Barter 1998
5. Y.X. Li in litt.

Sites of international importance for Red Knot



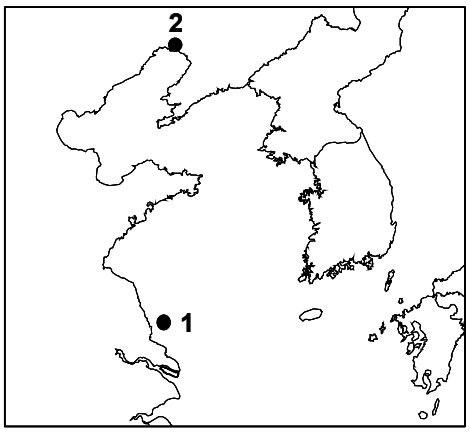
	China
1	Dong Sha
2	Yancheng NNR
3	Tianjin Municipality
4	Shi Jiu Tuo
5	Shuangtaizihekou NNR

Sites of international importance for Red Knot during northward migration



	Site	Country	Count	Ref
1	Tianjin Municipality	China	14 277	1
2	Shi Jiu Tuo	China	5 000	2
3	Yancheng NNR	China	3 169	3

Sites of international importance for Red Knot during southward migration



	Site	Country	Count	Ref
1	Dong Sha	China	8 140	4
2	Shuangtaizihekou NNR	China	4 200	5

4.4.18 Sanderling *Calidris alba*

Subspecies None.

Distribution in the EAAF

Breeding: Probably New Siberian Is.

Non-breeding: Open sandy beaches in e. and se. China, South Korea, Japan, Thailand, se. Asia and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Widespread, but generally only in small numbers except for a few favoured areas. **NB** At Yancheng NNR; small numbers in South Korea. Numbers are probably underestimated, as this species is relatively easy to miss amongst other small shorebirds.

Movements: **NM** and **SM** Appears to migrate on a broad front, as the species is common in Japan (NM: 3 206 max; SM: 4 401 max.). Birds from se. Australia occur in both China and South Korea.

Significance of Yellow Sea: There is insufficient information to allow an estimate to be made of numbers occurring in China.

Key sites: 3 sites of international importance have been identified, 2 in South Korea and 1 in China; 1 of the sites is important during NM, all 3 during SM and 1 during the NB season (see site location maps below). Yancheng NNR is a particularly important site supporting >10% of the estimated flyway population during NM and >5% in the NB season.

Status of key sites: The Chinese site is in a Protected Area.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China. No information from North Korea.

EAAF POPULATION ESTIMATE: 22 000

YELLOW SEA

Status: Passage migrant and non-breeding visitor

Estimated minimum numbers:

NM: South Korea: 250.
SM: South Korea: 540.
NB: South Korea: 30.

INTERNATIONALLY IMPORTANT SITES

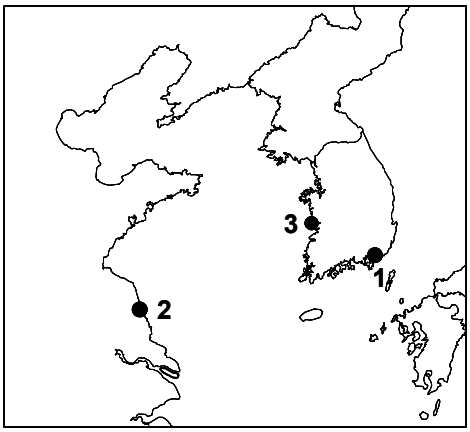
(and Protected Area status)

South Korea: 2 *(0)*
China: 1 *(1)*

Site count references

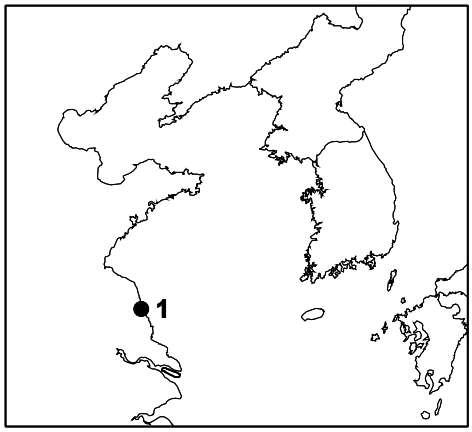
1. Wang 1997
2. Yi & Kim in prep.

Sites of international importance for Sanderling (all used during southward migration)



	Site	Country	Count	Ref
1	Nakdong Gang Hagu	South Korea	533	2
2	Yancheng NNR	China	362	1
3	Geum Gang Hagu	South Korea	300	2

Site of international importance for Sanderling during both northward migration and the non-breeding season



	Site	Country	Count	Ref
1	Yancheng NNR (NM)	China	3 095	1
1	Yancheng NNR (NB)	China	1 102	1

4.4.19 Red-necked Stint *Calidris ruficollis*

Subspecies None; entire global population confined to the EAAF**.**

Distribution

Breeding: Taimyr to Chukotka and Koryak Highlands.

Non-breeding: Mostly coastal. Mainly in Australia, but also Thailand, e. and s. China, se. Asia and New Guinea.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Widespread and generally common, but nowhere present in very large concentrations. **NB** Small number in Chang Jiang Estuary. Numbers counted are probably realistic estimates of birds present in surveyed areas.

Movements: **NM** and **SM** In South Korea main passage is in May and in September. Insufficient information for China. Birds from all areas of Australia migrate through Yellow Sea. This species appears to be a broad-front migrant with many birds probably migrating across inland China to Mongolia and s. Russia (Goroshko 1999).

Significance of Yellow Sea: The Yellow Sea is of importance for this species as it supports about 30%

EAAF POPULATION ESTIMATE: 315 000

YELLOW SEA

Status: Passage migrant and uncommon non-breeding visitor

Estimated minimum numbers:

NM: South Korea: 24 000; China: 62 000.

SM: South Korea: 11 000.

INTERNATIONALLY IMPORTANT SITES

(and Protected Area status)

South Korea: 3 *(part of 1)*

China: 2 *(1)*

of the estimated flyway population during NM. It may be less common during SM.

Key sites: 5 sites of international importance have been identified, 3 in South Korea and 2 in China; all 5 sites are important during NM and 2 during SM (see site location maps below). Yancheng NNR and Mangyeung Gang Hagu are important during both NM and SM.

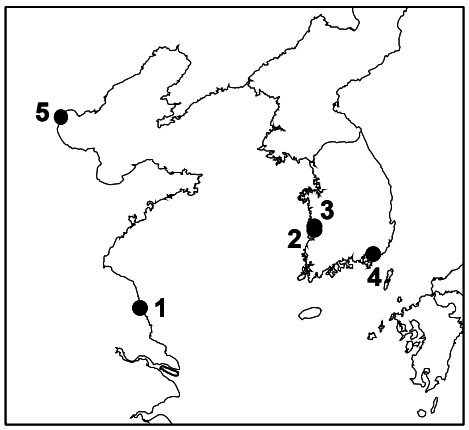
Status of key sites: 1 Chinese site and a small part of 1 South Korean site (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count reference

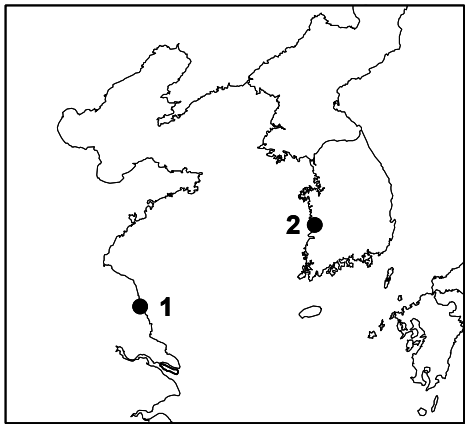
1. Barter *et al.* in press
2. Yi & Kim in prep.
3. Barter *et al*. 2001
4. Wang 1997

Sites of international importance for Red-necked Stint (all used during northward migration)



	Site	Country	Count	Ref
1	Yancheng NNR	China	10 073	1
2	Mangyeung Gang Hagu	South Korea	5 023	2
3	Dongjin Gang Hagu	South Korea	5 000	2
4	Nakdong Gang Hagu	South Korea	4 508	2
5	Tianjin Municipality	China	4 285	3

Sites of international importance for Red-necked Stint during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	5 822	4
2	Mangyeung Gang Hagu	South Korea	4 500	2

4.4.20 Sharp-tailed Sandpiper *Calidris acuminata*

Subspecies None; entire global population confined to the EAAF.

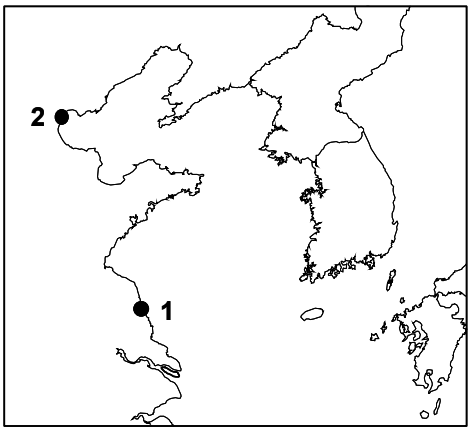
Distribution
Breeding: n. Yakutia and nw. Chukotka.
Non-breeding: Inland and coastal. s. New Guinea and Australia; mainly in se. Australia.

Usage and importance of Yellow Sea
Occurrence: Intertidal areas and adjacent non-tidal wetlands. **NM** Widespread and generally common, but nowhere present in large concentrations. **SM** Similar to NM on Chinese coast, but scarce in South Korea. Numbers are probably underestimated due to the dispersed distribution of the species.
Movements: **NM** Main passage through South Korea during May. **SM** Insufficient information. Birds from se., e. and n. Australia pass through Yellow Sea. Probably a broad-front migrant with many adult birds passing through inland China on both NM and SM; most juveniles migrate s. along the Pacific coast (Mlodinow 2001).
Significance of Yellow Sea: The Yellow Sea appears to be relatively unimportant for this species, supporting about 10% of the estimated flyway population during NM. Numbers may be lower during SM.
Key sites: 2 sites of international importance have been identified, both in China; both sites are important during NM and 1 during SM (see site location maps below). Yancheng NNR is important during both NM and SM.
Status of key sites: 1 site is in a Protected Area.
Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially of coastal non-tidal wetlands. No information from North Korea.

EAAF POPULATION ESTIMATE: 160 000
YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 2 600; China: 15 000.
SM: South Korea: Scarce.
INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 2 *(1)*

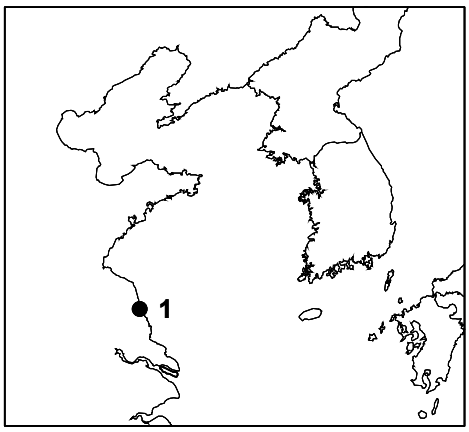
Site count references
1. Barter *et al.* in press
2. Barter *et al*. 2001
3. Wang 1997

Sites of international importance for Sharp-tailed Sandpiper (both used during northward migration)



	Site	Country	Count	Ref
1	Yancheng NNR	China	3 125	1
2	Tianjin Municipality	China	2 855	2

Site of international importance for Sharp-tailed Sandpiper during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	1 771	3

4.4.21 Dunlin *Calidris alpina*

Subspecies Worldwide 9 (*alpina, schinzii, arctica, sakhalina, kistchinski, actites, pacifica, arcticola* and *hudsonia*) plus probably another "*centralis*" (Wennerberg *et al.* 1999); EAAF 4 (*sakhalina, kistchinski, actites* and *arcticola*), *arcticola* occurs in the Yellow Sea, and *sakhalina, kistchinski* and *actites* probably do.

Distribution of *C. a. sakhalina, kistchinski, actites* **and** *arcticola*

Breeding: C. a. sakhalina, Chukotka; *C. a. kistchinski,* Kamchatka, n. coast of Sea of Okhotsk and n. Kurile Is.; *C. a. actites,* n. Sakhalin Is.; *C. a. arcticola,* n. Alaska.

Non-breeding: Inland and coastal. s. Japan, South Korea, e and s. China, and Taiwan. Geographical distribution of the subspecies is yet to be determined.

Usage and importance of Yellow Sea

Occurrence: Intertidal flats. Most abundant shorebird in Yellow Sea. **NM** and **SM** Widespread and very common, although less numerous during SM. **NB** Common in China s. from Yancheng and on w. coast of South Korea. Numbers counted are probably realistic estimates of birds present in surveyed areas.

Movements: **NM** Peak numbers in South Korea and China occur in late April to mid-May. **SM** Peak numbers in South Korea occur during September. No information for China.

Significance of Yellow Sea: The Yellow Sea is extremely important for this species as it supports >70% of the estimated combined flyway populations of the 4 Dunlin subspecies. Numbers are lower during SM.

Key sites: 11 sites of international importance have been identified, 6 in South Korea and 5 in China; 10 of the sites are important during NM and 5 during SM (see site location maps below). 4 sites are important on both NM and SM (Yancheng NNR, Yeong Jong Do, Mangyeung Gang Hagu and Dongjin Gang Hagu). Yancheng NNR and Mangyeung Gang Hagu support >5% of the estimated flyway population during NM.

Status of key sites: 4 of the Chinese sites and part of 1 South Korean site (Dongjin Gang Hagu) are in Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Insufficient information on subspecies distribution. Incomplete geographical and temporal coverage in China. No information from North Korea.

EAAF POPULATION ESTIMATE: 950 000

YELLOW SEA

Status: Passage migrant and non-breeding visitor

Estimated minimum numbers:

NM: South Korea: 164 000; China: 500 000.
SM: South Korea: 64 000.
NB: South Korea: 20 500.

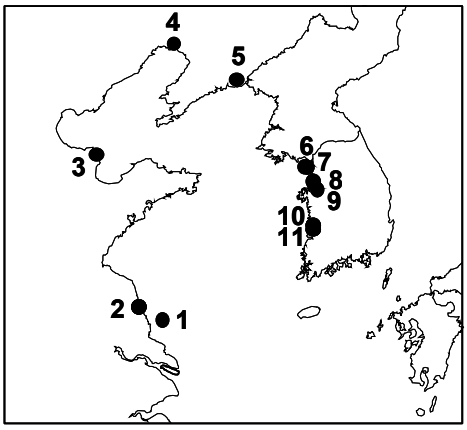
INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)

South Korea: 6 *(part of 1)*
China: 5 *(4)*

Site count references

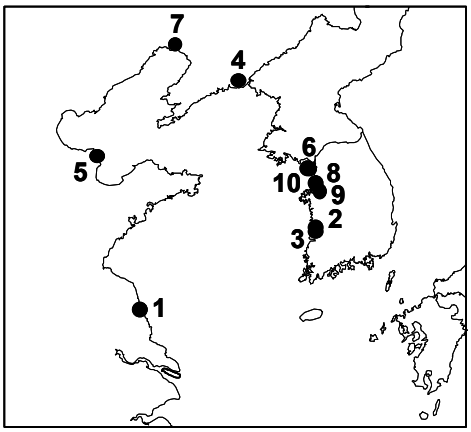
1. Barter *et al.* in press.
2. Yi & Kim in prep.
3. Barter *et al*. 2000e
4. Zhu *et al.* 2000
5. Barter *et al*. 2000d
6. Wang 1997
7. Wang & Barter 1998

Sites of international importance for Dunlin



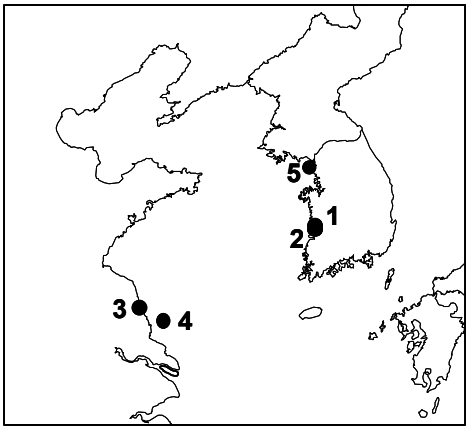
	China		South Korea
1	Dong Sha	6	Ganghwa Do
2	Yancheng NNR	7	Yeong Jong Do
3	Huang He NNR	8	Namyang Man
4	Shuangtaizihekou NNR	9	Asan Man
5	Yalu Jiang NNR	10	Mangyeung Gang Hagu
		11	Dongjin Gang Hagu

Sites of international importance for Dunlin during northward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	57 867	1
2	Mangyeung Gang Hagu	South Korea	47 650	2
3	Dongjin Gang Hagu	South Korea	38 850	2
4	Yalu Jiang NNR	China	25 181	3
5	Huang He NNR	China	24 106	4
6	Ganghwa Do	South Korea	17 000	2
7	Shuangtaizihekou NNR	China	16 411	5
8	Namyang Man	South Korea	15 200	2
9	Asan Man	South Korea	14 000	2
10	Yeong Jong Do	South Korea	13 208	2

Sites of international importance for Dunlin during southward migration



	Site	Country	Count	Ref
1	Mangyeung Gang Hagu	South Korea	22 000	2
2	Dongjin Gang Hagu	South Korea	20 004	2
3	Yancheng NNR	China	18 559	6
4	Dong Sha	China	13 081	7
5	Yeong Jong Do	South Korea	12 110	2

4.4.22 Curlew Sandpiper *Calidris ferruginea*

Subspecies None.

Distribution in the EAAF

Breeding: n. Taimyr to n. Chukotka.

Non-breeding: Mainly coastal. Bangladesh, Myanmar, se. Asia and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal flats and adjacent non-tidal wetlands. **NM** and **SM** Uncommon, except for n. Bohai Wan during NM. Numbers counted are probably realistic estimates of birds present in surveyed areas.

Movements: **NM** Appears to migrate through inland China to Mongolia and s. Russia (Melville *et al.* in prep.; O. Goroshko in litt.); Bo Hai Wan is probably on the eastern extremity of the main migration path. Peak passage occurs in May. **SM** Uncommon; takes more westerly route than during NM (Minton 1998). Birds from nw., e. and se. Australia occur in Yellow Sea during NM.

Significance of Yellow Sea: Apart from n. Bohai Wan, the Yellow Sea is of minor importance for this species and it probably supports about 10% of the flyway breeding population during NM; very few birds occur during SM.

EAAF POPULATION ESTIMATE: 180 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: Scarce; China: 18 000.
SM: South Korea: Scarce.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 2 *(0)*

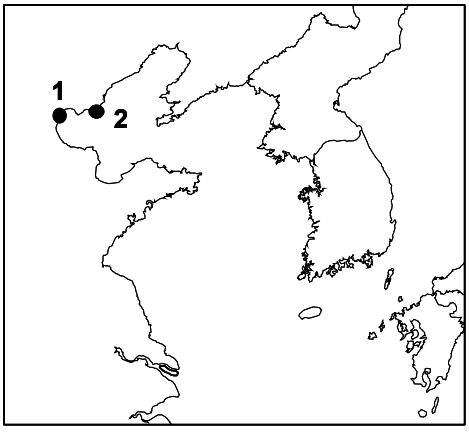
Key sites: 2 sites of international importance have been identified, both in China during NM (see site location map below). Tianjin Municipality supports >5% of the estimated flyway population during NM.

Status of key sites: Neither site is in a Protected Area.

Major gaps in knowledge: Insufficient geographical and temporal information from China, particularly from Bohai Wan.

Site count references
1. Barter *et al*. 2001
2. Regulus Tours in litt.

Sites of international importance for Curlew Sandpiper (both used during northward migration)



	Site	Country	Count	Ref
1	Tianjin Municipality	China	12 489	1
2	Shi Jiu Tuo	China	2 000	2

4.4.23 Spoon-billed Sandpiper *Eurynorhynchus pygmeus*

Subspecies None.

Distribution in the EAAF

Breeding: e. Chukotka, e. Koryak Highlands and n. Kamchatka.

Non-breeding: Coastal. Bangladesh, Myanmar, Thailand, Indochina, sw. China, The Philippines and Malaysia.

N.B. Recent breeding ground studies indicate that the population may have significantly declined,

CONSERVATION STATUS: Vulnerable

EAAF POPULATION ESTIMATE: 4 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
No estimates, but probably supports most of the population on both NM and SM.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 2 *(part of 1)*

perhaps to about 2 000 individuals (Tomkovich *et al.* 2000).

Usage and importance of Yellow Sea

Occurrence: Intertidal flats. **NM** and **SM** Widespread but rare, except for concentrations in the Mangyeung and Dongjin estuaries during SM. Appears to be more common in South Korea during SM. Numbers are probably underestimated as this species is relatively easy to miss amongst other small shorebirds, particularly Red-necked Stints

Movements: **NM** Main passage takes place in April and May **SM** Main passage takes place during September and October.

Significance of Yellow Sea: The Yellow Sea probably supports the majority of the population during both NM and SM.

Key sites: 2 sites of international importance have been identified, both in South Korea during SM (see site location map below). The rarity of this species means that any site that has supported the species at all in recent years is of conservation importance (see Site Accounts).

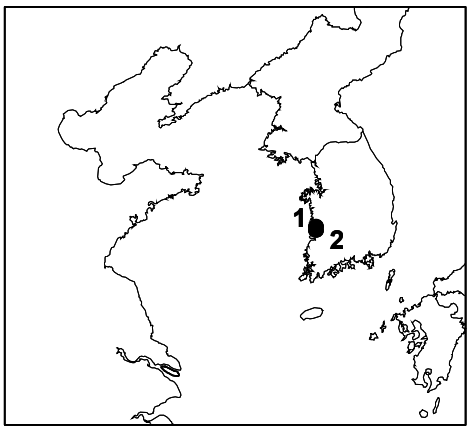
Status of key sites: A small part of 1 site (Dongjin Gang Hagu) is located in a Protected Area. Both sites are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Insufficient information on migration routes. Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count reference

1. Yi & Kim in prep.

Sites of international importance for Spoon-billed Sandpiper (both used during southward migration)



	Site	Country	Count	Ref
1	Mangyeung Gang Hagu	South Korea	180	1
2	Dongjin Gang Hagu	South Korea	100	1

4.4.24 Broad-billed Sandpiper *Limicola falcinellus*

Subspecies Worldwide 2 (*falcinellus* and *sibirica*); Yellow Sea 1 (*sibirica*).

Distribution of *L. f. sibirica* in the EAAF

Breeding: n. Yakutia.

Non-breeding: Coastal. Bangladesh, Myanmar, Thailand, Indochina, se. China, Taiwan, se. Asia and Australia, particularly n. and nw.

Usage and importance of Yellow Sea

Occurrence: Intertidal flats. **NM** and **SM** Widespread in small numbers; apparently more common on sw. and n. coasts of China and central w. coast of South Korea. Numbers are probably underestimated, as this species is relatively easy to miss amongst other small shorebirds.

Movements: Probably migrates on a broad front, also using inland wetlands. Birds from nw. Australia occur in the Yellow Sea.

EAAF POPULATION ESTIMATE: 18 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
NM: South Korea: 200; China: 4 900.
SM: South Korea: 830.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 2 *(part of 1)*
China: 3 *(2)*

Significance of Yellow Sea: The Yellow Sea is important for this species as it supports approximately 30% of the estimated flyway population during NM. Higher numbers possibly occur on SM.

Key sites: 5 sites of international importance have been identified, 2 in South Korea and 3 in China; 2 of the sites are important during NM and 4 during

SM (see site location maps below). Yancheng NNR is important during both NM and SM.

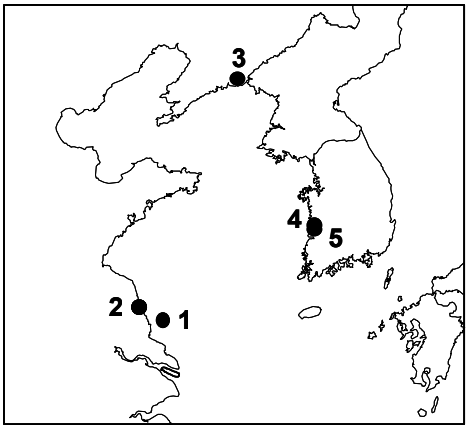
Status of key sites: 2 of the Chinese sites and part of 1 of the South Korean sites (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count references

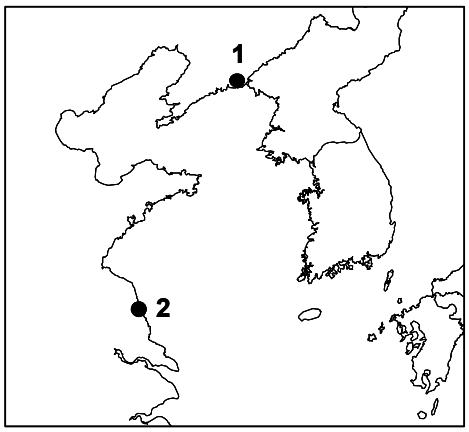
1. Barter *et al*. 2000e
2. Wang 1997
3. Yi & Kim in prep.
4. Wang & Barter 1998

Sites of international importance for Broad-billed Sandpiper



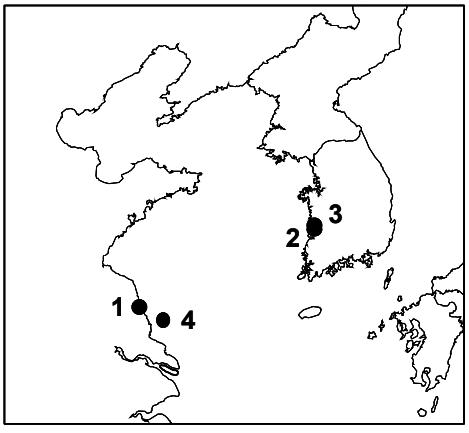
	China		South Korea
1	Dong Sha	4	Mangyeung Gang Hagu
2	Yancheng NNR	5	Dongjin Gang Hagu
3	Yalu Jiang NNR		

Sites of international importance for Broad-billed Sandpiper during northward migration



	Site	Country	Count	Ref
1	Yalu Jiang NNR	China	729	1
2	Yancheng NNR	China	717	2

Sites of international importance for Broad-billed Sandpiper during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	806	2
2	Dongjin Gang Hagu	South Korea	800	3
3	Mangyeung Gang Hagu	South Korea	700	3
4	Dong Sha	China	416	4

4.4.25 Red-necked Phalarope *Phalaropus lobatus*

Subspecies None.

Distribution in the EAAF

Breeding: Coastal regions of arctic ne. Siberia, as far s. as n. Sakhalin and n. Kurile Is.

Non-breeding: Pelagic, from central Indonesia to w. Melanesia.

Usage and importance of Yellow Sea

Occurrence: No information on habitat preferences but, presumably, using coastal areas and, particularly, saltpans. **NM** Recorded in small numbers in Yancheng NNR-Dong Sha region. **SM** Apparently more common and widespread than on NM, with records from Chang Jiang Estuary to Huang He Delta. Few recorded in South Korea on either migration. Numbers may be underestimated as this species often occurs on non-tidal wetlands, such as saltpans, which were generally less well surveyed than intertidal areas. It may also occur in offshore waters.

Movements: No information.

EAAF POPULATION ESTIMATE: 100 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
No estimates

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 1 *(0)*

Significance of Yellow Sea: The Yellow Sea appears to be of little importance for this species, but preferred migration habitats, i.e. saltpans and the open sea, have been under-surveyed.

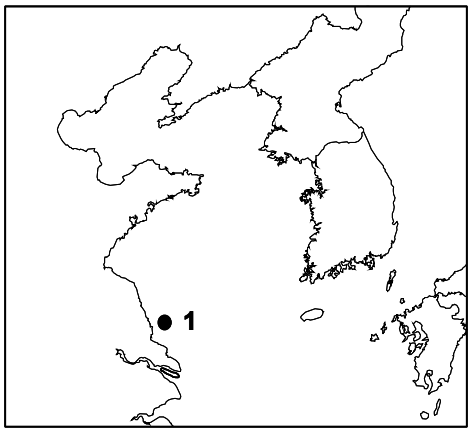
Key sites: 1 site of international importance has been identified, in China, during SM (see site location map below).

Status of key sites: The site is not in a Protected Area.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially in preferred saltpan and pelagic habitats.

Site count reference
1. Wang & Barter 1998

Site of international importance for Red-necked Phalarope (used during southward migration)



	Site	Country	Count	Ref
1	Dong Sha	China	1 728	1

4.4.26 Eurasian Oystercatcher *Haematopus ostralegus*

Subspecies Worldwide 4 (*ostralegus, longipes, osculans* and *finschi*); Yellow Sea 1 (*osculans*).

Distribution of *H. o. osculans*

Breeding: ne. China, w. North and South Korea, n. Sea of Okhotsk and Kamchatka.

Non-breeding: Coastal. Japan, South Korea, and e. and s. China.

Usage and importance of Yellow Sea

Occurrence: Intertidal flats. Interpretation of count data is complicated by lack of knowledge about breeding numbers in Yellow Sea. **B** Suspected that 300-700 pairs breed in South Korea, although only 15 pairs proven (Yi & Kim in prep.). 100 pairs at Shuangtaizihekou NNR (Y.X. Li in litt.); about 50 pairs in Yancheng NNR (H. Wang pers. comm.). **NM** and **SM** Widespread, normally in small numbers but with some important concentrations. **NB** More common in South Korea, with >50% of the estimated flyway population occurring at the Geum Gang Hagu. Counts probably reasonably complete in areas surveyed during NM and SM. However, surveys during the breeding season could identify additional important concentrations.

Movements: No information.

Significance of Yellow Sea: The Yellow Sea is extremely important for this species, as part of the flyway population breeds there and most of the population spends the NB season in the region. There is insufficient information to enable estimates to be made of numbers in China.

Key sites: 7 sites of international importance have been identified, 2 in South Korea and 5 in China; 3 of the sites are important during NM, 4 during SM and 2 during the NB season (see site location maps below). Breeds in internationally important numbers at Yancheng NNR and Shuangtaizihekou NNR (for site locations see map below). Shuangtaizihekou NNR is important during both NM and SM, supporting 5% of the flyway population on SM. Geum Gang Hagu holds more than 50% of the estimated flyway population during the NB season.

Status of key sites: 4 of the Chinese sites are in Protected Areas.

Major gaps in knowledge: Inadequate information on breeding distribution and abundance in Yellow Sea. Incomplete geographical and temporal coverage in China and South Korea. No information from North Korea.

EAAF POPULATION ESTIMATE: 10 000

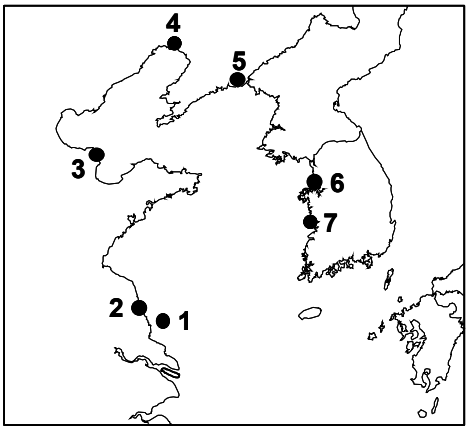
YELLOW SEA
Status: Probably resident breeder, passage migrant and non-breeding visitor
Estimated minimum numbers:
NM: South Korea: 550.
SM: South Korea: 550.
NB: South Korea: 6 000.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 2 *(0)*
China: 5 *(4)*

Site count references

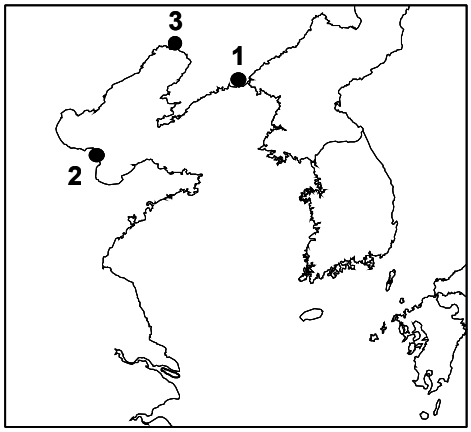
1. Barter *et al*. 2000c
2. Wang *et al*. 1992
3. Brazil 1992
4. Yi & Kim in prep.
5. Y.X. Li in litt.
6. Wang & Barter 1998
7. N. Moores in litt.
8. Wang 1997

Sites of international importance for Eurasian Oystercatcher



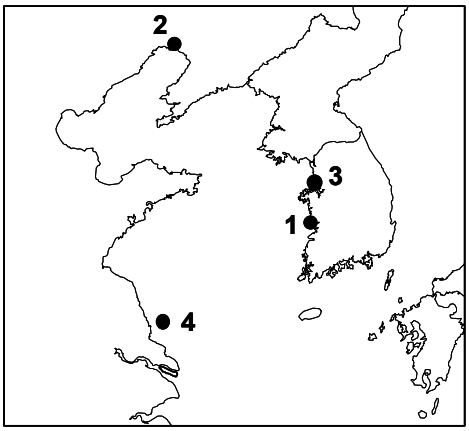
	China		South Korea
1	Dong Sha	6	Namyang Man
2	Yancheng NNR	7	Geum Gang Hagu
3	Huang He NNR		
4	Shuangtaizihekou NNR		
5	Yalu Jiang NNR		

Sites of international importance for Eurasian Oystercatcher during northward migration



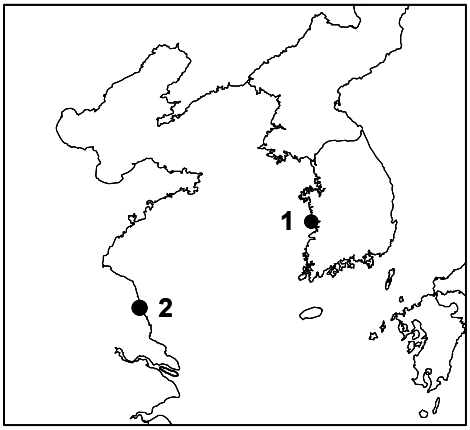
	Site	Country	Count	Ref
1	Yalu Jiang NNR	China	189	1
2	Huang He NNR	China	130	2
3	Shuangtaizihekou NNR	China	100	3

Sites of international importance for Eurasian Oystercatcher during southward migration



	Site	Country	Count	Ref
1	Geum Gang Hagu	South Korea	1 060	4
2	Shuangtaizihekou NNR	China	500	5
3	Namyang Man	South Korea	220	4
4	Dong Sha	China	120	6

Sites of international importance for Eurasian Oystercatcher during the non-breeding season



	Site	Country	Count	Ref
1	Geum Gang Hagu	South Korea	5 700	7
2	Yancheng NNR	China	200	8

4.4.27 Black-winged Stilt *Himantopus himantopus*

Subspecies Worldwide 5 (*himantopus, leucocephalus, knudseni, mexicanus* and *melanurus*); Yellow Sea (*himantopus*).

Distribution of *H. h. himantopus* in the EAAF

Breeding: Mongolia, n. central China and Yellow Sea coast.

Non-breeding: Mainly inland, but also coastal s. China, Taiwan and Indochina.

EAAF POPULATION ESTIMATE: 20 000

YELLOW SEA

Status: Possibly resident, breeding visitor, passage migrant and non-breeding visitor

Estimated minimum numbers:

No estimates; rare in South Korea

INTERNATIONALLY IMPORTANT SITES

(and Protected Area status)

China: 5 *(2)*

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **B** Common breeder around Chinese part of Yellow Sea (pers. obs.), but little quantitative information. More than 300 pairs at Shuangtaizihekou NNR (Y.X. Li in litt.), about 100 pairs in Yancheng NNR (H. Wang pers. comm.) and also breeds in Tianjin Municipality in unknown numbers (pers. obs.). **NM** and **SM** Widespread and common in China, with higher numbers present on SM; rare in South Korea. **NB** Small numbers in Yancheng NNR. Numbers are probably underestimated, as this species generally occurs on non-tidal wetlands which were generally less well surveyed than intertidal areas.

Movements: No information.

Significance of Yellow Sea: There is insufficient information to allow an estimate to be made of numbers occurring in China.

Key sites: 5 sites of international importance have been identified, all in China; 4 of the sites are important during NM and 3 during SM (see site location maps below). Breeds in internationally important numbers at Yancheng NNR and Shuangtaizihekou NNR (for site locations see map below). Dong Sha and Yancheng NNR are important during both NM and SM. Tianjin Municipality supports 10% of the estimated flyway population during NM and Shi Jiu Tuo >5% during SM.

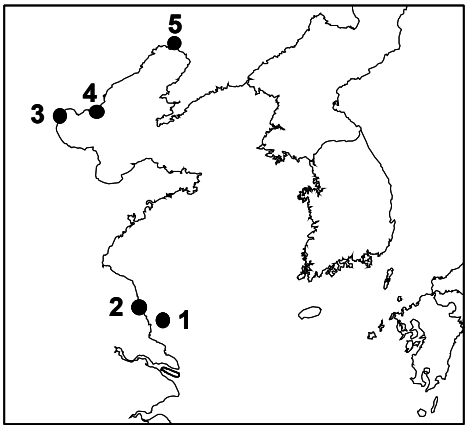
Status of key sites: 2 of the sites are in Protected Areas.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially in coastal non-tidal wetlands.

Site count references

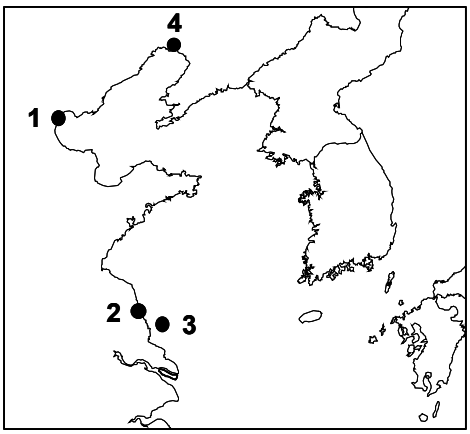
1. S.P. Zhang in litt.
2. Barter *et al.* in prep.
3. Wang & Barter 1998
4. Brazil 1992
5. J. Kriegs in litt.
6. Wang 1997

Sites of international importance for Black-winged Stilt



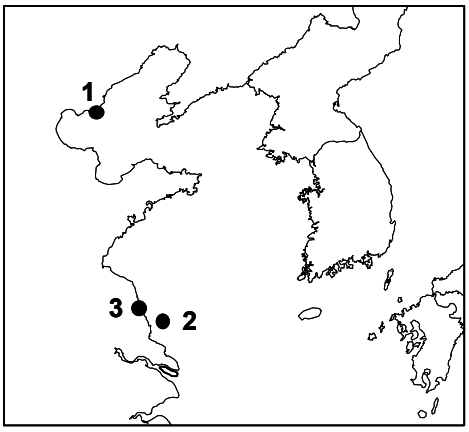
	China
1	Dong Sha
2	Yancheng NNR
3	Tianjin Municipality
4	Shi Jiu Tuo
5	Shuangtaizihekou NNR

Sites of international importance for Black-winged Stilt during northward migration



	Site	Country	Count	Ref
1	Tianjin Municipality	China	2 000	1
2	Yancheng NNR	China	482	2
3	Dong Sha	China	465	3
4	Shuangtaizihekou NNR	China	200	4

Sites of international importance for Black-winged Stilt during southward migration



	Site	Country	Count	Ref
1	Shi Jiu Tuo	China	1 100	5
2	Dong Sha	China	562	3
3	Yancheng NNR	China	327	6

4.4.28 Pied Avocet *Recurvirostra avosetta*

Subspecies None.

Distribution in the EAAF

Breeding: Mongolia and ne. China.

Non-breeding: Coastal and inland. e. and s. China.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **B** Small numbers breed in the northern part of the Yellow Sea. 10 pairs in Shuangtaizihekou NNR (Y.X. Li in litt.). **NM** and **SM** Small numbers from Chang Jiang Estuary n, with concentrations in Yancheng NNR and n. Bohai Wan. Vagrant in South Korea. **NB** Good numbers present in Yancheng NNR. Numbers are probably underestimated as this species often occurs on non-tidal wetlands, which were generally less well surveyed than intertidal areas.

Movements: It is probable that most birds migrate through inland China.

EAAF POPULATION ESTIMATE: 30 000

YELLOW SEA
Status: Breeding visitor, passage migrant and non-breeding visitor
Estimated minimum numbers:
No estimates; vagrant in South Korea

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 2 *(2)*

Significance of Yellow Sea: There is insufficient information to make an estimate of numbers occurring in China. However, the region appears to be relatively unimportant for this species, probably supporting <10% of the estimated flyway population during both NM and SM.

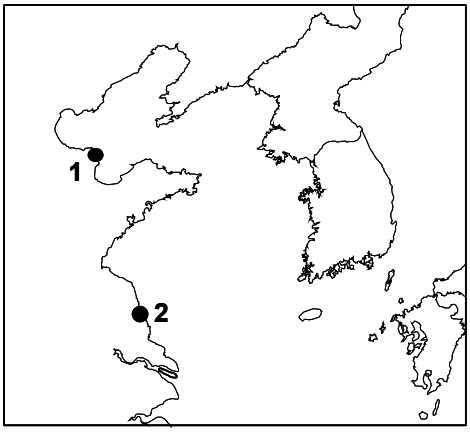
Key sites: 2 sites of international importance have been identified, both in China; Huang He NNR is important during NM and Yancheng during the NB season (see site location maps below).

Status of key sites: Both sites are in Protected Areas.

Major gaps in knowledge: Improved geographical and temporal information from China, especially in coastal non-tidal wetlands.

Site count references
1. Wang *et al*. 1992
2. Wang 1997

Sites of international importance for Pied Avocet during northward migration and the non-breeding season



	Site	Country	Count	Ref
1	Huang He NNR (NM)	China	450	1
2	Yancheng NNR (NB)	China	775	2

4.4.29 Grey-headed Lapwing *Vanellus cinereus*

Subspecies None.

Distribution in EAAF

Breeding: ne China, se Russia and Japan.

Non-breeding: Mainly inland. s. central and se. China, n. Vietnam, n. Thailand and Bangladesh.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas, and adjacent non-tidal wetlands and fields. **B** 2 pairs breed at Shuangtaizihekou NNR (Y.X. Li in litt.); a few pairs breed in the Yancheng NNR (H. Wang pers. comm.). **NM** Small numbers occur in China. Rare in South Korea. **SM** More common, with concentrations at Shi Jiu Tuo and Yancheng NNR. Rare in South Korea. Numbers are probably underestimated due to the dispersed distribution of the species.

Movements: No information.

Significance of Yellow Sea: The Yellow Sea is important for this species as it supports at least 10% of the estimated flyway population during SM. Small numbers breed along the Chinese coastline.

EAAF POPULATION ESTIMATE 10 000

YELLOW SEA
Status: Breeding and non-breeding visitor
Estimated minimum numbers:
No estimates; rare in South Korea

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 2 *(1)*

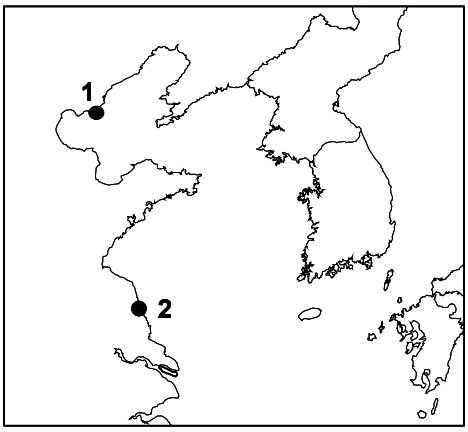
Key sites: 2 sites of international importance have been identified, both in China and both supporting >5% of the estimated flyway population during SM (see site location map below).

Status of key sites: 1 site is in a Protected Area.

Major gaps in knowledge: Improved geographical and temporal information from China, especially in coastal non-tidal wetlands.

Site count references
1. F Heintzenberg in litt.
2. Wang 1997

Site of international importance for Grey-headed Lapwing (both used during southward migration)



	Site	Country	Count	Ref
1	Shi Jiu Tuo	China	630	1
2	Yancheng NNR	China	542	2

4.4.30 Northern Lapwing *Vanellus vanellus*

Subspecies None.

Distribution in EAAF

Breeding: central and s. Yakutia, L. Baikal area, Amur Land, Primorye, Mongolia and n. China.

Non-breeding: Mainly inland. se. China and s. Japan.

Usage and importance of Yellow Sea

Occurrence: Non-tidal wetlands and fields. **NM** and **SM** Widespread in China in small numbers, except for concentrations in n. Bohai Wan. Uncommon in South Korea. Numbers are probably underestimated, as this species occurs in non-tidal habitats which were generally less well surveyed than intertidal areas.

Movements: No information.

Significance of Yellow Sea: The Yellow Sea is important for this species as it supports at least 10% of the estimated flyway population during SM. There is insufficient information to allow an estimate to be made of numbers in China.

EAAF POPULATION ESTIMATE 60 000

YELLOW SEA
Status: Non-breeding visitor
Estimated minimum numbers:
No estimates; uncommon in South Korea

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 2 *(0)*

Key sites: 2 sites of international importance have been identified, both in China; 1 of the sites is important during NM and both during SM (see site location maps below). Tianjin Municipality is important during both NM and SM. Shi Jiu Tuo supports >5% of the estimated flyway population during SM.

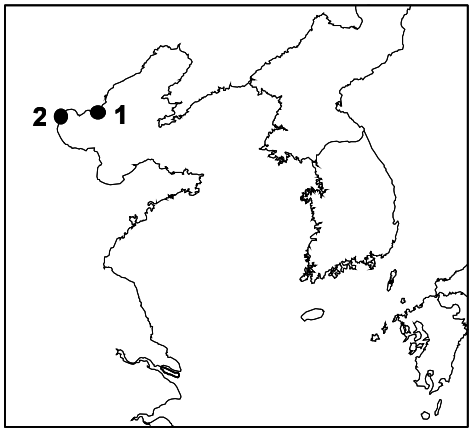
Status of key sites: Neither site is in a Protected Area.

Major gaps in knowledge: Improved geographical and temporal information from China, especially in coastal non-tidal wetlands.

Site count references

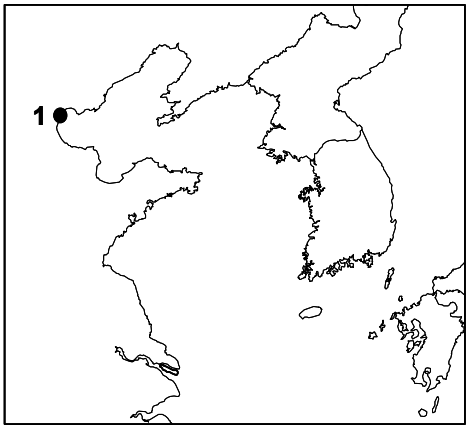
1. J. Hornskov in litt.
2. S.P. Zhang in litt.

Sites of international importance for Northern Lapwing (both used during southward migration)



	Site	Country	Count	Ref
1	Shi Jiu Tuo	China	4 035	1
2	Tianjin Municipality	China	2 000	2

Site of international importance for Northern Lapwing during northward migration



	Site	Country	Count	Ref
1	Tianjin Municipality	China	2 000	2

4.4.31 Grey Plover *Pluvialis squatarola*

Subspecies None.

Distribution in the EAAF

Breeding: Taimyr to n. Chukotka and e. Anadyr lowland, Wrangel Is. and nw. Alaska.

Non-breeding: Mainly coastal. Bangladesh, Myanmar, Indochina, s. and e. China, Japan, South Korea, se. Asia and Australia.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** Widespread and common, particularly in n. China and w. South Korea. **SM** Widespread, but less common than during NM. **NB** Common in the Mangyeung and Dongjin estuaries, smaller numbers elsewhere in South Korea and e. China. Numbers counted are probably realistic estimates of birds present in surveyed areas.

Movements: **NM** Peak numbers occur from mid-April to mid-May; se. Australian birds tend to have a more easterly migration route (probably mostly through Japan) than those from nw. Australia. **SM** Extended passage from August until October. Smaller numbers on SM indicate that the Australian and se. Asian populations probably fly non-stop across the Pacific to the non-breeding grounds.

Significance of Yellow Sea: The Yellow Sea is extremely important as it supports about 80% of the

EAAF POPULATION ESTIMATE: 125 000

YELLOW SEA

Status: Passage migrant and non-breeding visitor

Estimated minimum numbers:

NM: South Korea:18 000; China: 87 000.
SM: South Korea:12 000.
NB: South Korea: 4 500.

INTERNATIONALLY IMPORTANT SITES

(and Protected Area status)

South Korea: 6 *(part of 1)*
China: 7 *(4)*

estimated flyway population during NM; many fewer birds occur during SM.

Key sites: 13 sites of international importance have been identified, 7 in China and 6 in South Korea; 12 of the sites are important during NM and 7 during SM (see site location maps below). 6 are important during both NM and SM (Shi Jiu Tuo, Yeong Jong Do, Namyang Man, Asan Man, Mangyeung Gang Hagu and Dongjin Gang Hagu). Huang He supports >10%, and Yalu Jiang NNR and Tianjin Municipality support >5%, of the estimated flyway population on NM.

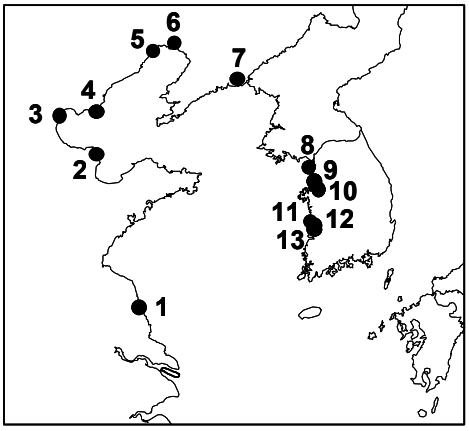
Status of key sites: 4 of the Chinese sites and part of 1 of the South Korean sites (Dongjin Gang Hagu) are within Protected Areas. The Dongjin and Mangyeung estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China. No information from North Korea.

Site count references

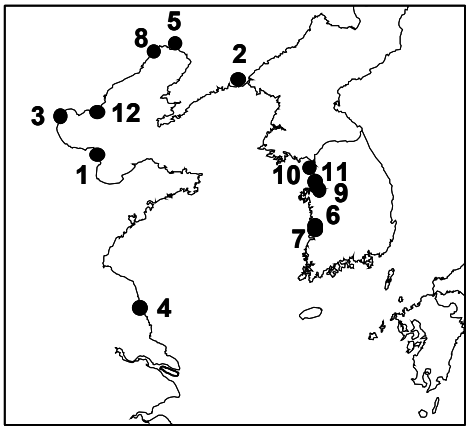
1. Zhu *et al*. 2000
2. Barter *et al*. 2000c
3. Barter *et al*. 2001
4. Barter *et al*. in prep.
5. Barter *et al*. 2000d
6. Yi & Kim in prep.
7. Barter *et al*. 2000b
8. Regulus Tours in litt.
9. F. Heintzenberg in litt.

Sites of international importance for Grey Plover



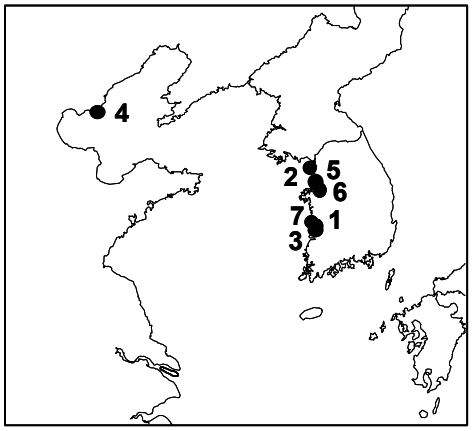
	China		South Korea
1	Yancheng NNR	8	Yeong Jong Do
2	Huang He NNR	9	Namyang Man
3	Tianjin Municipality	10	Asan Man
4	Shi Jiu Tuo	11	Geum Gang Hagu
5	Linghekou	12	Mangyeung Gang Hagu
6	Shuangtaizihekou NNR	13	Dongjin Gang Hagu
7	Yalu Jiang NNR		

Sites of international importance for Grey Plover during northward migration



	Site	Country	Count	Ref
1	Huang He NNR	China	14 899	1
2	Yalu Jiang NNR	China	7 232	2
3	Tianjin Municipality	China	6 493	3
4	Yancheng NNR	China	5 295	4
5	Shuangtaizihekou NNR	China	4 248	5
6	Mangyeung Gang Hagu	South Korea	4 155	6
7	Dongjin Gang Hagu	South Korea	3 601	6
8	Linghekou	China	2 739	7
9	Asan Man	South Korea	2 400	6
10	Yeong Jong Do	South Korea	2 280	6
11	Namyang Man	South Korea	2 265	6
12	Shi Jiu Tuo	China	1 500	8

Sites of international importance for Grey Plover during southward migration



	Site	Country	Count	Ref
1	Mangyeung Gang Hagu	South Korea	4 700	6
2	Yeong Jong Do	South Korea	2 200	6
3	Dongjin Gang Hagu	South Korea	1 959	6
4	Shi Jiu Tuo	China	1 800	9
5	Namyang Man	South Korea	1 533	6
6	Asan Man	South Korea	1 378	6
7	Geum Gang Hagu	South Korea	1 300	6

4.4.32 Kentish Plover *Charadrius alexandrinus*

Subspecies Worldwide 5 (*alexandrinus, dealbatus, seebohmi, nivosus* and *occidentalis*); Yellow Sea 1 (*dealbatus)* and, probably, *alexandrinus*.

Distribution of *C. a. dealbatus* and *C. a. alexandrinus* in the EAAF

Breeding: C. a. dealbatus, e. and se. China, s. Primorye, Sakhalin and s. Kurile Is., s. Japan and Ryukyu Is; *C. a. alexandrinus*, Torei L., s. Transbaikalia, Mongolia and ne. China.

Non-breeding: Mainly coastal, but also inland. *C. a. dealbatus*, e. and se. China, s. Japan, s. to The Philippines and Borneo. *C. a. alexandrinus*, w. Indonesia; also thought to occur in Taiwan (W.T. Liu in litt.).

Usage and importance of Yellow Sea

Occurrence: Intertidal areas and adjacent non-tidal wetlands. **B** Breeds widely around Yellow Sea coasts, but little data available. 1000 pairs at Shuangtaizihekou NNR (Y.X. Li in litt.), very common breeding bird at Yancheng NNR (H. Wang pers. comm.) and >500 pairs in South Korea (Yi & Kim in prep.). **NM** Widespread; very common in the Bo Hai and e. China, and common on w. coast of South Korea; few in n. China and sw. and s. coasts of South Korea. **SM** Similar to NM, except much large numbers in South Korea on w. and s. coasts. **NB** Common on e. coast of China; few elsewhere. Numbers are probably underestimated due to the dispersed distribution of the species.

Movements: **NM** Early migrant with numbers peaking in April, then declining significantly by late April. **SM** In South Korea, passage occurs during August to October.

Significance of Yellow Sea: The Yellow Sea is extremely important for this species as it supports >90% of the estimated flyway population during NM.

EAAF POPULATION ESTIMATE: 95 000

YELLOW SEA
Status: Probably resident, breeding visitor, passage migrant and non-breeding visitor
Estimated minimum numbers:
NM: South Korea: 6 700; China: 83 000.
SM: South Korea: 38 000.
NB: South Korea: Few.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 13 *(part of 1)*
China: 8 *(4)*

Key sites: 21 sites of international importance have been identified, 13 in South Korea and 8 in China; 11 of the sites are important during NM, 16 during SM and 4 during the NB season (see site location maps below). Breeds in internationally important numbers at Yancheng NNR and Shuangtaizihekou NNR (see map below for site locations). 6 sites are important on both NM and SM (Dong Sha, Yancheng NNR, Huang He NNR, Tianjin Municipality, Shi Jiu Tuo and Mangyeung Gang Hagu). Huang He NNR holds 25% and Chongming Dao PNR >5% of the estimated flyway population during NM, whilst Mangyeung Gang Hagu held >10% and Dongjin Gang Hagu, Shi Jiu Tuo and Yancheng NNR held >5% during SM.

Status of key sites: 4 of the Chinese sites and part of 1 of the South Korean sites (Dongjin Gang Hagu) are within Protected Areas. The 2 most important sites during SM, the Dongjin and Mangyeung estuaries, are currently being reclaimed as part of the Saemangeum Reclamation Project.

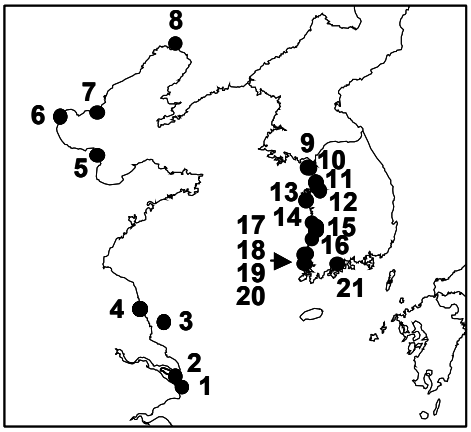
Major gaps in knowledge: Insufficient information on general distribution of both subspecies and on the breeding distribution of *dealbatus* around Yellow Sea. Incomplete geographical and temporal

coverage in China. No information from North Korea.

Site count references

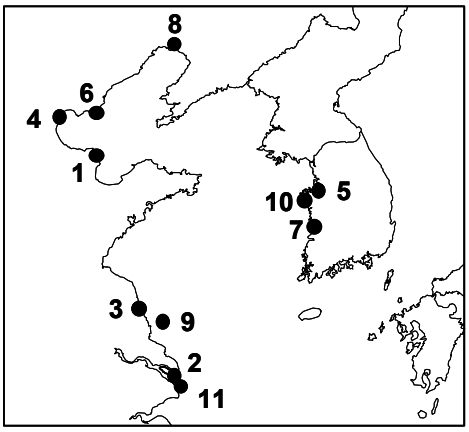
1. Zhu *et al*. 2000
2. Barter *et al*. 1997a
3. Wang 1997
4. S.P. Zhang in litt.
5. Yi & Kim in prep.
6. RSPB Sabbatical Report 2002
7. Barter *et al*. 2000d
8. Wang & Barter 1998
9. J.J. Lu in litt.
10. F. Heintzenberg in litt.
11. Moores 1999a
12. Wang *et al.* 1991

Sites of international importance for Kentish Plover



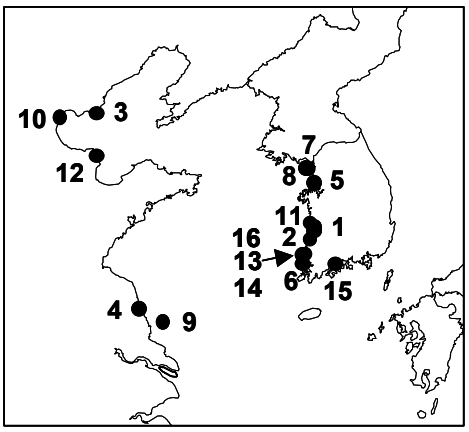
	China		South Korea
1	Jiu Duan Sha	9	Ganghwa Do
2	Chongming Dao PNR	10	Yeong Jong Do
3	Dong Sha	11	Namyang Man
4	Yancheng NNR	12	Asan Man
5	Huang He NNR	13	Seosan Reclaimed Area
6	Tianjin Municipality	14	Geum Gang Hagu
7	Shi Jiu Tuo	15	Mangyeung Gang Hagu
8	Shuangtaizihekou NNR	16	Dongjin Gang Hagu
		17	Paeksu Tidal Flat
		18	Hampyeong Man
		19	Meian Gun Tidal Flat
		20	Aphae Do
		21	Suncheon Man

Sites of international importance for Kentish Plover during northward migration



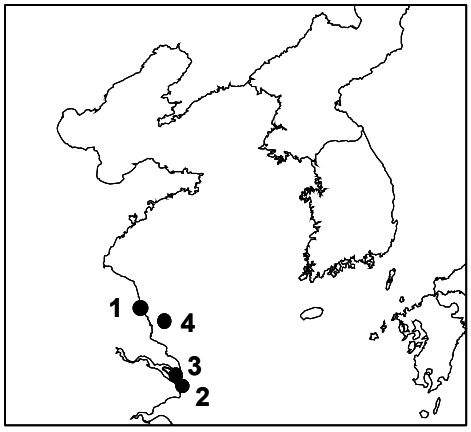
	Site	Country	Count	Ref
1	Huang He NNR	China	24 313	1
2	Chongming Dao PNR	China	7 202	2
3	Yancheng NNR	China	4 165	3
4	Tianjin Municipality	China	3 000	4
5	Asan Man	South Korea	2 100	5
6	Shi Jiu Tuo	China	1 994	6
7	Mangyeung Gang Hagu	South Korea	1 500	5
8	Shuangtaizihekou NNR	China	1 367	7
9	Dong Sha	China	1 103	8
10	Seosan Reclaimed Area	South Korea	1 063	5
11	Jiu Duan Sha	China	1 000	9

Sites of international importance for Kentish Plover during southward migration



	Site	Country	Count	Ref
1	Mangyeung Gang Hagu	South Korea	11 000	5
2	Dongjin Gang Hagu	South Korea	8 850	5
3	Shi Jiu Tuo	China	5 500	10
4	Yancheng NNR	China	4 890	3
5	Namyang Man	South Korea	4 600	5
6	Aphae Do	South Korea	4 332	11
7	Ganghwa Do	South Korea	3 500	5
8	Yeong Jong Do	South Korea	3 048	5
9	Dong Sha	China	3 000	8
10	Tianjin Municipality	China	3 000	4
11	Geum Gang Hagu	South Korea	2 500	5
12	Huang He NNR	China	2 238	12
13	Hampyeong Man	South Korea	1 830	11
14	Meian Gun Tidal Flat	South Korea	1 345	11
15	Suncheon Man	South Korea	1 230	5
16	Paeksu Tidal Flat	South Korea	1 020	5

Sites of international importance for Kentish Plover during the non-breeding season



	Site	Country	Count	Ref
1	Yancheng NNR	China	3 937	3
2	Jiu Duan Sha	China	1 830	9
3	Chongming Dao PNR	China	1 500	9
4	Dong Sha	China	1 185	8

4.4.33 Little Ringed Plover *Charadrius dubius*

Subspecies Worldwide and EAAF 3 (*curonicus, jerdoni* and *dubius*); Yellow Sea 1 (*curonicus*).

Distribution of *C. d. curonicus* in EAAF

Breeding: Russian Far East, Mongolia, w., central and e. China, Korean Pen. and Japan.

Non-breeding: Coastal and inland. e. China and se. Asia.

EAAF POPULATION ESTIMATE 25 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
No estimates; few in South Korea.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 4 *(2)*

Usage and importance of Yellow Sea

Occurrence: Intertidal areas, adjacent non-tidal wetlands and river banks. **NM** and **SM** Widespread in China from Chang Jiang Estuary to Bohai Wan. Few in South Korea. Numbers are probably underestimated, as this species often occurs on non-tidal wetlands which were generally less well surveyed than intertidal areas.

Movements: No information.

Significance of Yellow Sea: There is insufficient information to allow an estimate to be made of numbers occurring in China.

Key sites: 4 sites of international importance have been identified, all in China; all 4 sites are important during NM and 2 during SM (see site location maps below). Yancheng NNR and Tianjin Municipality are important during both NM and SM. Yancheng NNR holds >10% of the estimated flyway population during SM.

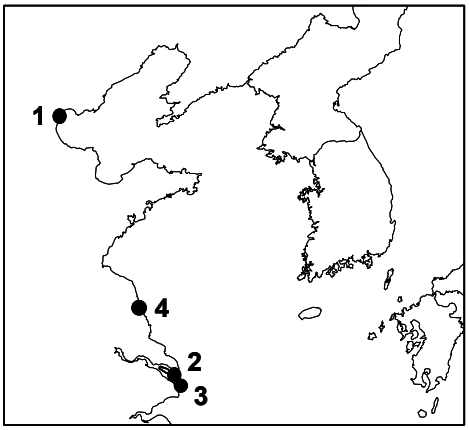
Status of key sites: 2 of the sites are in Protected Areas.

Major gaps in knowledge: Improved geographical and temporal information from China, especially in coastal non-tidal wetlands.

Site count references

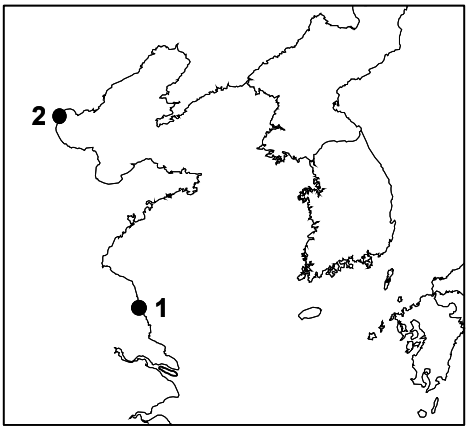
1. S.P. Zhang in litt.
2. J. J. Lu in litt.
3. Wang 1997

Sites of international importance for Little Ringed Plover (all used during northward migration)



	Site	Country	Count	Ref
1	Tianjin Municipality	China	1 000	1
2	Chongming Dao PNR	China	300	2
3	Jiu Duan Sha	China	300	2
4	Yancheng NNR	China	255	3

Sites of international importance for Little Ringed Plover during southward migration



	Site	Country	Count	Ref
1	Yancheng NNR	China	4 658	3
2	Tianjin Municipality	China	1 000	1

4.4.34 Lesser Sand Plover *Charadrius mongolus*

Subspecies Worldwide 5 (*mongolus, atrifrons, pamirensis, stegmanni* and *schaeferi*); Yellow Sea 2 (*mongolus* and *stegmanni*).

Distribution of *C. m. mongolus* and *C. c. stegmanni*

Breeding: C. m. mongolus, s. and e. Yakutia, n. Sea of Okhotsk; *C. m. stegmanni*, Kamchatka, Koryak Highland. Kurile Is., Commander Is. and Chukotka.

Non-breeding: Coastal. *C. m. mongolus* and *C. m. stegmanni*, Japan, e. and s. China, Taiwan, Indochina, se. Asia and Australia; *C. m. stegmanni* range generally more easterly than *C. m. mongolus*, but there is much overlap.

Usage and importance of Yellow Sea

Occurrence: Intertidal areas. **NM** and **SM** Widespread and common; particularly on w. coast of South Korea. Similar numbers on NM and SM. **NB** Small numbers in e. China. Numbers are probably underestimated due to the dispersed distribution of the species over intertidal areas.

Movements: **NM** and **SM** Peak numbers in South Korea occur during May and August-September. No information is available on differences between the migration routes of *C. m. mongolus* and *C. m. stegmanni*. It is assumed that both subspecies pass through the Yellow Sea and it is reasonable to expect that the more easterly-breeding *C. m. stegmanni* takes a more easterly path.

Significance of Yellow Sea: The Yellow Sea is very important for this species as it supports about 50% of the estimated combined populations of *C. m. mongolus* and *C. m. stegmanni* during NM. The species is also common on SM.

Key sites: 11 sites of international importance have been identified, 7 in South Korea and 4 in China; 10 sites are important during NM and 7 during SM (see site location maps below). 6 sites are important during both NM and SM (Yancheng NNR, Ganghwa Do, Yeong Jong Do, Namyang Man, Mangyeung Gang Hagu and Dongjin Gang Hagu). The Dongjin and Mangyeung estuaries each support >5% of the combined estimated flyway populations during both NM and SM.

Status of key sites: All Chinese sites and part of 1 South Korean site (Dongjin Gang Hagu) are within Protected Areas. The Mangyeung and Dongjin estuaries, which are the most important sites for this species on both NM and SM, are currently being reclaimed as part of the Saemangeum Reclamation Project.

Major gaps in knowledge: No information on subspecies distribution during migration. Incomplete geographical and temporal coverage in China. No information from North Korea.

EAAF POPULATION ESTIMATES:
C. m. mongolus: 40 000
C. m. stegmanni: 20 000

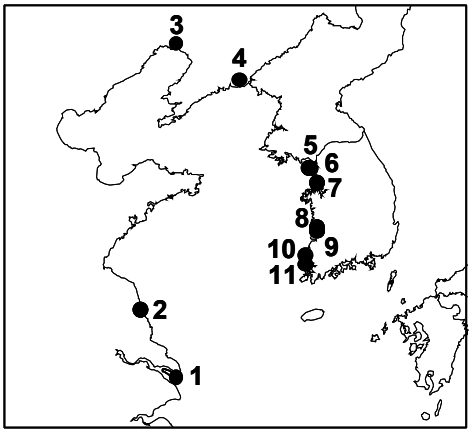
YELLOW SEA
Status: Passage migrant and uncommon non-breeding visitor
Estimated minimum numbers:
NM: South Korea: 13 000; China: 19 000.
SM: South Korea: 17 000.

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
South Korea: 7 *(part of 1)*
China: 4 *(4)*

Site count references

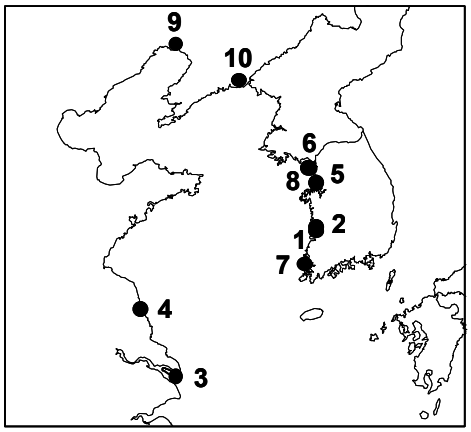
1. Yi & Kim in prep.
2. Wang & Tang 1990a
3. Wang & Liu 1994
4. Moores 1999a
5. Barter *et al*. 2000d
6. Barter *et al*. 2000c

Sites of international importance for Lesser Sand Plover



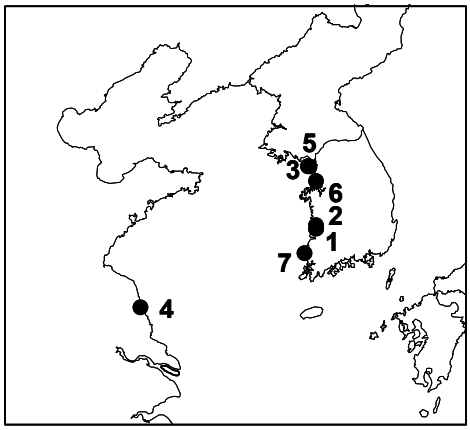
	China		South Korea
1	Chongming Dao PNR	5	Ganghwa Do
2	Yancheng NNR	6	Yeong Jong Do
3	Shuangtaizihekou NNR	7	Namyang Man
4	Yalu Jiang NNR	8	Mangyeung Gang Hagu
		9	Dongjin Gang Hagu
		10	Meian Gun Tidal Flat
		11	Aphae Do

Sites of international importance for Lesser Sand Plover during northward migration



	Site	Country	Count	Ref
1	Dongjin Gang Hagu	South Korea	3 857	1
2	Mangyeung Gang Hagu	South Korea	3 800	1
3	Chongming Dao PNR	China	1 790	2
4	Yancheng NNR	China	1 765	3
5	Namyang Man	South Korea	1 410	1
6	Ganghwa Do	South Korea	1 214	1
7	Aphae Do	South Korea	1 144	4
8	Yeong Jong Do	South Korea	930	1
9	Shuangtaizihekou NNR	China	682	5
10	Yalu Jiang NNR	China	647	6

Sites of international importance for Lesser Sand Plover during southward migration



	Site	Country	Count	Ref
1	Dongjin Gang Hagu	South Korea	4 320	1
2	Mangyeung Gang Hagu	South Korea	4 100	1
3	Yeong Jong Do	South Korea	2 060	1
4	Yancheng NNR	China	1 787	3
5	Ganghwa Do	South Korea	1 700	1
6	Namyang Man	South Korea	1 610	1
7	Meian Gun Tidal Flat	South Korea	862	4

4.4.35 Oriental Plover *Charadrius veredus*

Subspecies None; entire global population confined to the EAAF.

Distribution

Breeding: s. Siberia, Mongolia and ne. China.

Non-breeding: Mostly n. Australia.

Usage and importance of Yellow Sea

Occurrence: No information on habitat preferences. **NM** and **SM** Concentrated along se. China coast of Yellow Sea. Vagrant in South Korea. Numbers are probably underestimated, as this species occurs in non-tidal habitats which were generally less surveyed than intertidal areas.

Movements: No information for Yellow Sea. Probably migrates mainly through inland China, using its preferred open grassland habitat.

Significance of Yellow Sea: There is insufficient information to allow the importance of the Yellow Sea for this species to be determined or numbers to be estimated.

EAAF POPULATION ESTIMATE: 70 000

YELLOW SEA
Status: Passage migrant
Estimated minimum numbers:
No estimates; vagrant in South Korea

INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 1 *(1)*

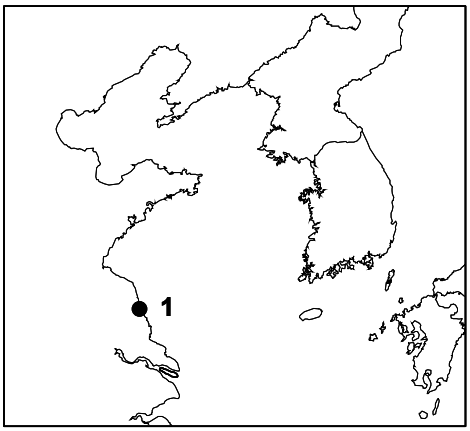
Key sites: 1 site of international importance has been identified, in China during NM (see site location map below).

Status of key sites: The site is in a Protected Area.

Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially in near-coastal areas.

Site count reference
1. Wang 1997

Site of international importance for Oriental Plover (used during northward migration)



	Site	Country	Count	Ref
1	Yancheng NNR	China	1 717	1

4.4.36 Oriental Pratincole *Glareola maldivarum*

Subspecies None; entire global population confined to the EAAF.

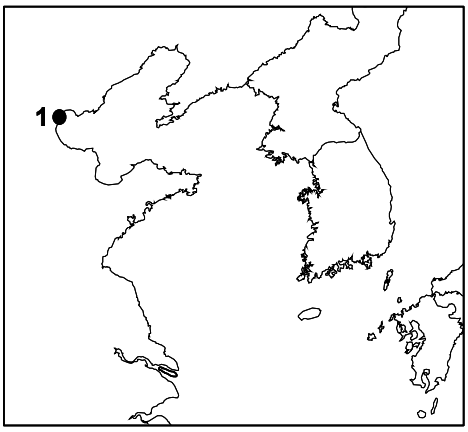
Distribution
Breeding: Myanmar, Thailand, Vietnam to s., e. and n. China; ne. Mongolia and s. Manchuria. se. Asia and Indochina support sedentary populations.
Non-breeding: Mostly n. Australia.

Usage and importance of Yellow Sea
Occurrence: No information on habitat preferences. **B** Estimated 500 pairs in Tianjin Municipality (S.P. Zhang in litt.), a few pairs at Yancheng NNR (H. Wang pers. comm.) and 5 pairs at Shuangtaizihekou NNR (Y.X. Li in litt.). **NM** and **SM** Widespread in China, with highest numbers in Yancheng NNR- Dongsha region. Rare in South Korea. Numbers are probably underestimated, as this species occurs in non-tidal habitats which were generally less well surveyed than intertidal areas.
Movements: No information.
Significance of Yellow Sea: There is insufficient information to allow the importance of the Yellow Sea for this species to be determined or numbers to be estimated.
Key sites: 1 site of international importance has been identified, in China, during the breeding season (see site location map below).
Status of key sites: The site is not in a Protected Area.
Major gaps in knowledge: Incomplete geographical and temporal coverage in China, especially in near-coastal areas.

EAAF POPULATION ESTIMATE: 75 000
YELLOW SEA
Status: Breeding visitor and passage migrant
Estimated minimum numbers:
No estimates; rare in South Korea
INTERNATIONALLY IMPORTANT SITES
(and Protected Area status)
China: 1 *(1)*

Site count reference
1. S.P. Zhang in litt.

Site of international importance for Oriental Pratincole (used during breeding season)



	Site	Country	Count	Ref
1	Tianjin Municipality	China	1 000	1

5 INTERNATIONALLY IMPORTANT SHOREBIRD SITES IN THE YELLOW SEA

5.1 Organisation of Site Accounts

Accounts have been prepared for all sites in the coastal regions of the Yellow Sea for which there is count information showing the occurrence of at least one species in **internationally important** numbers.

Each account contains:
1. Sections on:
   - **Site Information**:
     - Location – Province, Country and coordinates.
     - Area – in hectares.
     - Wetland type – brief description of habitats within the site.
     - Protected Area status - whether a nature reserve; participants in the East Asian-Australasian Shorebird Site Network are also noted.
     - Threats – brief description of threats. N.B. Information on threats has been obtained from a variety of sources and is not standardised.
   - **Count information** - information on scope and timing of counts, and count data sources.
   - **Significance of site**:
     - Highest counts – during northward and southward migrations, and the non-breeding season.
     - Summary information on:
       - numbers of internationally important species recorded at the site during the northward and southward migrations, and the non-breeding season.
       - species recorded in very high concentrations, i.e. >5%, or more, of the estimated flyway population.
       - occurrence of globally threatened species.
       - important breeding concentrations.
       - species for which the site has the highest recorded numbers in the Yellow Sea during either northward or southward migration.

2. Tables listing the maximum counts of international importance for individual species during the migration periods and in the non-breeding season. A list of references for the individual species counts is given at the end of each account.

Moores (1999b) and Yoo & Lee (1998) have been used widely as an information source for site information in South Korea. For China, similar information has been obtained from nature reserve publications, Scott (1989), maps and personal observations.

5.2 Site Accounts Summary

A total of 27 sites have been identified around the Yellow Sea coastline at which at least one shorebird species has been recorded in internationally important numbers (see Figure 6 for names and locations). Ten of these sites are located in China, one in North Korea and sixteen in South Korea.

All sites, except one, consist mainly of intertidal areas that are often associated with non-tidal wetlands. The exception is an area of rice paddies in South Korea (Hongwon Ri).

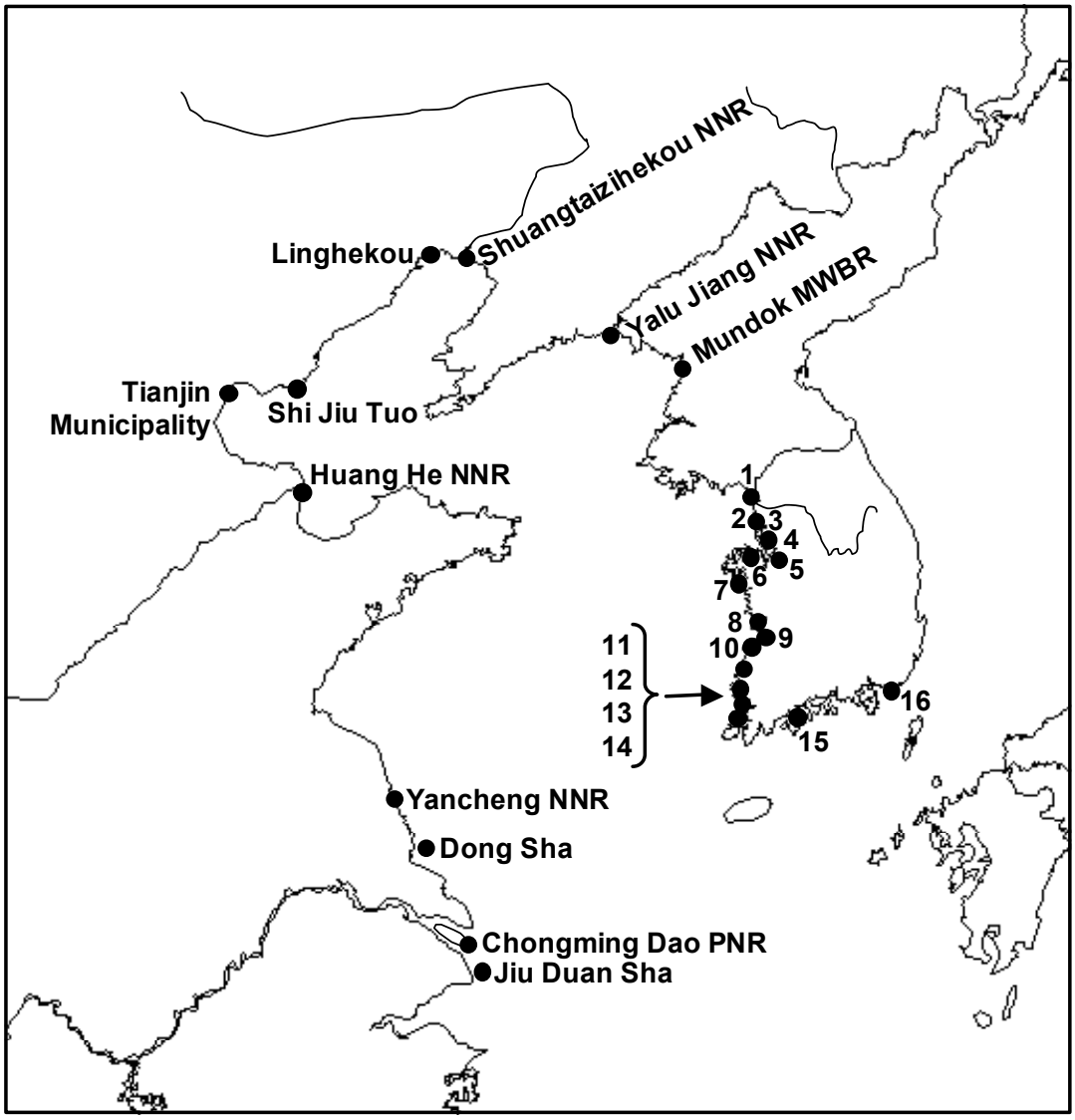
Six of the ten Chinese sites, the North Korean site and a small part of one of the 16 South Korean sites are within Protected Areas. Summary information on the numbers of internationally important species and highest seasonal counts at each site is presented in Table 6.

The sites exhibit a great diversity in the number of internationally important species and shorebirds they support. Half of the sites carry at least five internationally important species, whilst six sites (Yancheng NNR, Tianjin Municipality, Huang He NNR, Mangyeung Gang Hagu, Shi Jiu Tuo and Dongjin Gang Hagu) support 15 or more. Five sites (Yalu Jiang NNR, Huang He NNR, Dongjin Gang Hagu, Mangyeung Gang Hagu and Yancheng NNR) have highest counts of greater than 100 000 shorebirds on northward migration, whilst one (Dong Sha) supports almost 250 000 shorebirds on southward migration.

The data indicate that more birds pass through South Korea during northward migration than southward, with numbers being 60% lower when birds return after the breeding season, despite the probable presence of young birds in the population. It is possible that many species may choose instead to use the Chinese coast during southward migration and the high numbers on the Jiangsu coast at this time provides support for the suggestion. However, there is evidence that some of the species which are very common during northward migration choose to bypass the Yellow Sea on southward passage, e.g. Great Knot, Bar-tailed Godwit and Grey Plover (see Species Accounts for more detail).

Some sites support high percentages of a species flyway population and Table 7 lists those sites holding >5%, >10% and >20% of the estimated flyway populations. Thus, 14 out of the 27 sites support at least one species in numbers exceeding 5% of its flyway population. Some sites carry a

Figure 6 Locations of the sites in the Yellow Sea at which internationally important numbers of at least one species of shorebird have been recorded



Key for South Korean sites: 1 Ganghwa Do, 2 Yong Jeong Do, 3 Daebu Do., 4 Namyang Man, 5 Hongwon Ri, 6 Asan Man, 7 Seosan Reclaimed Area, 8 Geum Gang Hagu, 9 Mangyeung Gang Hagu, 10 Dongjin Gang Hagu, 11 Paeksu Tidal Flat, 12 Hampyeong Man, 13 Meian Gun Tidal Flat, 14 Aphae Do, 15 Suncheon Man, 16 Nakdong Gang Hagu.

number of species in concentrations exceeding 5% of their flyway populations, with Yancheng NNR and the Mangyeung Gang Hagu holding the most. Sites supporting high percentages of a species flyway population have very important conservation significance. Six extremely important regions within the Yellow Sea can be identified:

- central and northern Jiangsu coast (Yancheng NNR and Dongsha);
- Bohai Wan (Huang He NNR, Tianjin Municipality and Shi Jiu Tuo);
- northern Liaodong Wan (Shuangtaizihekou NNR and Linghekou);
- Yalu Jiang NNR;
- Namyang and Asan Mans; and
- the Mangyeung and Dongjin estuaries.

Each of these regions supports peak numbers well in excess of 100 000 shorebirds on northward migration, whilst the Jiangsu coast holds more than 250 000 on southward migration and is also the most important area within the Yellow Sea during the non-breeding season.

Most of the important sites for the endangered Spotted Greenshank and vulnerable Spoon-billed Sandpiper lie within the regions listed above. Additional important sites for the Spotted Greenshank are Ganghwa Do and Suncheon Man. It is considered that every site that supports any individuals of these two species should be protected because of their extreme rarity and vulnerability to extinction.

Table 6 Sites ranked according to the number of internationally important shorebird species supported and their highest seasonal counts

Site	Number of internationally important species	Highest Count		
		Northward migration	Southward migration	Non-breeding season
Yancheng NNR	23	111 285	82 530	27 181
Huang He NNR	17	130 122	70 748	-
Tianjin Municipality	17	73 553	-	-
Dongjin Gang Hagu	16	126 145	36 181	-
Mangyeung Gang Hagu	16	115 054	53 178	-
Shi Jiu Tuo	15	-	-	-
Shuangtaizihekou NNR	14	63 641	25 780	-
Dong Sha	13	72 584	244 176	44 737
Namyang Man	12	53 359	26 470	2 303
Asan Man	11	70 507	10 362	635
Yalu Jiang NNR	10	151 708	-	-
Geum Gang Hagu	10	34 198	12 212	4 084
Yeong Jong Do	10	22 886	21 038	240
Ganghwa Do	9	28 715	15 317	1 183
Jiu Duan Sha	7	5 780	843	4 190
Chongming Dao PNR	6	24 770	2 889	4 871
Nakdong Gang Hagu	4	14 198	2 857	-
Suncheon Man	4	14 170	3 443	3 770
Aphae Do	4	12 862	9 162	606
Seosan Reclaimed Area	3	10 696	408	-
Meian Gun Tidal Flat	3	2 180	6 466	585
Linghekou	2	34 445	-	-
Hampyeong Man	2	5 728	6 549	964
Daebu Do	1	-	3 668	-
Paeksu Tidal Flat	1	1 511	2 060	
Hongwon Ri	1	-	-	-
Mundok MBWR	1	-	-	-

The adjacent Mangyeung and Dongjin estuaries, which are currently being reclaimed as part of the Saemangeum Reclamation Project, are the most important South Korean sites during both northward and southward migration in terms of maximum counts and numbers of internationally important species supported. During the northward migration period, the two estuaries jointly carry 30% of the Great Knot breeding population. The estuaries also support the most significant concentrations within the Yellow Sea of the Spotted Greenshank and Spoon-billed Sandpiper during southward migration. Between them the two estuaries support the highest recorded concentrations in the Yellow Sea during northward migration of Terek Sandpiper, Great Knot and Lesser Sand Plover, and during southward migration of Black-tailed Godwit, Bar-tailed Godwit, Great Knot, Dunlin, Grey Plover, Kentish Plover and Lesser Sand Plover.

Scott (1989) records a further 14 potentially important sites in China and three in North Korea which have not yet been surveyed. These sites are listed at the end of the Site Account section and they should be surveyed as a matter of priority.

5.3 Site Accounts

The following section contains accounts for all 27 sites that have been identified as supporting **internationally important numbers** of at least one shorebird species in the coastal regions of the Yellow Sea. Section 5.4 contains a listing of potentially important shorebird sites that have not yet been surveyed.

Table 7 Sites supporting >20%, >10% and >5% of an estimated shorebird flyway population during northward migration, southward migration or the non-breeding season

Sites	>20%	>10%	>5%
Chongming Dao PNR			Kentish Plover (NM)
Dong Sha			Asian Dowitcher (SM)
Yancheng NNR		Spotted Redshank (SM) Marsh Sandpiper (NM) Sanderling (NM) Little Ringed Plover (SM)	Spotted Redshank (NM) Marsh Sandpiper (SM) Sanderling (NB) Dunlin (NM) Kentish Plover (SM)
Huang He NNR	Eurasian Curlew (NM) Kentish Plover (NM)	Grey Plover (NM) Little Curlew (NM)	
Tianjin Municipality		Black-winged Stilt (NM)	Eurasian Curlew (NM, SM & NB) Red Knot (NM) Curlew Sandpiper (NM) Grey Plover (NM)
Shi Jiu Tuo	Eurasian Curlew (SM)		Eurasian Curlew (NM) Black-winged Stilt (SM) Grey-headed Lapwing (SM) Northern Lapwing (SM) Kentish Plover (SM)
Shuangtaizihekou NNR			Great Knot (NM)
Yalu Jiang NNR		Great Knot (NM) Bar-tailed Godwit (NM)	Eastern Curlew (NM) Grey Plover (NM)
Ganghwa Do			Eastern Curlew (NM)
Namyang Man			Eurasian Curlew (NM & SM) Spotted Greenshank (NM) Great Knot (NM)
Asan Man		Black-tailed Godwit (NM)	Great Knot (NM)
Geum Gang Hagu	Eurasian Oystercatcher (NB)	Eurasian Oystercatcher (NB)	Eurasian Curlew (SM)
Mangyeung Gang Hagu		Great Knot (NM) Kentish Plover (SM)	Black-tailed Godwit (SM) Spotted Greenshank (SM) Dunlin (NM) Lesser Sand Plover (NM & SM)
Dongjin Gang Hagu		Great Knot (NM)	Spotted Greenshank (SM) Kentish Plover (SM) Lesser Sand Plover (NM & SM)

(Key: For site location see Figure 6 on Page 69.
NM = northward migration, SM = southward migration, NB = non-breeding season)

5.3.1 Jiu Duan Sha

Site information

Location: Chang Jiang Estuary, Shanghai, China
31° 10' N, 120° 00' E

Area: 11 400 ha.

Wetland type: Islands and shoals with extensive intertidal flats.

Protected Area status: Ramsar site. Provincial Nature Reserve (J.J. Lu pers. comm.)

Threats: Future reduced silt flows, due to Three Gorges dam, leading to lower accretion rates and predicted erosion of the intertidal flats (Yang 1999a, 1999b). Hunting of shorebirds (Ma *et al.* 1998).

Count information

Detailed counts were conducted by East China Normal University during NM (March-April 1998, March-April 1999 and April-May 2001), SM (September 1997 and October 1998) and in the NB season (December 1997 and November 1998-January 1999) (J.J. Lu in litt.). The tabulated data is from this series of counts.

During a visit in 1996, East China Normal University estimated that about 160 000 shorebirds were present on 30 March (sum of two separate counts [90 000 and 70 000] from different parts of the island). Whilst detailed species counts were not made, it was estimated that internationally important numbers of Eastern Curlew (>500), Spotted Redshank (>1 000), Kentish Plover (>1 000), Grey-tailed Tattler (>500) and Great Knot (>5 000) were present (J.J. Lu in litt.). Weather conditions in late March 1996 were poor with heavy rain and ne. winds and Jiu Duan Sha is probably acting, similarly to Chongming Dao, as an emergency site for weather-affected long-distance migrants (Barter *et al*. 1997b).

Internationally important species counts for Jiu Duan Sha

Northward migration	Count	Ref
Kentish Plover	1 000	1
Whimbrel	800	1
Spotted Redshank	500	1
Little Ringed Plover	300	1
Non-breeding season	**Count**	**Ref**
Kentish Plover	1 830	1

Significance of site

Highest counts: **NM** 5 780; **SM** 843; **NB** 4 190.

Supports:

- 7pecies in internationally important numbers (NM 7NB 1), which includes Eastern Curlew, Grey-tailed Tattler and Great Knot recorded in March 1996;
- the endangered Spotted Greenshank during NM (maximum count: 2).

Species count reference

1. J.J. Lu in litt.

5.3.2 Chongming Dao Provincial Nature Reserve

Site information

Location: Chang Jiang Estuary, Shanghai, China
31° 30' N, 121° 45' E

Area: Nature Reserve: 32 600 ha;
Intertidal flats: 26 500 ha.

Wetland type: Intertidal flats, salt marsh, fish and crab ponds.

Protected Area status: Provincial Nature Reserve. East Asian-Australasian Shorebird Network Site.

Threats: Unsustainable exploitation of natural products and hunting of shorebirds (Tang & Wang 1995; Barter *et al.* 1997c; Kong *et al.* 1998; Ma *et al.* 1998). Future reduced silt flows, due to Three Gorges dam, leading to lower accretion rates and projected erosion of the intertidal flats (Yang 1999a, 1999b).

Count information

Comprehensive counts were made in January-February, April-May and September-October 1990 (Wang & Tang 1990a, 1990b), March-April 1996 (Barter *et al.* 1997a), April 1997 (Barter *et al.* 1998) and September-May 1998 and November-May 1999 (J.J. Lu in litt.).

Internationally important species counts for Chongming Dao Provincial Nature Reserve

Northward migration	Count	Ref
Kentish Plover	7 202	1
Great Knot	5 761	1
Lesser Sand Plover	1 790	2
Whimbrel	1 200	3
Eastern Curlew	794	1
Little Ringed Plover	300	3
Non-breeding season	**Count**	**Ref**
Kentish Plover	1 500	3

Significance of site

Highest counts: **NM** 24 770; **SM** 2 889; **NB** 4 871.

Supports:

- 6 species in internationally important numbers (NM 6; NB 1);
- >5% of the estimated flyway population of Kentish Plover during NM;
- the endangered Spotted Greenshank during NM and SM (maximum counts: NM: 2; SM: 1);

- the vulnerable Spoon-billed Sandpiper during NM (maximum count: 9).

This site probably supports >100 000 shorebirds on NM. During NM it has a very high turnover rate and is used as an emergency site by long-distance migrants during poor weather conditions (Barter *et al.* 1997b).

Species count references

1. Barter *et al.* 1997a
2. Wang & Tang 1990a
3. J.J. Lu in litt.

5.3.3 Dong Sha

Site information

Location: Jiangsu Province, China
33° 07' N, 121° 21' E

Area: 70 000 ha.

Wetland type: Islands and shoals with extensive intertidal flats.

Protected Area status: None.

Threats: General decline in the ecosystem due to increasing water pollution from coastal industries, algal red tides and unrestricted harvesting of shellfish (Wang & Barter 1998).

Count information

Counts spread over 1-2 days and covering four roosting areas were made in August 1993, February 1995, May 1996, January, April and September 1997 (Wang & Barter 1998).

Significance of site

Highest counts: **NM** 72 584; **SM** 244 176; **NB** 44 737.

Supports:

- 13 species in internationally important numbers (NM 5; SM 11; NB 2);
- >5% of the estimated flyway population of Asian Dowitcher during SM;
- internationally important numbers of the endangered Spotted Greenshank during NM;
- the highest recorded internationally important numbers of Asian Dowitcher, Red Knot and Red-necked Phalarope in the Yellow Sea during SM.

This site probably supports >100 000 shorebirds during NM and >300 000 shorebirds during SM (Wang & Barter 1998).

Species count reference

1. Wang & Barter 1998.

Internationally important species counts for Dong Sha

Northward migration	Count	Ref
Kentish Plover	1 103	1
Eastern Curlew	819	1
Asian Dowitcher	664	1
Black-winged Stilt	465	1
Spotted Greenshank	16	1
Southward migration		
Dunlin	13 081	1
Red Knot	8 140	1
Kentish Plover	3 000	1
Red-necked Phalarope	1 728	1
Eastern Curlew	1 532	1
Asian Dowitcher	1 320	1
Marsh Sandpiper	1 140	1
Common Greenshank	615	1
Black-winged Stilt	562	1
Broad-billed Sandpiper	416	1
Eurasian Oystercatcher	120	1
Non-breeding season		
Kentish Plover	1 185	1
Eurasian Curlew	400	1

5.3.4 Yancheng National Nature Reserve

Site information

Location: Jiangsu Province, China
33° 30' N, 120° 30' E

Area: Nature Reserve: 453 000 ha;
Intertidal flats: c. 150 000 ha.

Wetland type: Complex of permanent, fresh to brackish ponds and marshes, marshy grassland, extensive reed-beds and intertidal flats, with areas of fish and shrimp ponds and saltpans (Scott 1989).

Protected Area status: Ramsar site. National Nature Reserve. Man and the Biosphere Reserve. East Asian-Australasian Shorebird Network Site.

Threats: Drainage for agriculture and conversion to aquaculture ponds; human disturbance (Scott 1989). Past reclamation for port and industrial development, roads, saltpans and mariculture has been extensive and is continuing at a high rate (Barter *et al.* in prep.).

Count information

Counts, with varying degrees of coverage, were conducted during NM in 1990, 1992, 1993, 1995 and 2001, during SM in 1989, 1990, 1991, 1992, 1993 and 1995, during the northern summer in 1993 and 1994, and during the NB season from 1989 to 1995 (Wang & Liu 1994; Wang 1997; Barter *et al*. in prep.).

Internationally important species counts for Yancheng National Nature Reserve

Northward migration	Count	Ref
Dunlin	57 867	1
Red-necked Stint	10 073	1
Marsh Sandpiper	9 026	1
Grey Plover	5 295	1
Kentish Plover	4 165	2
Spotted Redshank	3 834	1
Red Knot	3 169	2
Sharp-tailed Sandpiper	3 125	1
Sanderling	3 095	2
Lesser Sand Plover	1 765	3
Oriental Plover	1 717	2
Common Greenshank	955	2
Asian Dowitcher	945	1
Ruddy Turnstone	860	3
Broad-billed Sandpiper	717	2
Black-winged Stilt	482	1
Little Ringed Plover	255	2
Spotted Greenshank	35	2
Southward migration		
Dunlin	18 559	2
Spotted Redshank	7 150	2
Marsh Sandpiper	6 022	2
Red-necked Stint	5 822	2
Kentish Plover	4 890	2
Little Ringed Plover	4 658	2
Common Greenshank	2 325	2
Lesser Sand Plover	1 787	2
Sharp-tailed Sandpiper	1 771	2
Black-tailed Godwit	1 686	2
Ruddy Turnstone	919	2
Broad-billed Sandpiper	806	2
Grey-headed Lapwing	542	2
Eurasian Curlew	379	2
Sanderling	362	2
Black-winged Stilt	327	2
Asian Dowitcher	285	2
Non-breeding season		
Kentish Plover	3 937	2
Spotted Redshank	1 511	2
Sanderling	1 102	2
Common Greenshank	803	2
Pied Avocet	775	2
Eurasian Curlew	697	2
Eurasian Oystercatcher	200	4

Significance of site

Highest counts: **NM** 111 285; **SM** 82 530; **NB** 27 181.

Supports:

- 23 species in internationally important numbers (NM 18; SM 17; NB 7; B 3);
- >10% of the estimated flyway populations of: Marsh Sandpiper during NM and >5% during SM;
- >5% of the estimated flyway population of Spotted Redshank during NM and >10% during SM;
- >10% of the estimated flyway population of Sanderling during NM and >5% during the NB season;
- >5% of the estimated flyway populations of Dunlin during NM and Kentish Plover during SM;
- >10% of the estimated flyway population of Little Ringed Plover during SM; internationally important numbers of the endangered Spotted Greenshank during NM;
- the vulnerable Spoon-billed Sandpiper during NM and SM (maximum counts: NM: 8; SM: 18);
- internationally important numbers of immature Eastern Curlew during the northern summer (1 718 max.);
- internationally important breeding populations of Common Redshank, Eurasian Oystercatcher and Black-winged Stilt; breeding populations of Grey-headed Lapwing, Kentish Plover, Common Redshank (probably internationally important) and Oriental Pratincole;
- the highest recorded internationally important numbers of Spotted Redshank, Marsh Sandpiper, Ruddy Turnstone, Sanderling, Red-necked Stint, Sharp-tailed Sandpiper, Dunlin and Oriental Plover in the Yellow Sea during NM, of Spotted Redshank, Marsh Sandpiper, Common Greenshank, Ruddy Turnstone, Red-necked Stint, Sharp-tailed Sandpiper, Broad-billed Sandpiper and Little Ringed Plover during SM, and of Spotted Redshank, Common Greenshank, Sanderling, Pied Avocet and Kentish Plover during the NB season.

Species count references

1. Barter *et al*. in prep.
2. Wang 1997
3. Wang and Liu 1994
4. Scott 1989

5.3.5 Huang He National Nature Reserve

Site information

Location: Shandong Province, China
37° 55' N, 119° 00' E

Area: Huang He NNR: 153 000 ha, with 38 534 ha of intertidal flat and 32 772 ha of marsh land.

Wetland type: Intertidal flats and coastal marshes, saltpans, fish and shrimp ponds.

Protected Area status: National Nature Reserve. East Asian-Australasian Shorebird Network Site.

Threats: Reclamation for agriculture, shrimp ponds and oil extraction, human disturbance, unsustainable fishing and oil industry pollution (Zhu *et al.* 1998).

Count information

Comprehensive counts were conducted in September 1991 (Wang *et al.* 1991), April-May 1992 (Wang *et al.* 1992), late April to early May 1997, second-half April 1998 and early April 1999 (Zhu *et al.* 2000). Counting was carried out within the Reserve and also at two other locations inside the Delta region – Wuhaozhang and the joint mouth of the Guangli and Zima Rivers.

Internationally important species counts for Huang He National Nature Reserve

Northward migration	Count	Ref
Kentish Plover	24 313	1
Dunlin	24 106	1
Little Curlew	17 000	2
Grey Plover	14 899	1
Great Knot	12 816	1
Bar-tailed Godwit	10 678	1
Eurasian Curlew	9 766	1
Black-tailed Godwit	7 197	1
Whimbrel	2 626	1
Marsh Sandpiper	1 135	1
Eastern Curlew	1 125	1
Terek Sandpiper	724	1
Spotted Redshank	594	1
Common Greenshank	585	1
Pied Avocet	450	3
Eurasian Oystercatcher	130	3
Southward migration		
Marsh Sandpiper	4 246	4
Kentish Plover	2 238	4
Terek Sandpiper	1 228	4
Eurasian Curlew	912	4
Spotted Greenshank	11	4

Significance of site

Highest counts: **NM** 130 122; **SM** 70 748.

Supports:

- 17 species in internationally important numbers (NM 16; SM 5);
- >20% of the estimated flyway population of Eurasian Curlew during NM;
- >10% of the estimated flyway populations of Kentish Plover and Grey Plover during NM;
- >10% of the estimated Little Curlew population during NM. Numbers of this species were estimated by transecting grassland areas - see Species Account for more details;
- internationally important numbers of the endangered Spotted Greenshank during SM; also occurs during NM (maximum count: 4).
- breeding populations of Eurasian Oystercatcher, Grey-headed Lapwing, Black-winged Stilt, Kentish Plover, Common Redshank and Oriental Pratincole;
- the highest recorded internationally important numbers of Little Curlew, Whimbrel, Eurasian Curlew, Pied Avocet, Grey Plover and Kentish Plover in the Yellow Sea during NM.

This site probably supports >200 000 shorebirds during NM and probably >100 000 during SM. Additional counts during SM would probably allow additional internationally significant species to be identified and also an improved estimate to be made of shorebird numbers during that period.

Species count references

1. Zhu *et al.* 2000
2. Barter *et al.* 1999
3. Wang *et al.* 1992
4. Wang *et al.* 1991

5.3.6 Tianjin Municipality

Site information

Location: Tianjin Municipality, China
39° 00' N, 117° 42' E

Area: c. 12 000 ha of intertidal flats; c. 20 000 ha of saltpans, shrimp and fish ponds.

Wetland type: Intertidal flats, saltpans, fish and shrimp ponds.

Protected Area status: None.

Threats: Ongoing reclamation for industrial development, oil extraction, roads, saltpans and aquaculture; significant human disturbance from oil extraction and fishing activities (Barter *et al.* 2001).

Count information

Complete count of Tianjin Municipality coastline only carried out once in mid-May 2000, with good coverage of intertidal flats but limited coverage of saltpans, fish and shrimp ponds (Barter *et al.* 2001). Department of Biology, Beijing Normal University, conducted surveys of near-coastal wetlands from 1998-2000 (S.P. Zhang in litt..)

Internationally important species counts for Tianjin Municipality

Northward migration	Count	Ref
Red Knot	14 277	1
Curlew Sandpiper	12 489	1
Grey Plover	6 493	1
Red-necked Stint	4 285	1
Kentish Plover	3 000	2
Sharp-tailed Sandpiper	2 855	1
Marsh Sandpiper	2 425	1
Common Redshank	2 000	2
Eurasian Curlew	2 000	2
Northern Lapwing	2 000	2
Black-winged Stilt	2 000	2
Spotted Redshank	1 000	2
Little Ringed Plover	1 000	2
Asian Dowitcher	966	1
Southward migration		
Kentish Plover	3 000	2
Common Redshank	2 000	2
Eurasian Curlew	2 000	2
Northern Lapwing	2 000	2
Common Greenshank	1 000	2
Spotted Redshank	1 000	2
Little Ringed Plover	1 000	2
Pied Avocet	1 000	2
Non-breeding season		
Eurasian Curlew	2 000	2

Significance of site

Highest count: **NM** 73 553.

Supports:

- 17 species in internationally important numbers (NM 14; SM 8; NB 1; B 1);
- >5% of the estimated flyway populations of Red Knot and Grey Plover during NM;
- internationally important breeding population of 1 000 Oriental Pratincoles (S.P. Zhang in litt.);
- the highest recorded internationally important numbers of Common Redshank, Red Knot, Curlew Sandpiper, Black-winged Stilt, Northern Lapwing and Little Ringed Plover in the Yellow Sea during NM, of Common Redshank during SM and of Eurasian Curlew during the NB season.

This site probably supports >100 000 shorebirds during NM. Additional counts would probably allow additional internationally significant species to be identified and also enable improved estimates to be made of shorebird numbers during the migration and non-breeding periods.

Species count references

1. Barter *et al.* 2001
2. S.P. Zhang in litt.

5.3.7 Shi Jiu Tuo (Happy Island)

Site information

Location: Hebei Province, China
39° 08' N, 118° 49' E

Area: c. 2 500 ha

Wetland type: Intertidal flats, fish and shrimp ponds.

Protected Area status: None.

Threats: Human disturbance, possible hotel development and oil exploration (J. Hornskov in litt.).

Count information

Information obtained from birdwatchers who have visited the Beidaihe-Shi Jiu Tuo region to observe bird migration.

Internationally important species counts for Shi Jiu Tuo

Northward migration	Count	Ref
Red Knot	5 000	1
Great Knot	4 000	1
Eurasian Curlew	3 400	2
Curlew Sandpiper	2 000	1
Black-tailed Godwit	1 994	2
Kentish Plover	1 838	2
Grey Plover	1 500	1
Asian Dowitcher	1 100	1
Common Redshank	800	3
Terek Sandpiper	700	4
Southward migration		
Eurasian Curlew	15 000	5
Kentish Plover	5 500	5
Northern Lapwing	4 035	6
Marsh Sandpiper	3 500	5
Grey Plover	1 800	5
Black-winged Stilt	1 100	7
Grey-headed Lapwing	630	5
Eastern Curlew	500	7
Asian Dowitcher	495	5

Significance of site

Supports:

- 15 species in internationally important numbers (NM 10; SM 9);
- >40% of the estimated flyway population of Eurasian Curlew during SM and almost 10% during NM;
- >5% of the estimated flyway populations of Kentish Plover, Black-winged Stilt and Grey-headed Lapwing during SM;
- the endangered Spotted Greenshank during NM and SM (maximum counts: NM: 3; SM: 8);
- the vulnerable Spoon-billed Sandpiper during NM (maximum count: 2);
- the highest recorded internationally important numbers of Asian Dowitcher in the Yellow

Sea during NM and of Eurasian Curlew, Black-winged Stilt, Grey-headed Lapwing and Northern Lapwing during SM.

Species count references

1. Regulus Travel in litt.
2. RSPB Sabbatical Report 2002
3. C. Doughty in litt.
4. G. Carey in litt.
5. F. Heintzenberg in litt.
6. J. Hornskov in litt.
7. J. Kriegs in litt.

5.3.8 Linghekou

Site information

Location: Liaoning Province, China
40° 45' N, 121° 00' E

Area: Proposed Reserve: 140 000 ha; Intertidal flats: 20 000 ha.

Wetland type: Intertidal flats, shrimp and fish ponds, and saltpans.

Protected Area status: None.

Threats: Reclamation for shrimp ponds and oil extraction, human disturbance, unsustainable fishing and oil industry pollution (Barter *et al.* 2000b).

Count information

Complete count of coastline carried out once, during NM, with good coverage of intertidal flats but only limited coverage of saltpans, fish and shrimp ponds (Barter *et al*. 2000b).

Internationally important species counts for Linghekou

Northward migration	Count	Ref
Great Knot	17 540	1
Grey Plover	2 739	1

Significance of site

Highest count: **NM** 34 445.

Supports:

- 2 species in internationally important numbers during NM;

This site probably supports >50 000 shorebirds on NM. Additional counts during NM, and counts during SM, would almost certainly allow additional internationally significant species to be identified and also enable improved estimates to be made of shorebird numbers during the migration periods.

Species count reference

1. Barter *et al.* 2000b

5.3.9 Shuangtaizihekou National Nature Reserve

Site information

Location: Liaoning Province, China
40° 58' N, 121° 45' E

Area: Reserve: 80 000 ha; intertidal flats: c. 20 000 ha

Wetland type: Intertidal flats, reed beds, shrimp ponds and rice fields.

Protected Area status: National Nature Reserve. East Asian-Australasian Shorebird Network Site.

Threats: Reclamation for oil extraction and associated human disturbance and pollution; disturbance from shellfishing activities (Barter *et al*. 2000d).

Count information

Comprehensive counts were conducted in mid-May 1998 and late April 1999 (Barter *et al.* 2000d) with good coverage of intertidal flats, but only limited coverage of saltpans, fish and shrimp ponds, and reed beds. A number of incomplete counts were made in the August-September 1999 period (Y.X. Li in litt.).

Internationally important species counts for Shuangtaizihekou National Nature Reserve

Northward migration	Count	Ref
Great Knot	24 915	1
Dunlin	16 411	1
Grey Plover	4 248	1
Bar-tailed Godwit	3 738	1
Eastern Curlew	1 803	1
Eurasian Curlew	1 535	1
Kentish Plover	1 367	1
Whimbrel	1 306	1
Lesser Sand Plover	682	1
Black-winged Stilt	200	2
Eurasian Oystercatcher	100	2
Southward migration		
Dunlin	7 600	3
Red Knot	4 200	3
Black-tailed Godwit	2 070	3
Eastern Curlew	1 817	3
Terek Sandpiper	1 200	3
Eurasian Curlew	700	2
Eurasian Oystercatcher	500	3

Significance of site

Highest counts: **NM** 63 641; **SM** 25 780.

Supports:

- 14 species in internationally important numbers (NM 11; SM 7; B 4);
- >5% of the estimated flyway population of Great Knot during NM;

- 5% of the estimated flyway population of Eurasian Oystercatcher during SM;
- internationally important breeding populations of Common Redshank, Eurasian Oystercatcher, Black-winged Stilt and Kentish Plover; breeding populations of Pied Avocet, Grey-headed Lapwing, and Oriental Pratincole;
- the highest recorded internationally important numbers of Eastern Curlew in the Yellow Sea during SM.

This site probably supports >100 000 shorebirds during both NM and SM. Additional counts during NM and SM would almost certainly allow additional internationally significant species to be identified and also improved estimates to be made of shorebird numbers during the migration periods.

Species count references

1. Barter *et al*. 2000d
2. Brazil 1992
3. Y.X. Li in litt.

5.3.10 Yalu Jiang National Nature Reserve

Site information

Location: Liaoning Province, China
40° 00' N, 124° 00' E

Area: Reserve: 108 057 ha;
Intertidal flats: c. 30 000 ha.

Wetland type: Intertidal flats, shrimp ponds and reed beds.

Protected Area status: National Nature Reserve. East Asian-Australasian Shorebird Network Site.

Threats: Disturbance at roost sites and by fishermen on feeding grounds (Barter *et al.* 2000c).

Count information

Comprehensive counts were conducted in early May 1999 and mid-May 2000 (Barter *et al.* 2000c) with good coverage of intertidal flats, but only limited coverage of fish and shrimp ponds, and reed beds.

Internationally important species counts for Yalu Jiang National Nature Reserve

Northward migration	Count	Ref
Great Knot	54 178	1
Bar-tailed Godwit	51 918	1
Dunlin	25 181	1
Grey Plover	7 232	1
Eastern Curlew	3 744	1
Common Greenshank	1 000	1
Broad-billed Sandpiper	729	1
Lesser Sand Plover	647	1
Eurasian Curlew	563	1
Eurasian Oystercatcher	189	1

Significance of site

Highest count: **NM** 151 708.

Supports:

- 10 species in internationally important numbers during NM;
- >10% of the estimated flyway populations of Great Knot and Bar-tailed Godwit during NM;
- >5% of the estimated flyway populations of Grey Plover and Eastern Curlew during NM;
- the endangered Spotted Greenshank during NM (maximum count: 3);
- the vulnerable Spoon-billed Sandpiper during NM (maximum count: 1);
- the highest recorded internationally important numbers in the Yellow Sea during NM of Bar-tailed Godwit, Eastern Curlew, Common Greenshank, Broad-billed Sandpiper and Eurasian Oystercatcher.

This site probably supports >200 000 shorebirds during NM. Additional counts during NM and counts during SM would almost certainly allow additional internationally significant species to be identified and also enable improved estimates to be made of shorebird numbers during NM and estimates to be obtained for SM.

Species count reference

1. Barter *et al.* 2000c

5.3.11 Mundok Migratory Bird Wetland Reserve

Site information

Location: South Pyongan Province, North Korea
39° 24' N, 125° 06' E

Area: 6 000 ha, including 3 000 ha buffer zone.

Wetland type: Intertidal flats, salt marsh and reed beds.

Protected Area status: Migratory Bird Wetland Reserve.

Threats: Reclamation for agriculture, aquaculture and salt production; habitat degradation from agricultural and industrial pollution; human disturbance (UNDP 2000c).

Count information

No detailed count information is available. This site is at the mouth of the Chongchan River and is part of the very extensive intertidal flats in the area. The region can be expected to support large numbers of shorebirds during both NM and SM.

Internationally important species counts for Mundok Migratory Bird Wetland Reserve

Northward migration	Count	Ref
Eastern Curlew	1 890	1

Significance of site
Supports:
- 1 species in internationally important numbers during NM;
- the endangered Spotted Greenshank (UNDP 2000c);
- the vulnerable Spoon-billed Sandpiper (UNDP 2000c);

Species count reference
1. UNDP 2000c.

5.3.12 Ganghwa Do

Site information
Location: Kyonggi Province, South Korea; 37° 35' N, 126° 25' E.
Area: 7 500 ha
Wetland type: Intertidal flats, fish ponds and rice fields.
Protected Area status: None at present; plan to designate protected tidal flat in southern part of island (Je 2002).
Threats: Current situation is unclear. At least partial reclamation is planned, perhaps complete. Pollution and tourism (Moores 1999b).

Count information
Counts have been conducted since 1993. Up to 1996, counts were carried out once or twice during both NM and SM; since 1997, count frequency has increased to twice during NM and three times during SM (Yi & Kim in prep.). Additional counts were made during NM and SM in 1998 and in the 1998-1999 NB season (Moores 1999a).

Internationally important species counts for Ganghwa Do

Northward migration	Count	Ref
Dunlin	17 000	1
Eastern Curlew	2 120	1
Lesser Sand Plover	1 214	1
Terek Sandpiper	640	1
Eurasian Curlew	363	1
Southward migration		
Kentish Plover	3 500	1
Black-tailed Godwit	2 915	1
Terek Sandpiper	2 300	1
Lesser Sand Plover	1 700	1
Eastern Curlew	1 535	1
Common Greenshank	1 000	1
Spotted Greenshank	40	1

Significance of site
Highest counts: **NM** 28 715; **SM** 15 317; **NB** 1 183.
Supports:
- 9 species in internationally important numbers (NM 5; SM 7);
- >5% of the estimated flyway population of Eastern Curlew during NM;
- internationally important numbers of the endangered Spotted Greenshank during SM; also occurs during NM (maximum count: 3);
- the highest recorded internationally important number of Terek Sandpiper in the Yellow Sea during SM.

Species count reference
1. Yi & Kim in prep.

5.3.13 Yeong Jong Do

Site information
Location: Inchon Province, South Korea; 37° 31' N, 126° 32' E.
Area: 7 500 ha.
Wetland type: Intertidal flats, salt marsh and saltpans.
Protected Area status: None.
Threats: >5 000 ha already reclaimed for construction of new Seoul International Airport. Pollution and tourism. Complete reclamation plan (Moores 1999b).

Count information
Counts have been conducted since 1993. Up to 1996, counts were carried out once or twice during both NM and SM; since 1997, count frequency has increased to twice during NM and three times during SM (Yi & Kim in prep.). Additional counts were made during NM and SM in 1998 and in the 1998-1999 NB season (Moores 1999a).

Significance of site
Highest counts: **NM** 22 886; **SM** 21 038; **NB** 240.
Supports:
- 10 species in internationally important numbers (NM 7; SM 8); the endangered Spotted Greenshank during both NM and SM (maximum counts: NM: 2; SM: 9);
- the vulnerable Spoon-billed Sandpiper during NM (maximum count: 1).

Species count references
1. Yi & Kim in prep.
2. Moores 1999a.

Internationally important species counts for Yeong Jong Do

Northward migration	Count	Ref
Dunlin	13 208	1
Bar-tailed Godwit	3 500	1
Grey Plover	2 280	1
Eastern Curlew	1 140	1
Lesser Sand Plover	930	1
Whimbrel	825	1
Terek Sandpiper	685	2
Southward migration		
Dunlin	12 110	1
Great Knot	6 000	1
Kentish Plover	3 048	1
Grey Plover	2 200	1
Lesser Sand Plover	2 060	1
Eastern Curlew	1 620	1
Terek Sandpiper	1 358	2
Eurasian Curlew	852	1

5.3.14 Daebu Do

Site information

Location: Kyonggi Province, South Korea; 37° 15' N, 126° 29' E.

Area: 3 000 ha.

Wetland type: Intertidal flats.

Protected Area status: None.

Threats: None known.

Count information

Counts were conducted in June and September 1993, August and September 1998, and August and September 1999 (Yi & Kim in prep.; Moores 1999a).

Internationally important species counts for Daebu Do

Southward migration	Count	Ref
Common Greenshank	1 209	1

Significance of site

Highest count: **SM** 3 668.

Supports:

- 1 species in internationally important numbers during SM.

Species count reference

1. Yi & Kim in prep.

5.3.15 Namyang Man

Site information

Location: Kyonggi Province, South Korea; 37°10' N, 126° 45' E.

Area: 10 000 ha.

Wetland type: Intertidal flats, salt marsh and ponds.

Protected Area status: None,

Threats: Sea wall 80% completed by early 2002 (N. Moores in litt.).

Count information

Counts have been conducted since 1993. Up to 1996, counts were carried out once or twice during both NM and SM; since 1997, count frequency has increased to twice during NM and three times during SM (Yi & Kim in prep.). Additional counts were made during NM and SM in 1998 and in the 1998-1999 NB season (Moores 1999a).

Internationally important species counts for Namyang Man

Northward migration	Count	Ref
Great Knot	21 000	1
Dunlin	15 200	1
Bar-tailed Godwit	5 800	1
Grey Plover	2 265	1
Black-tailed Godwit	2 020	1
Eurasian Curlew	1 880	1
Lesser Sand Plover	1 410	1
Terek Sandpiper	997	2
Whimbrel	740	1
Spotted Greenshank	57	1
Southward migration		
Kentish Plover	4 600	1
Eurasian Curlew	2 451	1
Lesser Sand Plover	1 610	1
Grey Plover	1 533	1
Terek Sandpiper	1 420	1
Eurasian Oystercatcher	220	1
Spotted Greenshank	28	1
Non-breeding season		
Eurasian Curlew	1 148	2

Significance of site

Highest counts: **NM** 53 359; **SM** 26 470; **NB** 2 303.

Supports:

- 12 species in internationally important numbers (NM 10; SM 7; NB 1);
- >5% of the estimated flyway population of Eurasian Curlew during both NM and SM;
- >5% of the estimated flyway population of Great Knot during NM;
- internationally important numbers of the endangered Spotted Greenshank during both

NM (>5% of the estimated flyway population) and SM;
- the vulnerable Spoon-billed Sandpiper during SM (maximum count: 1);
- the highest recorded internationally important number of Spotted Greenshank in the Yellow Sea during NM.

Species count references
1. Yi & Kim in prep.
2. Moores 1999a

5.3.16 Hongwon Ri

Site information
Location: Kyonggi Province, South Korea; 37° 05' N, 126° 45' E.
Area: 1 000 ha.
Wetland type: Rice fields.
Protected Area status: None.
Threats: None known (Moores 1999b).

Count information
A count was conducted in May 1998. According to the local farmers, the rice paddies support several thousand Black-tailed Godwit during NM (Moores 1999a).

Internationally important species counts for Hongwon Ri

Northward migration	Count	Ref
Black-tailed Godwit	1 701	1

Significance of site
Supports:
- 1 species in internationally important numbers during NM.

Species count reference
1. Moores 1999a.

5.3.17 Asan Man

Site information
Location: Chunchongnam Province, South Korea; 37° 02' N, 126° 40' E.
Area: 5 000 ha.
Wetland type: Intertidal flats.
Protected Area status: None.
Threats: 35 000 ha of original 40 000 ha already reclaimed. Mining for construction materials, pollution, tourism and changing agricultural methods (Moores 1999b).

Count information
Counts have been conducted since 1993. Up to 1996, counts were carried out once or twice during both NM and SM; since 1997, count frequency has increased to twice during NM and three times during SM (Yi & Kim in prep.). Additional counts were made during NM and SM in 1998 and in the 1998-1999 NB season (Moores 1999a).

Internationally important species counts for Asan Man

Northward migration	Count	Ref
Great Knot	34 000	1
Black-tailed Godwit	18 282	1
Dunlin	14 000	1
Bar-tailed Godwit	3 500	1
Grey Plover	2 400	1
Kentish Plover	2 100	1
Whimbrel	1 310	1
Eastern Curlew	1 170	1
Terek Sandpiper	1 072	2
Spotted Greenshank	12	1
Southward migration		
Black-tailed Godwit	2 650	1
Common Greenshank	1 450	1
Terek Sandpiper	1 420	1
Grey Plover	1 378	1

Significance of site
Highest counts: **NM** 70 507; **SM** 10 362; **NB** 635.
Supports:
- 11 species in internationally important numbers (NM 10; SM 4);
- >10% of the estimated flyway population of Black-tailed Godwit on NM;
- >5% of the estimated flyway population of Great Knot on NM
- internationally important numbers of the endangered Spotted Greenshank on NM; also occurs during SM (maximum count: 2);
- the vulnerable Spoon-billed Sandpiper during SM (maximum count: 1);
- the highest recorded internationally important number of Black-tailed Godwit in the Yellow Sea during NM.

Species count references
1. Yi & Kim in prep.
2. Moores 1999a

5.3.18 Seosan Reclaimed Area

Site information

Location: Chunchongnam Province, South Korea; 36° 39' N, 126° 23' E.

Area: 17 500 ha

Wetland type: Mostly lakes and rice fields formed by coastal reclamation which was completed in 1984; also intertidal flats (2 000 ha).

Protected Area status: None.

Threats: None known (Moores 1999b).

Count information

Counts were conducted twice during NM and three times during SM in 1997 and 1998. The count for the site has been obtained by summing the species maxima over the 1997-1998 period (Yi & Kim in prep.).

Internationally important species counts for Seosan Reclaimed Area

Northward migration	Count	Ref
Black-tailed Godwit	6 006	1
Kentish Plover	1 063	1
Common Greenshank	963	1

Significance of site

Highest counts: **NM** 10 696; **SM** 408.

Supports:

- 3 species in internationally important numbers on NM;

Species count reference

1. Yi & Kim in prep.

5.3.19 Geum Gang Hagu

Site information

Location: Chollabuk Province, South Korea; 36° 00' N, 126° 40' E.

Area: 12 000 ha.

Wetland type: Intertidal flats and barraged river.

Protected Area status: None.

Threats: 7 km of southern bank already reclaimed. Proposed to completely reclaim remaining mud flats. Pollution, tourism and changing agricultural methods (Moores 1999b).

Count information

Counts were conducted twice during NM and three times during SM in 1997, 1998 and 1999 (Yi & Kim in prep.). Additional counts were made during NM and SM in 1998 and in the 1998-1999 NB season (Moores 1999a). Roost counts obtained at Yubu Island, which is located within the estuary, have been included in the site data.

Internationally important species counts for Geum Gang Hagu

Northward migration	Count	Ref
Great Knot	18 850	1
Black-tailed Godwit	2 049	2
Terek Sandpiper	761	1
Eastern Curlew	422	1
Southward migration		
Eurasian Curlew	2 800	1
Kentish Plover	2 500	1
Terek Sandpiper	1 653	2
Grey Plover	1 300	1
Eurasian Oystercatcher	1 060	1
Common Greenshank	699	2
Sanderling	300	1
Non-breeding season		
Eurasian Oystercatcher	5 700	3
Eurasian Curlew	350	1

Significance of site

Highest counts: **NM** 34 198; **SM** 12 212; **NB** 4 084.

Supports:

- 10 species in internationally important numbers (NM 4; SM 7; NB 2);
- >50% of the estimated flyway population of Eurasian Oystercatcher during the NB period (at Yubu Island roost);
- >5% of the estimated flyway population of Eurasian Curlew during SM;
- the highest recorded internationally important numbers of Eurasian Oystercatcher in the Yellow Sea during SM and the NB season.

Species count references

1. Yi & Kim in prep.
2. Moores 1999a
3. N. Moores in litt.

5.3.20 Mangyeung Gang Hagu

Site information

Location: Chollabuk Province, South Korea; 35° 54' N, 126° 45' E.

Area: 12 000 ha

Wetland type: Intertidal flats and salt works.

Protected Area status: None.

Threats: Estuary currently being reclaimed, together with the adjacent Dongjin Gang Hagu, as part of the 40 100 ha Saemangeum Reclamation Project.

Count information
Counts have been conducted since 1993. Up to 1996, counts were carried out once or twice during both NM and SM; since 1997, count frequency has increased to twice during NM and three times during SM and the area covered has been extended (Yi & Kim in prep.).

Internationally important species counts for Mangyeung Gang Hagu

Northward migration	Count	Ref
Great Knot	59 000	1
Dunlin	47 650	1
Red-necked Stint	5 023	1
Grey Plover	4 155	1
Lesser Sand Plover	3 800	1
Bar-tailed Godwit	3 350	1
Kentish Plover	1 500	1
Eastern Curlew	625	1
Whimbrel	620	1
Ruddy Turnstone	400	1
Southward migration		
Dunlin	22 000	1
Kentish Plover	11 000	1
Great Knot	8 021	1
Black-tailed Godwit	8 008	1
Grey Plover	4 700	1
Red-necked Stint	4 500	1
Lesser Sand Plover	4 100	1
Eastern Curlew	1 100	1
Terek Sandpiper	1 040	1
Broad-billed Sandpiper	700	1
Eurasian Curlew	530	1
Spoon-billed Sandpiper	180	1
Spotted Greenshank	52	1

Significance of site
Highest counts: **NM** 115 054; **SM** 53 178.
Supports:

- 16 species in internationally important numbers (NM 10; SM 13);
- >10% of the estimated flyway populations of Great Knot during NM and of Kentish Plover during SM;
- >5% of the estimated flyway population of Lesser Sand Plover during both NM and SM;
- >5% of the estimated flyway populations of Dunlin during NM and of Black-tailed Godwit during SM;
- internationally important numbers of the endangered Spotted Greenshank (>5% of the estimated flyway population) during SM; also present during NM (maximum count: 2);
- internationally important numbers of the vulnerable Spoon-billed Sandpiper during SM; also occurs during NM (maximum count: 20);
- the highest recorded internationally important numbers of Black-tailed Godwit, Spotted Greenshank, Great Knot, Dunlin, Spoon-billed Sandpiper, Grey Plover and Kentish Plover in the Yellow Sea during SM.

Species count reference
1. Yi & Kim in prep.

5.3.21 Tongjin Gang Hagu

Site information
Location: Chollabuk Province, South Korea; 35° 47' N, 126° 45' E.
Area: 12 000 ha
Wetland type: Intertidal flats.
Protected Area status: Small portion (810 ha) is an East Asian-Australasian Shorebird Network Site.
Threats: Estuary currently being reclaimed, together with the adjacent Mangyeung Gang Hagu, as part of the 40 100 ha Saemangeum Reclamation Project.

Internationally important species counts for Tongjin Gang Hagu

Northward migration	Count	Ref
Great Knot	60 000	1
Dunlin	38 850	1
Bar-tailed Godwit	8 430	1
Red-necked Stint	5 000	1
Lesser Sand Plover	3 857	1
Grey Plover	3 601	1
Terek Sandpiper	1 600	1
Whimbrel	1 070	1
Eastern Curlew	1 045	1
Ruddy Turnstone	450	1
Southward migration		
Dunlin	20 004	1
Kentish Plover	8 850	1
Great Knot	5 200	1
Bar-tailed Godwit	4 845	1
Lesser Sand Plover	4 320	1
Black-tailed Godwit	2 750	1
Grey Plover	1 959	1
Common Greenshank	1 585	1
Terek Sandpiper	964	1
Broad-billed Sandpiper	800	1
Eurasian Curlew	775	1
Eastern Curlew	680	1
Spoon-billed Sandpiper	100	1
Spotted Greenshank	59	2

Count information
Counts have been conducted since 1993. Up to 1996, counts were carried out once or twice during both NM and SM; since 1997, count frequency has increased to twice during NM and three times during SM (Yi & Kim in prep.).

Significance of site
Highest counts: **NM** 126 145; **SM** 36 181.
Supports:

- 17 species in internationally important numbers (NM 10; SM 14);
- >10% of the estimated flyway population of Great Knot during NM;
- >5% of the estimated flyway population of Lesser Sand Plover during both NM and SM;
- >5% of the estimated flyway population of Kentish Plover during SM;
- internationally important numbers of the vulnerable Spoon-billed Sandpiper during SM; also present during NM (maximum count: 3);
- internationally important numbers of the endangered Spotted Greenshank (>5% of the estimated flyway population) during SM;
- the highest recorded internationally important numbers of Terek Sandpiper, Great Knot and Lesser Sand Plover in the Yellow Sea during NM, and of Bar-tailed Godwit and Lesser Sand Plover during SM.

Species count reference
1. Yi & Kim in prep.
2. N. Moores in litt.

5.3.22 Paeksu Tidal Flat

Site information
Location: Chollabuk Province, South Korea; 35° 12' N, 126° 26' E.
Area: 1 500 ha
Wetland type: Intertidal mudflats
Protected Area status: None.
Threats: Small scale reclamation (Moores 1999b).

Count information
Counts were conducted in May and October 1994 (Yi & Kim in prep.).

Internationally important species counts for Paeksu Tidal Flat

Southward migration	Count	Ref
Kentish Plover	1 020	1

Significance of site
Highest counts: **NM** 1 511; **SM** 2 060.
Supports:

- 1 species in internationally important numbers during SM;
- the endangered Spotted Greenshank during SM (maximum count: 5).

Species count reference
1. Yi & Kim in prep.

5.3.23 Hampyeong Man

Site information
Location: Chollanam Province, South Korea; 35° 07' N, 126° 25' E.
Area: 5 000 ha
Wetland type: Intertidal flats
Protected Area status: Designated Sea Resources Conservation Area; plan to designate protected tidal flat (Je 2002).
Threats: None known. Reclamation plan cancelled (Moores 1999b).

Count information
Counts were conducted in April, May, August and September 1998, and in January 1999 (Moores 1999a).

Internationally important species counts for Hampyeong Man

Southward migration	Count	Ref
Kentish Plover	1 830	1
Terek Sandpiper	1 496	1

Significance of site
Highest counts: **NM** 5 728; **SM** 6 549; **NB** 964.
Supports:

- 2 species in internationally important numbers during SM;
- the endangered Spotted Greenshank during SM (maximum count: 1).

Species count reference
1. Moores 1999a

5.3.24 Meian Gun Tidal Flat

Site information
Location: Chollanam Province, South Korea; 35° 05' N, 126° 20' E.
Area: 10 000 ha.
Wetland type: Intertidal flats.
Protected Area status: None.
Threats: None known. Reclamation plan cancelled (Moores 1999b).

Count information
Counts were conducted in May, August and September 1998, and in January 1999 (Moores 1999a).

Internationally important species counts for Meian Gun Tidal Flat

Southward migration	Count	Ref
Terek Sandpiper	1 628	1
Kentish Plover	1 345	1
Lesser Sand Plover	862	1

Significance of site
Highest counts: **NM** 2 180; **SM** 6 466; **NB** 585.
Supports:

- 3 species in internationally important numbers on SM.

Species count reference
1. Moores 1999a

5.3.25 Aphae Do

Site information
Location: Chollanam Province, South Korea; 34° 50' N, 126° 20' E.
Area: 3 000 ha.
Wetland type: Intertidal flats.
Protected Area status: None; plan to designate protected tidal flat (Je 2002).
Threats: None known. Reclamation plan cancelled (Moores 1999b).

Count information
Counts were conducted in April, May, August and September 1998, and in January 1999 (Moores 1999a).

Internationally important species counts for Aphae Do

Northward migration	Count	Ref
Lesser Sand Plover	1 144	1
Southward migration		
Kentish Plover	4 332	1
Terek Sandpiper	534	1
Non-breeding season		
Eurasian Curlew	397	1

Significance of site
Highest counts: **NM** 12 862; **SM** 9 162; **NB** 606.
Supports:

- 4 species in internationally important numbers (NM 1; SM 2; NB 1);

Species count reference
1. Moores 1999a

5.3.26 Suncheon Man

Site information
Location: Chollanam Province, South Korea; 34° 50' N, 127° 30' E.
Area: 5 000 ha.
Wetland type: Intertidal flats, salt marsh, reed beds and rice fields
Protected Area status: None.
Threats: River straightening (Moores 1999b).

Count information

Counts were conducted twice during NM and three times during SM in 1997-1999 (Yi & Kim in prep.). Additional counts were made during NM and SM in 1998 and in the 1998-1999 NB season (Moores 1999a).

Internationally important species counts for Suncheon Man

Northward migration	Count	Ref
Terek Sandpiper	1 046	1
Grey-tailed Tattler	429	1
Southward migration		
Kentish Plover	1 230	2
Terek Sandpiper	729	1
Spotted Greenshank	22	1

Significance of site
Highest counts: **NM** 14 170; **SM** 3 443; **NB** 3 770.
Supports:

- 4 species in internationally important numbers (NM 2; SM 3);
- internationally important numbers of the endangered Spotted Greenshank during SM; also occurs during NM (maximum count: 2);
- the vulnerable Spoon-billed Sandpiper during SM (maximum count: 2);
- the highest recorded internationally important number of Grey-tailed Tattler in the Yellow Sea during NM.

Species count references
1. Moores 1999a
2. Yi & Kim in prep.

5.3.27 Nakdong Gang Hagu

Site information

Location: Pusan, South Korea;
35° 05' N, 128° 50' E.

Area: 1 500 ha.

Wetland type: Intertidal flats and sand islands.

Protected Area status: All within Natural Monument Area (1966); mostly within Natural Ecosystem Conservation Area (1989).

Threats: Despite reserve designations, there has been significant ongoing reclamation (1 600 ha) and plans to reclaim a further 500 ha and to develop Ulsuk Island. Pollution (Moores 1999b).

Count information

Counts were conducted in April, May, August and September 1998 (Moores 1999a).

Internationally important species counts for Nakdong Gang Hagu

Northward migration	Count	Ref
Red-necked Stint	4 508	1
Southward migration		
Sanderling	533	1
Eurasian Curlew	479	1
Grey-tailed Tattler	463	1

Significance of site

Highest counts: **NM** 14 198; **SM** 2 857.

Supports:

- 4 species in internationally important numbers (NM 1; SM 3);
- the endangered Spotted Greenshank during NM (maximum count: 1);
- the highest recorded internationally important numbers of Grey-tailed Tattler and Sanderling in the Yellow Sea during SM.

Species count reference

1. Yi & Kim in prep.

5.4 Other potentially important shorebird sites in the Yellow Sea

A number of sites in China and North Korea that have not yet been surveyed are listed in Scott (1989). Brief details are provided below.

CHINA

1. **Shore of Rizhao County, Shandong Province (35° 20' N, 119° 30' E).**
   Area: 22 300 ha.
   Site description: Approximately 70 km of coast including several small estuaries, coastal salt marshes, saltpans and extensive intertidal flats.
2. **Dagu He Estuary and Jiaozhou Bay, Shandong Province (36° 10' N, 120° 10' E).**
   Area: c. 50 000 ha.
   Site description: Estuarine marshes of the Dagu He and extensive intertidal flats of Jiaozhou Bay.
3. **Wulong He Estuary and Zhaohushan Marshes, Shandong Province (36° 35' N, 121° 00' E).**
   Area: c. 35 000 ha.
   Site description: Estuary of the Wulong He, with riverine marshes, coastal salt marshes, intertidal flats and many saltpans, as well as several small estuaries and areas of intertidal flats in adjacent sea bays.
4. **Huanglei He and Rushan He estuaries, Shandong Province (36° 48' N, 121° 30' E).**
   Area: c. 15 000 ha.
   Site description: Two small estuaries uniting in a shallow sea bay with extensive intertidal flats.
5. **Muzhu He Estuary and Chashan Bay, Shandong Province (37° 00' N, 122° 00' E).**
   Area: c. 10 000 ha.
   Site description: Estuary of the Muzhu He, with riverine marshes, coastal salt marshes, intertidal flats and many saltpans, and Chashan Bay with extensive intertidal flats.
6. **Zhuduoshan and Rongcheng Coast, Shandong Province (37° 20' N, 122° 30' E).**
   Area: 3 500 ha.
   Site description: Several small bays with intertidal flats.
7. **Fushan, Zhifu, Jia He and Weide Shan, Shandong Province (37° 30' N, 121° 29' E).**
   Area: Unknown.
   Site description: Several small estuaries along 60 km of the n. coast of the Shandong Peninsula.
8. **Laizhou Bay, Weifang County, Shandong Province (37° 09' N, 119° 25' E).**
   Area: 130 000 ha.
   Site description: Saltpans, fish and shrimp ponds, and intertidal flats on the south shore of Laizhou Bay.
9. **Nanda Gang Marshes, Hebei Province (38° 30' N, 117° 30' E).**
   Area: 10 200 ha.
   Site description: Intertidal mudflats, salt marshes, fish ponds and saltpans.
10. **Nanbao Marshes, Hebei Province (39° 06' N, 118° 18' E).**
    Area: 32 400 ha.
    Site description: Salt marshes and intertidal flats, with adjacent very large area of saltpans.
11. **Luan Hekou Marshes, Hebei Province (39° 22' N, 119° 15' E).**
    Area: 8 000 ha.
    Site description: Intertidal flats, salt marshes and saltpans in Luan He Delta.
12. **Beidai He, Hebei province (39° 49' N, 119° 30' E).**
    Area: 7 000 ha.
    Site description: Complex of small coastal wetlands, including estuaries of the Heng He, Tai He and Yang He.
13. **Laotie Shan, Liaoning Province (38° 55' N, 121° 06' E).**
    Area: 17 000 ha.
    Site description: Intertidal flats.
14. **Zhuang He Coast, Liaoning Province (39° 30' N, 122° 42' E).**
    Area: 22 070 ha.
    Site description: Several small estuaries, extensive intertidal flats and some saltpans.

NORTH KOREA

1. **Chongchon-Gang Estuary, South Pyongan Province (39° 43' N, 125° 24' E).**
   Area: c.30 000 ha. N.B. The Mundok Migratory Bird Wetland Reserve is located within the estuary.
   Site description: Extensive estuarine marshes and intertidal mudflats, large areas of rice paddies and a marshy low-lying island.
2. **Taedong Estuary and Taesong-Ho, South Pyongyan and South Hwanghae Provinces (38° 40'-39° 00' N, 125° 05'-125° 30' E).**
   Area: c.70 000 ha.
   Site description: Extensive fresh to saline marshes, salt pans and intertidal mudflats in the estuary, and shallow freshwater lakes, associated marshes and large areas of rice paddies on the adjacent coastal plain.
3. **Wetlands of South Hwanghae and Kaesong, South Hwanghae Province (37° 45'-38° 15' N, 125° 00-126° 30' E).**
   Area: Unknown.
   Site description: A vast area of marshy plains and numerous estuaries and bays with extensive intertidal mudflats. Many small lakes and reservoirs, and large areas of reed beds and rice paddies.

6 THREATS TO SHOREBIRDS

6.1 Introduction

Approximately 600 million people (about 10% of the world's population) live in the river catchments draining into the Yellow Sea (UNDP 2000a). The Yellow Sea coastal provinces support 20% of the 1 400 million Chinese population and 53% of the 46 million South Korean population. Large coastal cities with more than two million inhabitants include Dalian, Tianjin, Qingdao, Rizhao, Shanghai, Seoul-Incheon and Pyongyang-Nampo (Yuan *et al.* 2001; UNDP 2000a).

The rapid growth of the populations and economies of China and South Korea is causing serious environmental problems for the Yellow Sea through loss and degradation of coastal habitats. The major causes of shorebird habitat loss are reclamation for industrial development, agricultural land, salt works, housing, mariculture and fresh water reservoirs. Degradation occurs due to pollution from industrial, agricultural and domestic sources, and unsustainable fishing (UNDP 2000a; Anon 1998b).

The major environmental issues in the Yellow Sea have been identified as (UNDP 2000a):

- degradation of biodiversity, and loss of coastal habitats, including fish spawning and nursery grounds and migratory bird habitat;
- water quality deterioration;
- human health problems, caused by airborne pollution and water-borne dispersion of contaminants and pathogens;
- decline of commercial fisheries;
- unsustainable mariculture;
- harmful algal blooms.

6.2 Nature of threats

A summary of the size and scope of threats to the Yellow Sea is presented below.

6.2.1 Habitat loss and alteration

Approximately 37% of the intertidal areas existing in the Chinese portion of the Yellow Sea in 1950 and 43% of those in the South Korean part in 1917 have been reclaimed to date (Yuan *et al.* 2001; Moores *et al.* 2001; MOMAF 1998). In North Korea, reclamation of intertidal areas for food production has been a national priority for many years and, during the last decade, more than 700 km^2 has been reclaimed in one province alone. Massive reclamation projects have also been undertaken in other coastal areas, indicating that loss of intertidal areas in North Korea is occurring at a high rate (UNDP 2000c).

Extensive reclamation is ongoing (pers. obs.) and China has plans to reclaim a further 45% of its existing Yellow Sea mudflats (Yuan *et al.* 2001) and South Korea, 34% (Moores *et al.* 2001). Although there has been serious questioning in South Korea of the environmental consequences resulting from reclamation (Anon 1998b), the Saemangeum Reclamation Project, which at 401 km^2 is probably the largest reclamation activity in the world, was restarted in 2001 after a moratorium period. This project will destroy the two most important shorebird areas in South Korea (the Mangyeung and Dongjin estuaries).

In North Korea, it is believed that the substantial investments that have already been made in seawalls and irrigation channels will ensure that wetland habitat will continue to be lost (UNDP 2000c).

6.2.2 Reduced river flows

The two longest rivers in China, the Huang He and Chang Jiang, are undergoing significant changes that will greatly reduce the amount of sediment being transported into the Yellow Sea. This will seriously affect their ability to nourish intertidal flats through supply of fresh silt and nutrients.

Until 1990, the 5 000 km^2 Huang He Delta increased in area annually by about 32 km^2 and grew outwards by 2 km (Yuan *et al.* 2001). However, in recent years the situation has changed dramatically due to increased water extraction from the river for agricultural, industrial and domestic purposes. The average duration of non-flow in the lower reaches of the river has increased from 14 days in the 1970s to 102 days in the 1990s. In 1997, the Huang He ceased flowing at the mouth for 226 days. During the period 2010-2019, water and sediment flows are predicted to decline by 34% and 49%, respectively, from the levels in the 1980s (YRCC 2000). The large reductions in water and sediment flows to date have already seriously affected the ecosystems of the Yellow River mouth, through reduced nutrient inflows, increased concentration on pollutants, salt water ingress and erosion, leading to reduced biological productivity (ADB 2000b). Modifications to sedimentation processes can also cause detrimental changes in the benthic fauna community (Paton 2000).

The commissioning of the Three Gorges Dam in the middle reaches of the Chang Jiang (partly by late 2003, completely by 2009) is predicted to reduce sediment discharge to the sea by 11% (Zhu 1987 in Yang 1999b). Yang (1999b) predicts that about 200 km^2, or about 22%, of the Chang Jiang's intertidal flats will be lost due to erosion within the next 100 years. This loss will be exacerbated by the plan to overcome increasing water shortages in northern China by transferring 48 x 10^9 m^3 of water annually from the Chang Jiang northward, via three channels, to the Huai He and Huang He.

Numerous smaller rivers flowing into the Yellow Sea are also being affected in similar ways leading to reduced sediment input to coastal areas, which often results in erosion of estuaries and intertidal areas (Yuan *et al.* 2001).

The rate at which new intertidal areas will be created in the future is likely to decline significantly as a consequence of the greatly reduced sediment input to the Yellow Sea. Therefore, whereas in the past ongoing accretion was able to partly replace reclaimed intertidal areas its ability to do so in the future will be greatly diminished. Thus, it can be predicted that the rate of decrease in intertidal area will accelerate.

6.2.3 Pollution

The major pollutants in the Yellow Sea are oil, inorganic phosphorous, inorganic nitrogen and heavy metals (Yuan *et al.* 2001; Moores *et al.* 2001). Long-term monitoring in China shows that seawater quality is steadily deteriorating (Yuan *et al.* 2001).

In the Bo Hai, 2 990 million tonnes of industrial effluent and domestic sewage are discharged annually, representing 34% of the total national marine discharge (ADB 2000b) despite the Bo Hai being only 1.6% of the total Chinese sea area. Additionally, more than 100 million tonnes of domestic sewage and about 530 million tonnes of industrial waste water are discharged annually into near shore areas of the central western Yellow Sea (UNDP 2000a) and approximately 600 million tonnes per year of waste water into the west and south coastal areas of South Korea (Moores *et al.* 2001).

It is considered that Jinzhou Bay, an internationally important area for shorebirds in northern Liaodong Wan, has the highest heavy metal pollution levels in the world (ADB 2000b). In 1999, 25% of the sampling stations in the Bo Hai had average oil pollution levels above the Chinese national standard of 0.05 mg L^{-1} maximum (ADB 2000b). Monitoring at more than 80 sites on the Chinese coast showed that 50% of shellfish had unacceptably high levels of harmful pollutants, with the main ones being oil, chromium, arsenic and DDT (Yuan *et al.* 2001). The incidence of algal red tides is increasing with 14 having been recorded in 1998 along the west coast of the Yellow Sea (Yuan *et al.* 2001) and 19 on the eastern side (Moores *et al.* 2001).

It is estimated that 100% of fish spawning and nursery sites (i.e. intertidal areas) in the Bo Hai and 70% in the central west Yellow Sea are suffering from serious pollution and lack of river runoff and this is resulting in a sharp decrease in finfish and shellfish biomass (Yuan *et al.* 2001). The reduction in intertidal shellfish numbers is also well documented for South Korea (Koh 1997).

6.2.4 Human disturbance and competition

The traditional dependence of coastal communities around the Yellow Sea on wetland food resources has meant that people have always been using the intertidal areas, either directly for food or to gain access to fishing boats moored at the water's edge. In recent years greatly increased human population numbers have led to unsustainable harvesting of shellfish and potentially serious human disturbance of shorebirds (pers. obs.), even in Protected Areas. The move to mechanical shellfishing (pers. obs.) can be expected to exacerbate the problem by increasing shellfish removal rates and reducing shellfish productivity over the long term through severe disturbance of sediments (Piersma *et al.* 2001).

Human disturbance not only occurs on the feeding areas but also in the shrimp and fish ponds, and saltpans, which are often the only available roosting areas for shorebirds at high tide when the natural roosting areas on the intertidal flats have been destroyed by reclamation.

Disturbance from oil exploration, drilling and extraction activities can be serious. There are four large oil fields in the Bo Hai, which accounted for 24% of national production in 1996 (ADB 2000b). Internationally important shorebird areas that contain oil fields are Huang He NNR, Tianjin Municipality, Linghekou and Shuangtaizihekou NNR.

6.2.5 Hunting

There have been a number of investigations into hunting activity in the Chang Jiang Estuary (Tang & Wang 1991, 1992, 1995; Barter *et al.* 1997c; Ma *et al.* 1998). Tang and Wang (1992) estimated that approximately 30 000 and 9 000 shorebirds were captured with clap nets in the 1991 and 1992 northward migrations, respectively. They suggested that the decrease between the two years could be due to declining hunter numbers, increasing incomes from alternative activities and/or reduction in shorebird habitat due to reclamation. However, a study during the 1996 northward migration showed that hunter numbers had not declined since 1991 and that the number of shorebirds caught was similar (Barter *et al.* 1997c). More recent studies (during the 2000-2001 period) indicate that hunting activity has now declined at Chongming Dao (Ma *et al.* 2002; T.H. Wang in litt.).

Wang *et al.* (1991, 1992) reported hunting activity in the Huang He Delta in the 1991 southward and 1992 northward migrations and it was estimated that 18 000-20 000 shorebirds were caught with clap nets during northward migration and probably a higher number during southward migration. However, no hunting was observed in the Delta during surveys in the 1997, 1998 and 1999 northward migrations.

With the exception of the Chang Jiang Estuary, no hunting activity has been detected in China during recent shorebird surveys that covered about one-third of the Chinese intertidal areas between 1996 and 2001 (pers. obs.).

The situation appears to be similar in South Korea (N. Moores in litt.), with the only reported instance being minor hunting activity in Mangyeung Gang Hagu (J.H. Kim pers. comm.).

Thus, hunting appears to be a minor threat to shorebirds using the Yellow Sea, with the exception of in the Chang Jiang Estuary where the activity is reportedly declining.

6.3 Adverse effects of threats on shorebirds

In order to survive and migrate successfully, shorebirds must have access to suitable feeding areas and roosting sites.

Healthy intertidal flats are essential for the spawning, growth and survival of the benthic fauna on which shorebirds feed, e.g. shellfish, crustaceans, crabs and worms. The amount and quality of these areas are being very seriously threatened by reclamation, reduced river flows, pollution, human disturbance and unsustainable harvesting of benthic fauna.

The significant amount of reclamation that has occurred to date in the Yellow Sea has directly affected shorebirds by greatly reducing their feeding habitat and, in many cases, the availability of roosting areas. It is predicted that the situation will get worse in the future as intertidal areas are lost at an increasing rate due to the combined effects of reclamation and reduced accretion. These effects will be exacerbated by the predicted rise in sea level.

Declining river flows are leading to decreased benthic productivity and, probably, changes in the benthic fauna community, which is also being affected by massive pollution from many sources. Changes in sedimentation processes may detrimentally affect the nature of the benthic community. Reduced availability of food will adversely affect the ability of the Yellow Sea intertidal areas to support the very large numbers of shorebirds that are dependent on them to successfully complete their annual migrations.

Human disturbance can also affect feeding and roosting birds by reducing feeding time and causing them to fly and use energy resources unnecessarily.

Serious depletion of benthic fauna due to unsustainable harvesting can be expected to negatively affect shorebirds through removal of an important shorebird food source. Mechanical harvesting will make the situation worse through serious disturbance of sediments, which adversely affects long term benthic productivity.

Shorebirds have to meet a very tight schedule on the breeding grounds, needing to complete the breeding process during the short summer so that they and the young birds can leave before the weather deteriorates. The schedule requires that birds arrive on time and in good breeding condition. Therefore, the adverse effects of the various threats being encountered in the Yellow Sea are most significant during northward migration when shorebirds are not only putting on fuel stores (mostly fat) for their long flight into the breeding grounds, but also additional reserves to sustain them during the period immediately after arrival when feeding conditions may be poor.

7 CONSERVATION OF SHOREBIRDS AND THEIR HABITATS IN THE YELLOW SEA

7.1 Introduction

Shorebird conservation status is best measured by the actual extent to which shorebirds and their habitats are being effectively protected by legislation, policies and plans, and the Protected Area system.

The widescale, and ongoing, reclamation of intertidal areas, excessive pollution levels and high levels of human disturbance, as described in Section 6, show very clearly that migratory shorebirds are already encountering serious survival problems in the Yellow Sea, and these difficulties can be expected to increase. Thus, their conservation status is currently poor and is likely to decline further.

Concern about the conservation status of migratory waterbirds and their habitats in the Asia-Pacific region has resulted in formal motions for action at the Ramsar Conferences of Parties in 1996 and 1999. Recommendation 6.4 calls for the establishment of a network of listed sites for migratory shorebirds along the East Asian-Australasian Flyway while Recommendation 7.3 calls for increased multilateral cooperation on the conservation of migratory waterbirds in the Asia-Pacific region. These are further strengthened by Resolution VII.21 which calls for enhanced conservation and wise use of intertidal wetlands.

Although the fate of migratory shorebirds is very closely linked to the availability of extensive and healthy wetlands, it is unrealistic to expect that these areas will be protected solely for the sake of shorebirds. However, the Yellow Sea wetlands supply very important economic and social benefits for local inhabitants and, thus, shorebird conservation is best achieved by the implementation of plans to maintain these benefits by protecting the region's biodiversity and encouraging sustainable use of wetland resources.

7.2 Conservation situation in China

7.2.1 Sources of information

The National Wetland Conservation Action Plan for China (NWCAPC 2000).

The PRC National Report for the Preliminary Transboundary Diagnostic Analysis of the Yellow Sea Large Marine Ecosystem (UNDP 2000a).

Annex A "Coastal Marine Environment and Living Resources" of the Coastal Resource Conservation and Environmental Management Project for the Bohai Sea (ADB 2000a).

Yellow Sea Ecoregion: Reconnaissance Report on Identification of Important Wetland and Marine Areas for Biodiversity Conservation. Vol. 1: China (Yuan *et al.* 2001).

7.2.2 Situation

The National Wetland Conservation Action Plan for China (NWCAPC 2000) lists the following major reasons for problems in wetland conservation and use:

1. **Wetland nature reserves and their management**
   - area of protected wetlands is too small;
   - inadequate coverage of different habitat types;
   - poor management, insufficient funds and equipment;
   - conservation measures, including bans on hunting, fishing and logging, are insufficient.
2. **Legal system**
   - no specific laws or regulations concerning wetland conservation and wise use;
   - although there are a few provisions for wetlands scattered within many laws and regulations, staff and resources for law enforcement are insufficient.
3. **Coordination of wetland management**
   - although wetland conservation and use are relevant to many sectors, no satisfactory coordination system exists;
   - due to conflicts between the objectives and interests of the different sectors, wetlands cannot be managed in a scientific manner.
4. **Monitoring systems**
   - monitoring of changes in wetland ecology and biodiversity is inadequate;
   - incompatibility of methodologies between sectors and lack of information sharing.
5. **Environmental Impact Assessment (EIA)**
   - no effective EIA has been made on wetlands in China because of the lack of a unified and scientifically-based wetland assessment system.
6. **Basic research**
   - no systematic and in-depth wetland research has been undertaken;
   - very limited number of qualified professionals.
7. **Funding constraints**
   - shortage of funds is a major limitation to wetland conservation and management;
   - no funds earmarked for wetland research, training and monitoring, reserve improvement and law enforcement.
8. **Awareness and education about wetland conservation**
   - Chinese society has a limited knowledge of the value and importance of wetlands;
   - rate of education and dissemination of information about wetlands lags far behind the level required to cope with rapid economic

development and the need to protect wetland resources.

The Action Plan specifies the following priorities to address the problems faced in achieving wetland conservation in China:

- create or improve legislation to protect wetlands;
- set up a co-ordination mechanism for wetland management;
- reduce the speed of wetland degradation through integrated management and use;
- conserve wetland wildlife resources by enhancing the establishment and management of nature reserves;
- undertake public awareness and education programmes, and training of human resources;
- conduct surveys and produce inventories to assist in monitoring wetland resources;
- promote the sustainable use of wetland resources;
- strengthen research on wetlands;
- conduct specific activities for wetland conservation; and
- enhance international co-operation.

Priority projects listed in The Action Plan, that are specifically relevant to intertidal areas in the Yellow Sea, are:

1. Waterbird Conservation Initiatives in China (Project No. 10);
2. The Establishment of Wetland Conservation Demonstration Projects on Inter-tidal and Estuarine Areas (Project No. 17);
3. The Conservation and Wise Use of Coastal Wetlands Bordering the Bohai Sea (Project No. 19);
4. The Conservation of Wetland Biodiversity and Sustainable Utilisation of Resources in the Liaohe River Delta (Project No. 22).
5. The Sustainable Development of Wetland Ecosystems in the Yellow River Delta (Project No. 23);
6. A Demonstration of Wetland Conservation in Oil Fields (Project No. 32);
7. A Demonstration of Conservation and Development of an Ecosystem for Migratory Waterbirds and Wetlands at Dongtan, Chongming Island, Shanghai Municipality (Project No. 33)

China is currently involved in two major projects designed to improve biodiversity conservation in the Yellow Sea region.

The first project (UNDP 2000e), being carried out in conjunction with South Korea and partly funded by UNDP, has the objective of achieving "Ecosystem-based, environmentally-sustainable management and use of the Yellow Sea Large Marine Ecosystem and its watershed by reducing development stress and promoting sustainable exploitation of the ecosystem of a densely populated, heavily urbanized, and industrialized semi-enclosed shelf sea."

The second project (ADB 2000b), partly funded by the Asian Development Bank, has the aim of assisting the formulation of a *Bohai Sea Coastal Resources Management Action Plan* for the future management of the Sea's coastal and marine resources.

A further project (UNDP 1998) has the aim of removing barriers to effective conservation of wetland biodiversity (e.g. lack of integration of biodiversity conservation into development planning, no institutions for multi-sectoral wetland management, limited awareness of wetland values and functions at all levels, lack of technical capacity) at four demonstration sites, including Yancheng NNR in the Yellow Sea.

China is a signatory to the Convention on Wetlands of International Importance (Ramsar), the Convention on Biodiversity Conservation and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. It has bilateral agreements with Japan, USA and Australia for the protection of migratory birds.

At May 2002, China had seven sites in the East Asian-Australasian Shorebird Site Network, five of these on the Yellow Sea coastline.

Information on Chinese coastal Protected Areas is given in Table 8, with their locations being shown in Figure 7.

7.3 Conservation situation in North Korea

7.3.1 Sources of information

Coastal Biodiversity Management of DPR Korea's West Sea (UNDP 2000c).

7.3.2 Situation

The UNDP document *Coastal Biodiversity Management of DPR Korea's West Sea* (UNDP 2000c) states that despite the existence of environmental legislation, a National Biodiversity and Action Plan, and an extensive reserve system covering nearly 20% of the country, "the coastal wetlands of the Gulf of West Korea and the biodiversity they support continue to be lost." The broad goal of the UNDP project is to achieve planned and sustainable development of the coast of the Gulf of West Korea, with a focus on globally significant biodiversity, human health and quality of life, thus securing a balance between protection of natural resources and environmentally-sound development.

The root causes of habitat and species loss have been identified as being primarily due to North Korea's low technical capacity and it's single sector approach to land use planning. Specific problems are:

1. increasing competition for land and water between different sectors;
2. increasing pollution levels from agriculture and industry;
3. lack of an effective Environmental Impact Assessment mechanism for proposed land developments;
4. low management capacity within the protected area system;
5. general lack of environmental information and awareness at all levels of society.

The project, which has yet to be implemented, has four important objectives:

1. a planning process for wetlands management which is effective at national and local levels;
2. public awareness of natural resources and biodiversity values achieved through increased participation in Protected Area management;
3. implementation of an Integrated Coastal Area Management Plan at a coastal wetland to demonstrate biodiversity conservation with sustainable development; and
4. improved management practices in agriculture and other sectors with potential environmental impacts.

North Korea is a signatory to the Convention on Biodiversity Conservation. It has a bilateral agreement with Russia for the protection of migratory birds.

Information on North Korean coastal reserves is given in Table 8, with their locations being shown in Figure 7.

7.4 Conservation situation in South Korea

7.4.1 Sources of information

Environmental Protection in Korea 1997 (Anon 98a).
National Biodiversity Strategy 1997 (Anon 1998b).
Conservation of Globally Significant Wetlands in the Republic of Korea. (UNDP 2000d).
Yellow Sea Ecoregion: Reconnaissance Report on Identification of Important Wetland and Marine Areas for Biodiversity Conservation. Vol. 2: South Korea (Moores *et al.* 2001).

7.4.2 Situation

The National Biodiversity Strategy (Anon 1998b) states that although the intertidal region located on the west coast is recognized as being one of the top five in the world its biological diversity is being threatened by over-harvesting of marine biological resources, frequent outbreaks of red tides, oil spills, and pollution. In order to tackle these problems, the strategy encourages:

1. increased research and survey work in order to better manage biological resources and natural environments;
2. accelerating the designation of major natural tidal flats as protected areas;
3. increasing public awareness of the ecological importance of tidal flats;
4. restoring degraded coastlines and tidal flats; and
5. compensating for reclaimed wetland areas with artificial wetlands.

With respect to sustainable use of intertidal resources, the Strategy promotes*, inter alia*, the following actions:

1. establishment of an integrated management system for coastal areas;
2. development of a long-term plan for sustainable use of coastal areas;
3. reinforcing management by strengthening environmental impact assessment procedures;
4. reassessment of the economic and environmental values of tidal flats and marine ecosystems;
5. conducting research into the causes of red tides.

South Korea is currently involved in two major projects designed to improve biodiversity conservation in the Yellow Sea region. The first is the joint project with China (UNDP 2000e; see Section 7.2.2).

The second project (UNDP 2000d), partly funded by UNDP, has the aim of conserving globally significant wetlands and their biodiversity in South Korea. It is stated that "like other developing countries, Korea has many conflicts between conservation efforts and development pressures, which are mainly caused by the ignorance of the value of wetlands and by demands on land use … Presently, making policies on development is done based on poor data, or no data at all, regarding the value of wetlands, leading to many cases of unnecessary wetland destruction. The identification and assessment of wetlands resources are urgently needed for management and conservation. In addition, global values need to be identified so measures can be taken to mitigate current and future threats." The essential elements of the project are:

1. collection of data on biodiversity and socio-economic conditions of local communities;
2. ensuring conservation, restoration and effective management of wetland ecosystems through development and implementation of national and regional management plans;
3. undertaking public awareness campaigns to facilitate the implementation of wetland management plans;

4. revising and strengthening environmental laws and institutional mechanisms to enhance biodiversity conservation;
5. ensuring effective implementation of management plans through institutional coordination.

South Korea is a signatory to the Convention on Wetlands of International Importance (Ramsar), the Convention on Biodiversity Conservation and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. It has a bilateral agreement with Russia for the protection of migratory birds. South Korea also has a memorandum of understanding with China and conducts informal discussions with Japan on protection of migratory birds.

Information on the South Korean coastal reserve is given in Table 8, with its location being shown in Figure 7.

7.5 Habitat conservation in coastal Protected Areas

The known coastal Protected Areas in the Yellow Sea are listed in Table 8 and their locations shown in Figure 7. About 16% of the total intertidal area of the Yellow Sea is currently within Protected Areas, with China having 21% of its intertidal area within Protected Areas, North Korea 5% and South Korea 0.3%.

Protected Areas in China are generally divided into three parts: core area, buffer zone and experimental zone. The core area is fully protected. In the buffer zone, only scientific observations and research activities are allowed. The area surrounding the buffer zone is designated as the experimental zone, which may be used for such activities as scientific experimentation, education, tourism and the domestication and breeding of rare and endangered wild animals or plant species. If necessary, an outer protection area surrounding the nature reserve may be designated (UNDP 2000a). Experience gained during visits to the majority of Chinese Yellow Sea nature reserves shows that the wetland resources of the buffer and experimental zones are widely exploited, perhaps unsustainably, and that levels of human disturbance are significant; even core areas can be negatively impacted, despite their “fully protected “ status (pers. obs.).

The National Wetland Conservation Action Plan for China (NWCAPC 2000) notes that the area and habitat coverage of reserves is inadequate and that they suffer from poor management, insufficient funds and equipment.

Management of the North Korean reserves is restricted by lack of operational plans, training and equipment (UNDP 2000c).

The only coastal reserve on the west coast of South Korea protects about 5% of Dongjin Gang Hagu which, together with the adjacent Mangyeung Gang Hagu, is the most important area for migratory shorebirds in the country. The intertidal areas of these two estuaries are currently being reclaimed as part of the Saemangeum Reclamation Project totalling 401 km^2. Plans are being developed for the designation of protected tidal flats in the southern part of Ganghwa Do, and at Hampyeong Man and Aphae Do (Je 2002).

Clearly intertidal areas in the Yellow Sea are inadequately protected by the existing Protected Area system with respect to both coverage and management. Furthur recognition could be given to areas of international importance to shorebirds by nominating these sites for listing under the Ramsar Convention and the Shorebird Site Network.

7.6 Synthesis

Analysis of the situations in the three littoral countries shows that the causes of wetland problems, and the proposed solutions, are very similar.

The problems are mainly due to:
a) inadequate data on biodiversity and socio-economic conditions in wetland areas;
b) lack of understanding at all levels of the important benefits supplied by coastal wetlands;
c) inadequate coordination between authorities responsible for wetland management;
d) lack of effective Environmental Impact Assessment systems;
e) inadequate, poorly managed, Protected Area systems; and
f) shortage of funds.

The proposed solutions directly address these problems.

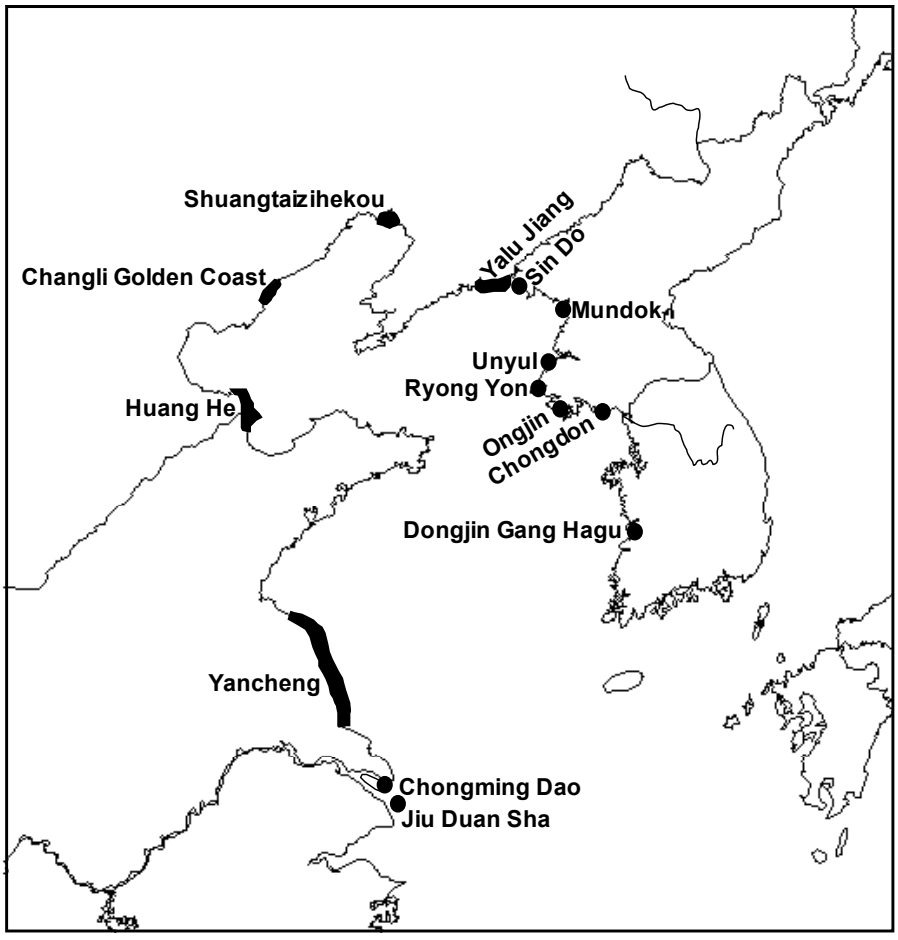
Given the common interest of the three countries in a healthy Yellow Sea ecosystem, it seems that the most effective and efficient way forward is for them to cooperate in developing and implementing solutions. The joint China-South Korea project being developed under UNDP auspices (UNDP 2000e) goes part way towards meeting this need, but it is interesting to note that two other highly relevant projects, i.e. Coastal Biodiversity Management of DPR Korea’s West Sea (UNDP 2000c) and Conservation of Globally Significant Wetlands in the Republic of Korea (UNDP 2000d) are being approached on a single country basis.

Table 8 Coastal Protected Areas in the Yellow Sea

Protected Area	Status	Juristriction	Area (km^2)
China			
Jiu Duan Sha	Provincial	Forestry	114
Chongming Dao*	Provincial	Forestry	326
Yancheng*	National	Environment Protection	4 530
Huang He*	National	Forestry	1 530
Changli Golden Coast	National	Oceania	300
Shuangtaizihekou*	National	Forestry	800
Yalu Jiang*	National	Environment Protection	1081
North Korea			
Sin Do	National	Land & Environment Protection	20
Mundok	National	Land & Environment Protection	30
Unyul	National	Land & Environment Protection	8
Ryong Yon	National	Land & Environment Protection	20
Ongjin	National	Land & Environment Protection	15
Chongdon	National	Land & Environment Protection	15
South Korea			
Dongjin Gang Hagu*	National	Forestry	8

* Involved in the East Asian-Australasian Shorebird Site Network

Figure 7 Locations of coastal Protected Areas in the Yellow Sea



Another very important project being implemented in China, i.e. Coastal Resource Conservation and Environmental Management Project for the Bohai Sea (ADB 2000b), is dealing with that part of the Yellow Sea which in the past has been the most important source of larvae and juvenile marine invertebrates for the Yellow and East China Seas. Thus, the condition of the Bo Hai Sea is critically important to improving the functioning of the Yellow Sea ecosystem, as a whole, and the successful completion of this project is of great importance to North Korea and South Korea, as well as China.

It is highly desirable that there be very close cooperation between those involved in the four projects as they are dealing with important elements of the same issue – the poor health of the Yellow Sea ecosystem.

7.7 An ecoregion approach to conservation

7.7.1 Background

Effective conservation of migratory shorebirds and their wetland habitats is a challenging task at any time, but it is particularly difficult around the Yellow Sea coastline where development activities are generally undertaken with little regard for environmental consequences.

The traditional approach to nature conservation of creating a network of protected areas, with severe limitations being placed on human activities, is inappropriate in the Yellow Sea due to the very extensive nature of the intertidal areas in the region and the high dependence of the local communities on the intertidal resources. Even nature reserves in China have large human populations, e.g. 90 000 people live within the Yancheng NNR.

Successful conservation activity will depend on the adoption of suitable national policies and plans for the appropriate use of intertidal and sub-coastal areas. These will need to be harmonized across the three littoral countries. Local community support will be an essential factor in creating the necessary political environment for the development and successful implementation of these policies and plans.

The concern of China, North Korea and South Korea about the serious environmental problems in the Yellow Sea has led to the development of one bilateral project (UNDP 2000e) and three unilateral projects (UNDP 2000c, 2000d; ADB 2000a).

7.7.2 An ecoregion based approach to conservation of Yellow Sea biodiversity

The exceptional importance of the Yellow Sea biodiversity, both on a global scale and as a shared resource for the three littoral countries, makes it highly desirable that conservation activity be implemented on an ecoregion-basis (see WWF (2000) and TNC (2000) for discussion of the concept of ecoregion conservation).

Therefore, it is encouraging that World Wide Fund for Nature-Japan has commenced a project called the Yellow Sea Region Initiative that has as its core objective the maintenance of a viable, diverse and productive Yellow Sea eco-system in the long term.

As explained in Yuan *et al.* (2001), development of ecoregion-based conservation progresses in steps, as follows:

1. Collection of multi-disciplinary data from the ecoregion on biodiversity, ecological processes and socio-economic activities in order to identify characteristic species, communities and ecological processes, as well as to determine the key conservation issues;
2. Determination of priority areas through review of the data on biodiversity distribution and ecological processes;
3. Setting of long-term conservation goals;
4. Analysis of the socio-economic data to establish the threats to and opportunities for biodiversity conservation;
5. Development of a comprehensive conservation plan for the ecoregion.

Step 1 has commenced with the publication of two reports which provide information on the geophysical environment, biological resources, human pressures, and legal and policy frameworks in China (Yuan *et al.* 2001) and South Korea (Moores *et al.* 2001).

The challenge will be to drive the process through to the point where a Yellow Sea ecoregion conservation plan is adopted and implemented by the Governments of China, North Korea and South Korea.

Only then will the future for the globally-important biodiversity of the Yellow Sea become brighter and the prospects of the millions of shorebirds passing through the region more promising.

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Wetland International's Specialist Groups

Specialist Groups are networks of expert scientists who provide information and advice in support of Wetlands International's programmes and projects. There are currently 21 Specialist Groups: 15 covering waterbird taxa and 6 thematic groups on wetlands and wetland and waterbird issues. Overall the Specialist Group network involves over 2 000 people. Waterbird Specialist Groups are operated as a 'Waterbird Network' jointly with IUCN - Species Survival Commission and BirdLife International.

Each Specialist Group is led by one or more Co-ordinators, who represent their groups on Wetlands International's Board of Members and who work with Regional Co-ordinators covering particular geographic areas, and Assistant Co-ordinators dealing with particular topics or species.

Specialist Groups:

- provide strategic guidance to Wetlands International's organisational development and priorities, through representation on the Advisory Council, Board of Directors and Regional Councils;
- contribute to the delivery of Wetlands International's information and advice on research, conservation and management of wetlands and wetland species, through accessing expert networks and developing partnerships;
- provide information and technical advice as part of Wetlands International's technical support and input to global conventions (Ramsar, Bonn, Convention on Biological Diversity);
- undertake or lead projects on behalf of Wetlands International;
- represent Wetlands International, as a member of its network, at external fora and to other organisations; and
- promote and publicise the role of Wetlands International in wetlands and waterbirds conservation to the global scientific community.

Many Specialist Groups produce regular Bulletins and newsletters for their members, hold conferences and workshops, and publish proceedings volumes.

For further information contact Wetlands International's Science Coordinator: Doug Taylor, Wetlands International, PO Box 471, 6700 AL, Wageningen, The Netherlands. Tel: +31 317 478854; e-mail: taylor@wetlands.agro.nl

International Wader Study Group

The International Wader Study Group (IWSG) is an international association of amateurs and professionals from all parts of the world interested in Charadrii (waders or shorebirds). It is an independent legally constituted body, registered in the Netherlands. A membership-based society, it is funded by annual fees paid by its 620 members. It acts in the capacity of a Wetlands International (and IUCN Species Survival Commission) Specialist Group according to a Memorandum of Agreement. The interests of the group have diversified from its original focus of ringing and migration-related studies to embrace all aspects of wader biology.

The aims of the International Wader Study Group are to:

- maintain contact between both amateurs and professionals studying waders;
- help organise co-operative studies; and
- provide a vehicle for exchange of information on waders and their biology.

The main means of achieving these aims are through:

- holding an annual conference;
- publishing, three times per year, the *Wader Study Group Bulletin*;
- publishing an occasional series, *International Wader Studies*, each volume covering a major topic of wader biology and conservation.

For information on membership, contact IWSG's Membership Secretary, Rodney West, c/o National Centre for Ornithology, The Nunnery, Thetford, Norfolk, IP24 2 PU, UK. e-mail: rodwest@ndirect.co.uk

International Wader Studies

International Wader Studies replaces volumes previously published as *Special Issues* (formerly titled *Supplements*) of the *Wader Study Group Bulletin*. Publication of *International Wader Studies* is overseen by a General Editor and an Editorial Board composed of the members of the WSG Executive Committee. General Editor: David Stroud. Address for correspondence: c/o UK Joint Nature Conservation Committee, Monkstone House, City Road, Peterborough PE1 1JY, U.K. (telephone: +44 (0) 1733 62626; fax: +44 (0) 1733 555948; e-mail: David.Stroud@jncc.gov.uk).