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# Waterbirds around the world

## A global overview of the conservation, management and research of the world's waterbird flyways

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*Cover photography:* Whooper Swans *Cygnus cygnus* arriving at Martin Mere, England. Photo: Paul Marshall. (www.paulmarshallphotography.com)

# The conservation and population status of the world's waders at the turn of the millennium

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## ABSTRACT

Using information from many sources, but especially data collated for the third edition of Wetlands International's *Waterbird Population Estimates*, we review the status of the world's waders in the late 1990s. There are widespread declines in most regions and biotopes caused principally by loss and degradation of wetland (and other) habitats. On different flyways, between 33% and 68% of populations are in decline, compared with only 0% to 29% increasing. Non-migratory, island species have especially poor status, with about half of all island waders being globally threatened with extinction. Of particular conservation concern is the declining environmental status of several key staging areas, which provide energetic 'spring-boards' for long-distance migrants. The degradation of these areas compromises the status of many migrant waders. The rapid collapse of populations, forced below threshold levels, has been predicted theoretically, and now appears to be occurring in a number of rapidly declining populations. Conservation responses must urgently address causes of wetland loss and degradation, as well as enhancing monitoring and research so as better to inform appropriate conservation policies. National and international strategies and conservation instruments have scope to help, but need to be much more strategic in their implementation so as to address root causes.

## INTRODUCTION

Other than in Antarctica, waders (or shorebirds) occur on nearly every shoreline of the world, as well as in many other biotopes. They are attractive birds, of economic and ecological importance, and accordingly in some parts of the world are well-studied. For some migratory waders, very large numbers occur at low densities over extensive breeding areas, but gather at much higher densities in the non-breeding season at a few localities, enabling their population status to be regularly assessed. They are thus amongst the better known groups of birds, and with their range of specialized feeding and migration ecologies, they are sensitive environmental indicators. Information on their international population status can accordingly be used to indicate the wider health of their environments: indeed, the task of ensuring the favourable conservation status of waders is inseparable from that of ensuring the conservation and wise use of their wetland and other habitats. Regrettably however, the loss and degradation of wetlands and other habitats continue apace all around the world (Millenium Ecosystem Assessment 2005), and are the underlying cause of the poor conservation status of so many species. Habitat changes have complex ecological, demographic and genetic consequences for waders.

In 2003, a conference of the International Wader Study Group (WSG) in Cádiz, Spain, brought together 132 specialists from 20 countries to review the population and conservation status of waders around the world. The global status of waders was assessed using the best available data, drawing on several major programmes that have compiled recent data, e.g. Dodman (in review 2002) and Thorup (2002), and summaries by Wetlands International (2002) and Zöckler *et al*. (2003). In particular, a major WSG review of the status of waders in Africa and Western Eurasia collated extensive new data (Stroud *et al*. 2004).

## RESULTS AND DISCUSSION

Following the taxonomy adopted by Wetlands International (2002), the scope of this review covers 511 populations of 214 species of waders in eleven families (Rostratulidae, Dromadidae, Haematopodidae, Ibidorhynchidae, Recurvirostridae, Burhinidae, Glareolidae, Charadriidae, Scolopacidae, Pedionomidae and Thinocoridae). Three of these species (and populations) are extinct; of the other 508 populations, trends are available for only 210.

Around the world, most populations of waders of known population trend are declining (Table 1) – a matter of international conservation concern. On different flyways, between 33% and 68% are in decline (overall 48%), compared with only 0-29% increasing (overall 16%): thus three times as many populations are in decline as are increasing. The reasons for these declines are diverse, although they are generally caused by habitat loss or degradation (Zöckler *et al*. 2003).

### Flyways in Western Eurasia and Africa

Comparisons between the three main wader flyway systems in Western Eurasia and Africa show that knowledge is better for populations using the largely coastal East Atlantic Flyway than for the other two: it has been possible to assess trends for 44 (93%) of East Atlantic Flyway populations, but for only 25 (76%) of the Black Sea/Mediterranean populations and for just 18 (35%) of West Asian/East African wader populations (Table 1; Stroud *et al*. 2004). Overall, the East Atlantic Flyway appears in the healthiest state: only a little over one-third (37%) of populations are decreasing. This is in contrast to the Black Sea/Mediterranean Flyway where, of populations with known trends, 65% are declining, and the West Asian/East African Flyway which has 53% of known populations in decline. Island populations – specifically those on the Canary and Cape Verde Islands, St. Helena and Madagascar – have a particularly poor conservation status and include most of the region's globally threatened species.

**Table 1. Status of the world's waders at the turn of the millennium. Data summarized from Wetlands International (2002). Figures include both migratory and sedentary species and populations.**

| Totals by Ramsar region[1] | Total no. wader species | Total no. wader popns. | No. popns. definitely or possibly extinct | No. Globally Threatened wader species[2] | No. Near Threatened wader species | No. popns. definitely or probably declining | No. popns. with definitly or probably stable nos. | No. popns. definitely or probably increasing | No. popns. with unknown trends |
|---|---|---|---|---|---|---|---|---|---|
| Africa | 81 | 202 | 1 | 5 | 4 | 40 | 36 | 14 | 111 |
| Europe | 39 | 98 | 0 | 2 | 1 | 30 | 28 | 12 | 28 |
| Asia | 65 | 198 | 1 | 10 | 7 | 31 | 16 | 7 | 143 |
| Oceania | 41 | 79 | 4 | 11 | 6 | 11 | 7 | 7 | 50 |
| Neotropics | 56 | 109 | 1 | 1[3] | 5 | 25 | 22 | 4 | 57 |
| North America | 42 | 86 | 1 | 4 | 2 | 31 | 20 | 6 | 28 |
| GLOBAL TOTALS | 214 | 511 | 7 | 23 | 19 | 96 | 72 | 32 | 304 |
| **Other regions and specific flyways[4,5]** | | | | | | | | | |
| East Atlantic Flyway | 29 | 47 | 0 | 0 | 0 | 16 | 19 | 9 | 3 |
| Black Sea/Mediterranean | 31 | 33 | 0 | 1 | 1 | 17 | 5 | 3 | 8 |
| West Asia/East Africa | 44 | 51 | 0 | 2 | 1 | 9 | 9 | 0 | 33 |
| Sub-Saharan Africa | 7 | 10 | 0 | 0 | 0 | 1 | 0 | 2 | 7 |
| Central/South Asia | 59 | 71 | 0 | 6 | 1 | 7 | 3 | 4 | 57 |
| East Asia/Australasia[6] | 67 | 79 | 1 | 5 | 7 | 9 | 1 | 1 | 67 |
| Australasian endemics[7] | 24 | 35 | 2 | 7 | 2 | 6 | 4 | 6 | 17 |
| Central Pacific[8] | 9 | 9 | 2 | 4 | 0 | 2 | 3 | 0 | 2 |
| North America/inter-continental | 46 | 71 | 1 | 3 | 2 | 25 | 20 | 3 | 22 |
| South America | 26 | 42 | 0 | 0 | 4 | 6 | 7 | 2 | 27 |

1 Some species or populations may occur in more than one Ramsar region.
2 Including extinct species.
3 There is an urgent need to update formal IUCN Red-listings for Neotropical waders as a number of species are clearly of this status but are not currently categorised as such.
4 Totals also included in Ramsar Regions; some populations occur on more than one of the flyways.
5 Comparable information is not yet available for the following flyways: Pacific North America, Central North America, Mississippi, Atlantic North America – given the apparently major overlaps south of the breeding areas, data for these flyways are combined in the "North America/inter-continental" flyway category.
6 Excludes Australian, New Zealand and associated island endemic populations.
7 Australian, New Zealand and associated island endemic populations.
8 Excludes New Zealand and associated island endemic populations.

Comparison with the status of 66 populations in the 1980s (Smit & Piersma 1989) indicates that more populations are in long-term decline (13) than are either stable (eight), or in long-term increase (four). Some populations are severely threatened and in decline, and extremely rapid population declines (>50% since the mid-1980s) have been recorded for four populations: the two populations of Sociable Lapwing *Vanellus gregarius*, the single population of Black-winged Pratincole *Glareola nordmanni*, and the western European breeding population of Black-tailed Godwit *Limosa limosa limosa*. None of Africa's globally threatened waders are increasing their small population sizes.

## Central and South Asian Flyway

This is shortest of the world's wader flyways, lying entirely in the Northern Hemisphere. It is also one of the most poorly known, with a high proportion of its wader populations being unknown in either size or population trend (80% of populations; Davidson 2003a). Furthermore, nearly all existing estimates are over ten years old, meaning that contemporary knowledge of the waders in this part of the world is almost unknown. Nonetheless, the best available information indicates that about twice as many wader populations are declining as are increasing. There is an urgent need both to assess recent data for this flyway and to improve processes of basic data gathering and analysis.

There are five globally threatened waders in the flyway; the populations of four are in active decline, whilst the current status of the remaining species is unknown. A further six small populations have unknown status, and at least one of the species concerned, the Long-billed Plover *Charadrius placidus*, clearly qualifies for IUCN Red-listing. The proposed establishment of a Central Asian Flyway Agreement under the Convention on the Conservation of Migratory Species of Wild Animals (CMS) is a welcome step forward towards better understanding and conservation of waders on this flyway, but the scale and range of issues indicate that it will need to be highly strategic in its operation to have positive impacts.

## East Asian and Australasian Flyway

There are enormous human population pressures in this region which contains over a third of the world's human population as well as some of the world's fastest growing economies (Wilson 2003). This has major direct consequences for waders: over 80% of wetlands in east and south-east Asia are classified as threatened, with over half under serious threat. Of inter-tidal wetlands in South Korea, 43% have been destroyed by land-claim (with more underway), as also have 37% of inter-tidal wetlands on China's coastline (e.g. Barter 2002).

The East Asian/Australasian Flyway is the flyway with the highest number of wader populations and also the highest proportion of populations for which information on numbers and trends is lacking (85% of populations – see Table 1). For populations of known trend on this flyway, 82% are declining and only 9% increasing. The status of Australasian[1] endemic populations is better known (49% with unknown trend), and equal numbers (38%) are declining and increasing.

1 Australia, New Zealand and its associated islands

Asia and Oceania between them hold 29 globally threatened and near threatened species – 69% of all such waders globally. Of the 12 globally threatened species on the East Asian/Australasian Flyway, one is possibly extinct, six are actively declining (including the Spoon-billed Sandpiper *Eurynorhynchus pygmeus*, which appears to be undergoing rapid population collapse; Tomkovich *et al*. 2002), and the status of the remaining five is unknown. None is recovering its status. The development of non-binding international mechanisms (APMWCS 2001) for conservation and monitoring is a welcome step forward, although there are huge challenges to secure the conservation of wetlands of global significance to waders so as to reverse current negative trends. This is especially so, given the intense socio-economic pressures within the region.

### Central Pacific Flyway

The region contains relatively few waders, but these are mostly small populations with poor conservation status (Gill *et al*. 2003), and there are more Critically Threatened and Endangered waders here than in any other part of the world. Excluding species endemic to New Zealand and its associated islands (which for the purposes of this paper are included in the East Asian/Australasian Flyway), 40% of populations are declining and none is increasing.

Whilst conservation actions have been taken for a few endemic species, the status of many other endemic and migratory species and populations is poorly known throughout this flyway. For endemic species, knowledge is better for species occurring in New Zealand and Australia than in the central and south Pacific (e.g. for species such as the Tuamotu Sandpiper *Prosobonia cancellata*).

Given the small population sizes and declines, there is an urgent need for greater conservation attention for endemic and especially migrant waders in the central Pacific. Limited conservation "capacity" of many Pacific island states and other nations' overseas territories in the region is currently a significant constraint on reversing the unfavourable conservation status of many Pacific waders.

### North America (including inter-continental migrants)

Migrant waders use four main flyway systems in North America (Pacific, Central, Mississippi and Atlantic: Morrison 2003), with most migrants overwintering in Central and South America. There are six globally threatened and near threatened species: one of these, the Eskimo Curlew *Numenius borealis*, is probably extinct, and four of the five remaining tiny populations may still be in decline.

Population trend analyses have indicated extensive declines in wader populations in many parts of North America, especially in Atlantic areas of the USA and Canada (Morrison *et al*. 2001). Overall, 52% of populations using the North American flyways are in decline, and only 6% are increasing. These widespread declines, which include alarming examples such as the recent extremely rapid decline of the Red Knot *Calidris canutus rufa*, indicate that conservation concerns and actions around the world must be extended to include species that are not currently listed as "at risk". Completion of Shorebird Conservation Plans in Canada (Donaldson *et al*. 2000) and the USA (Brown *et al*. 2001) are welcome national initiatives which have the potential to address the major issues, but it remains to be seen if they will be adequately funded by governments. As yet, their implementation seems not to have led to improved population status of waders.

### South America (residents and intra-continental migrants)

None of the resident waders or intra-continental migrants in South America is currently recognized as globally threatened, and there are only four near threatened species. There is, however, an urgent need to update the IUCN Red List for South America to better reflect the current situation (González & Blanco 2003). South America also supports a significant number of endemic species and one endemic family of waders, the seedsnipes (Thinocoridae).

There is very poor knowledge of the population sizes and trends of South American waders, with this information lacking for 64% of all populations occurring only within South America (compared with only 31% of North American migrants). Of populations with known trend, 40% are declining and only 13% are increasing.

There is a major lack of funding for basic survey and population monitoring. This is especially the case for Neotropical migrant and resident waders, since international sources of funding are not readily available for monitoring, research and conservation.

## CONCLUSIONS

### The importance of staging sites for long-distance migrants

Long-distance migrant waders are highly dependent on the continued existence, in favourable conservation status, of a few key staging areas – the essential "stepping stones" to more northerly breeding areas. The importance of maintaining the ecological character of these vital places has been repeatedly stressed: what happens on staging areas such as the Wadden Sea in Europe, Delaware Bay in North America, the Yellow Sea in Asia and the Banc d'Arguin in Africa, seems to control much of the rest of the annual cycle – and survival – of these waders (e.g. Ens *et al*. 1990, Piersma 1994, van de Kam *et al*. 2004).

Declining food resources and reduced suitability of staging sites have major implications for the survival and reproduction of these migrants (Davidson 2003b). "Virtual habitat loss" can occur in these areas as a consequence of poor management arising from unsustainable exploitation of natural resources, disturbance and other local perturbations. This leads to damage to the ecological character of these wetlands with major consequences for their ability to continue to support waders.

### Loss of key staging areas

Major conservation issues currently face three internationally important coastal wetlands of critical importance to migratory waders:

- The completion of the 33 km seawall at Saemangeum in South Korea will destroy 40 100 ha of tidal-flat and shallows – an estuarine system which, on present knowledge, is the most important site for waders in the whole of the Yellow Sea, supporting internationally important numbers of at least 17 species of waders, including several globally threatened species. The Yellow Sea is itself by far the most important staging area on the East Asian/Australasian Flyway, hosting

**Table 2. Conservation status of wader populations occurring on islands compared to continental land masses. Species status from BirdLife International (2000).**

| | Total no. of wader populations | Total no. of wader populations not Red Listed | Total no. of wader populations Red Listed | IUCN Red List Status | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Extinct | Critical | Endangered | Vulnerable | Near Threatened | Data Deficient |
| Island | 53 | 27 | 26 | 3 | 2 | 4 | 6 | 11 | 0 |
| populations | | 51% | 49% | 6% | 4% | 8% | 11% | 21% | 0.0% |
| Continental | 458 | 425 | 33 | 0 | 3 | 2 | 9 | 18 | 1 |
| populations | | 92.8% | 7.2% | 0.0% | 0.7% | 0.4% | 2.0% | 3.9% | 0.2% |

at least two million waders of 36 species during northward migration (Barter 2002). At least 25 000 people also depend econ-omically on this wetland system, for fishing and shell-fishing.

- Delaware Bay is a critically important spring staging area in eastern North America. Over-exploitation by humans of food resources used by waders may now be affecting the ability of waders using this site to reach their Arctic breeding areas and to breed there successfully. This appears to be leading to drastic and rapid population declines in some species, especially the Red Knot *Calidris canutus rufa*.
- In the Dutch part of the international Wadden Sea, there is now compelling scientific evidence to indicate that unsustainable levels of industrial shell-fishing have led to redistribution of birds from the high quality feeding areas (e.g. Piersma & Koolhaas 1997, Piersma *et al*. 2001, van de Kam *et al*. 2004). Declines of the biogeographical populations of long-distance migrant waders most heavily dependent on the Wadden Sea have occurred and are continuing (Davidson 2003b). However, recent decisions in the European Court over the legality of the shell-fishery in relation to the nature conservation directives of the European Union mean that this over-exploitation has now ceased.
- The Banc d'Arguin National Park in Mauritania is a major wintering area for waders on the East Atlantic Flyway, yet fishing on an industrial scale by international fleets in the waters just outside the park is depleting fish resources and possibly impacting on the wider ecosystem.

## Agricultural intensification

Intensification of agriculture is a major driver of change to wetlands (Millenium Ecosystem Assessment 2005) and remains a major adverse factor affecting the status of waders not only in western Europe, with its long-established agricultural landscapes, but also in other regions such as eastern Europe and central Asia, where natural steppe landscapes have now been replaced by arable cultivation and other forms of agriculture. In North and South America, loss of natural habitats to agriculture is also of significant concern.

## Climate change

The ecological consequences of changing climate will be complex, but effects such as altered distributions already appear to be occurring (Rehfisch *et al*. 2004). Changed climate patterns, such as increased desertification of continental steppe regions, will exacerbate habitat loss and degradation.

## Status of short-distance, intra-continental migrants

Short-distance, intra-continental migrants have generally been afforded less attention than inter-continental migrants. In South America, Asia and Africa especially, there is a severe lack of information on intra-continental migrant waders (González & Blanco 2003, Stroud *et al*. 2004). For migrant waders which move long distances between rich and poor countries, there are several international mechanisms that fund research and conservation initiatives. However, for those species which move solely between southern, developing countries, there are few such international funding opportunities. This constrains essential monitoring and conservation activity.

## Status of non-migratory waders

Whilst much conservation attention has, correctly, been focused on the needs of migratory species – the subject of several international legal instruments concerning their conservation – about two-thirds (60%) of globally or near threatened wader species are sedentary. Some of these species are much more poorly known and have a significantly worse conservation status than migrants. Evaluation of their current status suggests that these species should receive urgent attention, especially in light of the absence of international structures to promote their conservation.

Many of the world's rarest and most threatened waders occur on islands (Table 2). About half of all island waders are globally threatened (compared to just 7% of populations occurring in continental areas), and these comprise a significant proportion of all globally threatened waders (Table 2). The conservation challenges faced by independent island nations and self-governing overseas territories of other nations are many, and there is often limited human capacity to address these. International organizations and conventions should assist these islands to develop appropriate conservation programmes as a matter of priority.

## Monitoring and research

There is urgent need for more and better population monitoring. As a minimum, adequately funded national monitoring programmes are required. The International Waterbird Census co-ordinated by Wetlands International offers an effective framework within which such monitoring can be organized. Monitoring might be most effectively undertaken through targeted enhancements focused on particular populations, especially those associated with certain geographic regions or habitats.

Characteristics of the population dynamics of waders, especially the larger species, are such that under certain circum-

stances, very rapid population "collapses" occur. Examples include the probably extinct Eskimo Curlew, the *rufa* population of Red Knot, and the globally threatened Slender-billed Curlew *Numenius tenuirostris,* Sociable Lapwing and Spoon-billed Sandpiper. For this reason, and on a precautionary basis, it is desirable that population monitoring systems at national and international levels are as responsive as possible. Formal alerting systems should accordingly be developed to warn of significant declines (e.g. Atkinson *et al*. 2006). Integrating population monitoring with demographic information should be developed to provide further "early-warning" systems.

In view of the extensive declines noted for many species of migratory waders, there is an urgent need to develop internationally co-ordinated research initiatives to uncover reasons for the declines, and also to understand why some populations are able to increase on flyways which have many populations in decline. Funding for such programmes should be a global priority.

### Genetic consequences for small populations

Genetic studies indicate not only that small populations are especially vulnerable to the accumulation of harmful genetic mutation (genetic drift), but also that "effective population sizes" are significantly smaller than "census population sizes" (Baker 2003, 2006). That is, not all individuals in a population contribute to the gene pool. Owing to the low genetic variability (homozygosity) of waders, there is particular concern as to the long-term genetic consequences of populations falling below 15 000 individuals (Baker 2006). A total of 140 wader populations, comprising 28% of the global total, are estimated to be smaller than this threshold. Special attention is needed for declining populations which are getting close to this threshold, since they may still have the capacity to recover.

### Further analyses to guide conservation actions

A range of actions are desirable:

- Internationally co-ordinated programmes should be developed to assess wader productivity and survival. This information would aid in the development of more focussed and cost-effective conservation responses to information from count programmes. Interpretation of multiple information sources and especially spatial data is greatly helped by Geographic Information Systems.
- The application of IUCN Red List criteria at subspecies/population level should be encouraged to highlight the conservation status of individual biogeographical populations. This information is especially valuable in the context of listings under various international treaties.
- Further comparative analyses, using existing data and information, of the status of waders in different regions and flyways should be undertaken.
- The status of waders world-wide should continue to be reviewed, with the aim of continuing to provide technical advice to international conventions and other organizations as to those populations which should receive major attention with respect to their conservation, monitoring and research.

World leaders at the World Summit on Sustainable Development, Johannesburg, in 2002 established a target of *"a significant reduction in the current rate of loss of biological diversity"* by 2010. Before that, in 2001, European Union Heads of State at Göteborg adopted the more challenging target *"that biodiversity decline should be halted with the aim of reaching this objective by 2010."* The declines reported in this paper from all over the world suggest that, for waders at least, it will be extremely challenging to achieve these targets.

World leaders noted that to achieve this target *"will require the provision of new and additional financial and technical resources to developing countries"*. We agree, and also note that at a minimum, significantly greater investment is urgently needed not only in developing countries, but also in developed nations. This is required to establish and maintain national monitoring schemes, as well as to understand the causes of population declines so that appropriate, targeted conservation responses can be made.

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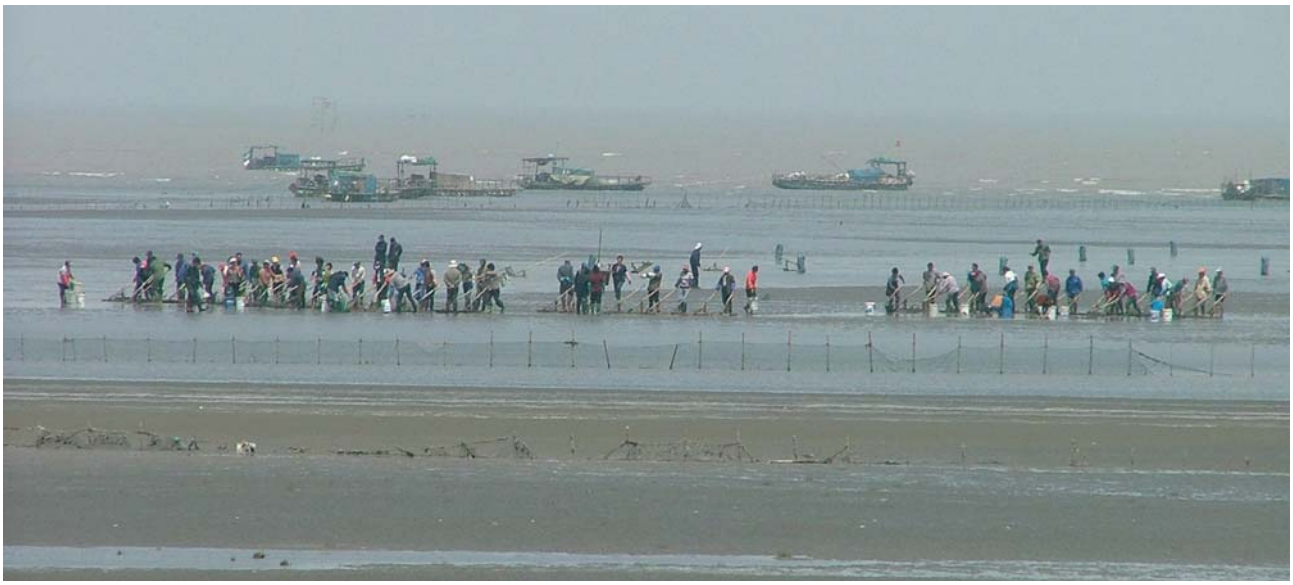

Over a third of the world's human population occurs in East Asia and Australasia. The region's wetlands support dense human populations and are subject to a wide range of pressures and threats which have major implications for the many waterbirds that share these areas. Shellfishing in Fujian Province, China (Yellow Sea). Photo: Mark Barter.