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 decline in wader populations along the east coast of India with special reference to Point Calimere, south-east India

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ABSTRACT

The main wintering grounds for waders (shorebirds) in the Central Asian/South Asian Flyway are located in India, especially along the east coast. Until the 1990s, Point Calimere was the most important site for waders on the east coast, supporting hundreds of thousands of birds throughout the migration season. Point Calimere is now degraded as a result of human interference, and a decline of over 70% has been noted in the wader populations. This decline has become apparent by comparing trapping data and transect counts from the early 1980s and early 1990s with those from 1998-2002. The decline has been reflected in wader numbers at other important habitats on the east coast, particularly Pulicat Lake and the Gulf of Mannar, which ringing recoveries have shown are used by the same wader populations. The decline has been highest in the two commonest sandpipers, Curlew Sandpiper *Calidris ferruginea* and Little Stint *C. minuta*. These species are now becoming uncommon at many sites where they formerly occurred in many thousands. Several thousand Pied Avocets *Recurvirostra avosetta* and Black-winged Stilts *Himantopus himantopus* wintered at Point Calimere in the 1980s, but these have now become scarce. Two species, the Crab Plover *Dromas ardeola* and Eurasian Oystercatcher *Haematopus ostralegus*, have not been sighted since 1992. The major causes of the decline are discussed, and some recommendations are made for further research and restoration of the important wetlands at Point Calimere.

INTRODUCTION

The Central Asian/South Asian Flyway lies entirely within the Northern Hemisphere and is the shortest flyway in the world. It is also the most poorly known flyway, and for a high proportion of its wader populations, nothing is known of population size or trends. India is the major wintering area for waders in this flyway, but information on wader populations is patchy and mostly over a decade old. Thus, contemporary knowledge of waders is almost absent. Between 1970 and 1990, the Bombay Natural History Society (BNHS) carried out bird ringing on a large scale in various parts of the country, and highlighted the importance of a number of wetlands and the status of migratory birds dependent on those wetlands. This work accumulated a vast amount of data on migration patterns and flyways, seasonal movements, biometrics, moult, longevity, weight changes etc. The study helped to obtain comprehensive information on breeding areas, staging areas (both within India and abroad) and wintering areas that are globally important for the protection of migratory birds.

Recoveries of ringed birds have shown that most of the migratory waders occurring in India are from northern and central Siberia, although some populations from north-eastern and eastern Siberia also winter in India. Birds ringed in India have been recovered in the former USSR during spring passage at over 60˚N and over 117˚E, and during autumn passage at lower latitudes between 60˚E and 80˚E. The recoveries have generated good data for some species, especially two *Calidris* sandpipers (Curlew Sandpiper *C. ferruginea* and Little Stint *C. minuta*) and the Ruff *Philomachus pugnax*. However, the available data are still insufficient to arrive at a meaningful conclusion with regard to the migration patterns of many species. The BNHS study was not able to document the total population of waterbirds in the wetlands under investigation. These and other gaps in knowledge can be filled only with the active collaboration of all countries within the Central Asian/South Asian Flyway.

Migration patterns of waders in India and overlap in flyways

Among waders, the Arctic-breeding species such as Little Stint and Curlew Sandpiper undertake a loop migration within India before departing in spring. Most waders migrate to India during early autumn, mainly through the north and north-west. From here, some birds continue on south-west to wintering areas in Africa (as confirmed in the Ruff), while others move south-east to the east coast of India, as demonstrated by a Curlew Sandpiper that was ringed at Bharatpur (north-west India) and recovered in the same winter at Point Calimere (south-east India). A similar migratory divide between birds wintering in India and those wintering in south-west Asia and Africa may also occur in Kazakhstan, as most of the recoveries during autumn passage of birds ringed in India have been from Kazakhstan. The spring passage of waders along the east coast of India is relatively well known (Ali 1981, Balachandran 1998, Hussain 1991).

Although the bulk of the waders wintering in India follow the Central Asian/South Asian Flyway, some ringing recoveries provide evidence of overlap with the East Asian/Australasian and West Asian/East African Flyways in eastern and western India, respectively. The recovery of a birds ringed at Point Calimere, in Australia and birds ringed at Bharatpur, in Africa are examples of this overlap. Thus, it is possible that there are migratory divides in both eastern and western India, with some birds moving on to their respective wintering grounds in the Southern Hemisphere.

Recent migration and related ecological studies in India

Systematic studies of bird migration in India through bird ringing came to an end when the bird migration projects sponsored by the US Fish and Wildlife Service were concluded in 1992. There was no ringing of waterbirds in India between 1993 and 1997, but in 1998, ringing was resumed on a small scale through a project sponsored by the US Fish and Wildlife Service to train volunteers in bird ringing and related studies. Under this

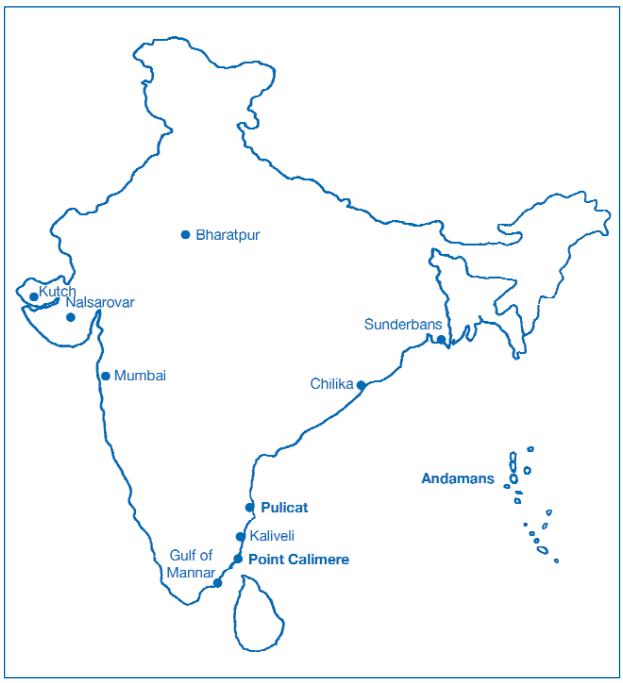

Fig. 1. Major habitats for waders in India.

programme, nearly 4 800 waterbirds were ringed in various parts of the country between 1998 and 2002. The bulk of the catch (68%) was at Point Calimere in the south-east.

In the last two years, a few locally sponsored ringing programmes have been organized at Basai Wetland near Delhi, and two 10-day programmes have been organized at Point Calimere through the BNHS Conservation Fund (Daniel & Balachandran 2003). The Himachal Pradesh State Government has recently sponsored a 20-day training programme on bird ringing at Pong Dam, a Ramsar site. Through these programmes, over 1 000 waterbirds have been ringed and data generated on the current status of waterbirds at these wetlands.

Regular bird ringing has been carried out at Chilika Lake for the last two years as part of a three-year project on waterbird populations sponsored by the Chilika Development Authority, Government of Orissa. Over 5 000 birds have been ringed, most of them waders. A bird atlas of Chilika Lake is now being prepared, based on the distribution of waterbirds (including waders) in different zones of the lake. Various conservation measures have been suggested for the creation of additional habitat for migratory waterbirds as well as the breeding birds, and these are being followed up and implemented by the government.

MATERIALS AND METHODS

The numbers of waders ringed and recorded at four wetlands on the east coast of India (Point Calimere, Gulf of Mannar, Pulicat Lake and Chilika Lake) under the Bird Migration Project of the BNHS between 1980 and 1992 were taken as the baseline data to assess the size of the wader populations during the 1980s and 1990s. The ringing and census data obtained at Point Calimere and Pulicat Lake under the Bird Banders' Training Programme of the BNHS between 1998 and 2003 and the bird counts carried out in Chilika Lake by the BNHS between 2001 and 2003 were compared with the earlier data to assess the decline in wader populations. The numbers of each species ringed and the capture rate per day were also used for comparison.

MAJOR WADER HABITATS ON THE EAST COAST MONITORED FOR BIRD MIGRATION

Point Calimere Wildlife Sanctuary and the adjoining Great Vedaranyam Swamp

The Point Calimere Wildlife Sanctuary (10°18'N, 79°51'E) is situated on a low promontory on the Coromandel Coast (southern Deccan Plateau) in the Bay of Bengal (Fig. 1). The adjoining Great Vedaranyam Swamp stretches parallel to the Palk Strait for about 48 km, and is separated from it by a sand-bank. Its north-south dimensions vary from about 10 km at its broadest in the east, to about 8 km in the central part and about 6 km in its western portion. Five freshwater channels connected to the Cauvery River empty into the swamp. There is a gradual slope from north to south. The total area is about 349 sq. km.

In about two-thirds of the swamp, the habitat varies seasonally. During the monsoon and periods of south-westerly winds, there is a continuous expanse of fresh, brackish or saline water extending to the northern tip of the swamp. At other times, the area of open water gradually dries up from north to south. During the drying stage, there are exposed flats and shallow pools. The extreme eastern promontory of the swamp, comprising Kodikkarai and Kodikkadu Reserve Forest, has been declared a wildlife sanctuary. This sanctuary, the Point Calimere Wildlife Sanctuary, supports both littoral and terrestrial life zones (Ali 1980, Manakadan 1992). It comprises 26 sq. km of tropical dry evergreen forest intermingled with scrub jungle and mangrove vegetation, and intersected by numerous tidal inlets and creeks.

Exploitation of the Great Vedaranyam Swamp for salt extraction and other marine-based industries is fast growing. Two private chemical firms have been operating in the leased swamp areas adjoining the wildlife sanctuary. The manufacture of salt involves three stages. Sea water is pumped into reservoirs and then condensed before it is finally allowed to flow into salt-pans, where the salt crystallizes. The reservoirs alter the ecosystem to some extent since they are, in the absence of tidal fluctuation, more or less stagnant. The composition of the littoral communities and microfauna is drastically altered under such conditions. The condensers have a relatively high salinity and temperature which create an ecological barrier for most marine organisms from April to October. Only the monsoon makes this environment temporarily habitable for marine organisms.

Point Calimere and Great Vedaranyam Swamp are an important wintering and staging area for over 1 000 000 waders and other waterbirds, and are the only site that has been intermittently monitored by bird ringing studies for the last three decades. The swamp is of great importance as a staging area for migrants on their way to and from Sri Lanka and other wintering grounds.

Chilika Lake

Chilika Lake, a designated Ramsar site, is the world's second largest brackish-water lagoon, situated between 19°28'N and 19°54'N and between 85°05'E and 85°38'E (Fig. 1). The water surface of the lake varies from a maximum of 1 165 sq. km during the monsoon to a minimum of 906 sq. km during the summer. The various habitats include marshes, mudflats, freshwater pools and areas of open water with varying depths and salinity.

Table 1. Declines in the catches of waders at Point Calimere, India.

Species	No. ringed in one season and maximum catch in a single day			Average catch/day		
	1980-82	1990-92	2000-02	1980-82	1990-92	1999-03
Charadrius mongolus	1 063 (45)	658 (48)	705 (34)	7	8	7
Calidris minuta	9 876 (376)	1 137 (170)	513 (40)	56	20	5
Calidris ferruginea	3 569 (180)	1 330 (110)	599 (35)	20	14	6
Philomachus pugnax	564 (80)	184 (47)	74 (17)	3	2	1

During the dry season (December to May), a large island is exposed (Nalabana Island), and this has extensive mudflats which attract over 300 000 waterbirds. This island was declared as a Bird Sanctuary in 1987. The island supports the largest concentrations of waders in the lake, and is also utilized by several ground-nesting birds for breeding.

Despite its large size, the lake has no areas of shallow water and mudflats until Nalabana Island emerges in December. Hence, small and medium-sized waders are scarce until December. The numbers of most wader species begin to increase from late December and reach a peak in late January. For the smaller waders, the lake serves mainly as a staging area during the northward migration in spring. However, the large and long-legged Black-tailed Godwit *Limosa limosa* has been seen in good numbers from November to March, indicating that this species utilizes the lake during the winter.

Gulf of Mannar Biosphere Reserve

The 21 islands in the Gulf of Mannar extend from Rameshwaram Island in the north to Tuticorin in the south, and comprise an island ecosystem that is unique on the east coast of India (Fig. 1). These islands, along with their marine environment between latitudes 8° 47' and 9°15'N and longitudes 78°12' and 79°14'E, have been notified as India's first Marine Biosphere Reserve. Most of the islands support a luxuriant growth of mangroves, while the sandy shores offer excellent nesting grounds for sea turtles. The sea bed around the inshore islands is carpeted with sea-grass beds which not only serve as feeding grounds for Sea Cows *Dugong dugong*, but also harbour a diverse animal community including birds. The highly productive fringing and patchy coral reefs that surround the islands are a treasure house of colourful marine fishes. Extensive inshore areas exposed during low tide at Manali and Hare islands are frequented by coastal waders, especially those species that prefer sand-flats such as the Crab Plover *Dromas ardeola*, Eurasian Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Lesser Sandplover *Charadrius mongolus*, Greater Sandplover *C. leschenaultii*, Bar-tailed Godwit *Limosa lapponica*, Eurasian Curlew *Numenius arquata*, Ruddy Turnstone *Arenaria interpres*, Great Knot *Calidris tenuirostris*, Red Knot *C. canutus* and Sanderling *C. alba*. Other areas with major concentrations of waterbirds are Dhanuskodi Lagoon on Rameswaram Island and Pillaimadam Lagoon on the mainland near Mandapam. These lagoons are frequented by thousands of small waders, mainly Lesser Sandplover, Little Stint and Curlew Sandpiper, as well as Greater Flamingos *Phoenicopterus (ruber) roseus*. During the 1980s, the Gulf of Mannar as a whole supported about 50 000 waterbirds (Balachandran 1990 & 1995).

Pulicat Bird Sanctuary

Pulicat Lake is situated on the south coast of Andhra Pradesh (13°25'-13°55'N, 80°03'- 80°19'E), on the eastern seaboard of India (Fig. 1). It covers an area of about 450 sq. km, and is the second largest brackish-water lagoon in India after Chilika Lake in Orissa. The lake was declared as a bird sanctuary by the Andhra Pradesh Forest Department in 1976. The entire area is a vast, brackish to saline lagoon with extensive mud- and sand-flats. The sanctuary is bounded on its eastern side by the spindle-shaped Sriharikota Island, 185 km in length. This island was probably formed by recession of the sea, and is mostly flat with a few sand dunes ranging from 4.5 to 6 m in height. Over 200 000 waterbirds were recorded at Pulicat Lake in 1988 and 1989, including over 30 000 Greater Flamingos. The most abundant waders were Lesser Sandplover, Black-tailed Godwit, Little Stint, Curlew Sandpiper and Ruff.

POPULATION DECLINES IN WATERBIRDS

Point Calimere

The decline in waterbird populations at Point Calimere is very conspicuous not only to ornithologists, but also to laymen in the area. Any local villager, especially anyone over 40 years of age, can recall the drastic changes that have occurred in the numbers of waders and other waterbirds in the Great Vedaranyam Swamp. The disappearance of the fabulous clouds of waterbirds (waders, ducks, terns, flamingos, egrets) that passed through the villages on their way between feeding and roosting sites up until the late 1980s is a visible indicator of the decline. The appearance of large mounds of salt on the mudflats, which were once thronged by thousands of waders, ducks and flamingos, is an indication of the habitat loss and degradation.

As no simultaneous counts were made throughout the swamp, it is difficult to quantify the decline. The data generated from the small areas sampled for bird counts during the 1980s and personal observations of the waterbird populations in the past and present have helped to provide qualitative estimates for some of the common species. Furthermore, the bird ringing data collected between 1980 and 1991 and the recent skeletal ringing data collected between 1998 and 2003 have helped in estimating the scale of the decline.

The ringing and census data from Point Calimere indicate that there has been a decline of over 70% in certain species of waders since the 1980s. This decline in wader populations is apparent from changes in the numbers of birds caught per day, in the total numbers of birds caught per season, and in the numbers of birds counted in areas that were monitored in the 1980s and 1990s. The number of birds caught per day has decreased for several species of wader, despite a doubling of

Table 2. Population estimates for common waders at Point Calimere, India.

Species	1980s	1990s	2000-03
Himantopus himantopus	>15 000	3 000	>1 000
Recurvirostra avosetta	>7 000	>500	<100
Charadrius mongolus	>10 000	>75 000	<40 000
Limosa limosa	>50 000	>40 000	>15 000
Calidris minuta	>200 000	>100 000	<20 000
Calidris ferruginea	>150 000	>80 000	<25 000
Philomachus pugnax	>100 000	30 000	<10 000

effort per day in recent years (Table 1). The population estimates for the common waders from the 1980s, 1990s and 2000-2003 indicate that although there was a decline in all species between the 1980s and 1990s, this has become much more pronounced in recent years (Table 2). Certain species that prefer the inter-tidal zone have either disappeared or declined drastically (e.g. Crab Plover, Eurasian Oystercatcher and Sanderling), as also have some inland waders (e.g. Spotted Redshank *Tringa erythropus*, Ruff and Black-winged Stilt *Himantopus himantopus*).

The most affected species are the two Arctic-breeding *Calidris* sandpipers, Little Stint and Curlew Sandpiper, which were formerly the most abundant winter visitors at Point Calimere. The reservoirs, inter-tidal zone and other brackish areas at Point Calimere provided enormous feeding areas for these species, with numbers of Little Stint in the 1980s exceeding 200 000 and those of Curlew Sandpiper, 150 000. During the last four years, however, neither of these species has been recorded in numbers exceeding 25 000. It appears that these two species formerly benefited from the shallow water levels in the reservoirs which carried many littoral organisms (crustaceans, polychaetes) into the environment. The plentiful rains also helped to increase the productivity of these habitats during the wet season. The extension of salt-based industries, the diminishing rainfall and disturbances caused by fishermen have now altered these habitats.

Causes for the decline in wader populations at Point Calimere

Poaching

There is intensive illegal hunting of Little Stints and Curlew Sandpipers by professional bird-trappers who depend on birds for their livelihood. These bird-trappers operate outside the sanctuary limits, and employ three traditional methods of trapping: clap-traps, mesh-nets (similar to gill-nets and operated at night) and nooses. The gregarious Little Stint and Curlew Sandpiper are particularly vulnerable to clap-traps, as they forage on mudflats with shallow water, i.e. in areas that are ideal for the use of this type of trap. It is interesting to note that in a single day in 1980, one clap-trap yielded 376 Little Stints for ringing. Similarly, 180 Curlew Sandpipers have been caught by this method in a single day.

The scale of the poaching was formerly huge. In the 1980s and 1990s, over 100 trappers were operating these highly effective traps throughout the migration season from August to March in the Muthupet and Adirampatinam areas outside the wildlife sanctuary. In recent times, however, the number of trappers involved in poaching has fallen, as trapping is no longer as productive as it was due to the fall in numbers of waders.

Depletion of groundwater and saltwater intrusion

The extraction of groundwater has increased manifold in recent years to cater to the needs of the floating population of fisherfolk who are on the increase. Groundwater recharge is inadequate because of the consistently diminishing rainfall in the area over the last two decades.

The flushing and dilution of the highly saline water stored in the reservoirs, condensers and salt-pans have been hampered by embankments constructed in the swamp by chemical companies and other salt-works. Formerly, the incursion of seawater into large areas of the swamp caused by the strong summer winds not only made the swamp habitable for waterbirds during the summer months, but also helped to prevent the mudflats from drying out completely.

The saline incursion has made the area unsuitable for raising traditional crops such as paddy, while water in the freshwater wells is no longer potable. The hyper-saline conditions have not only altered the texture of the mudflats in the reservoirs, but have also affected the adjacent habitats for birds.

Cessation of monitoring activities by the BNHS

The presence of a BNHS monitoring station at Point Calimere from 1979 to 1992 maintained a check on the activities of the salt-based chemical companies operating in the area. However, since the cessation of research activities by the BNHS at the end of 1992 due to a lack of funds, there has been little to restrain the chemical companies in their alteration of the habitat for commercial goals.

Ringing and bird censusing activities were resumed at Point Calimere in 1999, and since then, researchers have been present for 20-30 days each season. This has helped to monitor habitat changes in the area. During the migration season of 2003/04, following a relatively good monsoon, the chemical companies drained the water from the reservoirs to strengthen the earthen embankments. The continuing habitat changes have resulted in extensive compaction of the soft muddy substrate, making it less productive for the smaller organisms which form the bulk of the food resources for waders in the area. It is imperative, therefore, that in deciding the future of Great Vedaranyam Swamp, the greatest care be exercised in striking a balance between the commercial demands of the salt industry and the requirements of the migratory birds.

Wader populations at other sites.

Large declines have also been observed in the numbers of many species of waders wintering at Pulicat Lake and in the Gulf of Mannar since the 1980s (Tables 3 & 4). The declines were most apparent in coastal waders, and those species preferring inland and brackish habitats, such as the Black-tailed Godwit and Ruff, were less affected (Table 3). In contrast, the numbers of waders at Chilika Lake have remained high (Table 5), and here there was an increasing trend during the three migration seasons between 2001 and 2004. The possible increase at Chilika may be due to a movement of birds away from Point Calimere and other sites in the south. However, the numbers of Little Stint, the most abundant wader on the east coast of India, have never exceeded 100 000 in recent years. This indicates that there has been a decline in the South Asian wintering population of this species, possibly because of the degradation of its key wintering site at Point Calimere.

Table 3. Population estimates for common waders at Pulicat Lake, India.

Species	1988-89	1998-99
Himantopus himantopus	>5 000	3 000
Recurvirostra avosetta	>1 000	>400
Charadrius mongolus	>25 000	>15 000
Limosa limosa	>20 000	>18 000
Calidris minuta	>60 000	>35 000
Calidris ferruginea	>35 000	>20 000
Philomachus pugnax	>40 000	30 000

Table 4. Population estimates for common waders in the Gulf of Mannar, India.

Species	1985-88	1993	2001
Dromas ardeola	900	150	65
Pluvialis squatarola	970	230	180
Charadrius mongolus	>13 000	>8 000	>4 000
Numenius arquata	450	120	67
Tringa nebularia	250	>3 500	180
Calidris tenuirostris	350	140	450
Calidris canutus	300	85	90
Calidris minuta	>8 000	>3 000	>2 000
Calidris ferruginea	>10 000	>8 000	>5 000

Table 5. Peak counts of common waders at Chilika Lake, India (2001-2004).

Species	Peak count
Himantopus himantopus	5 000
Recurvirostra avosetta	>500
Charadrius mongolus	56 000
Limosa limosa	55 000
Calidris minuta	24 000
Calidris ferruginea	54 000
Philomachus pugnax	10 000

DISCUSSION

It is well known that many long-distance migrant waders are highly dependent on a series of key staging areas – essential "stepping stones" – between their wintering areas and more northerly breeding areas (see, for example, Stroud, and Baker, this volume). Up until the late 1980s, Point Calimere served both as a major wintering site for waders and as a key staging area for waders wintering elsewhere in India. This area now appears to be inhospitable for the bulk of the migratory wader populations because of anthropogenic pressures. The transit populations of waders en route to other wintering areas in autumn and their breeding areas in spring have disappeared. This is mainly due to the prevalence of dry and highly saline conditions during both autumn and spring as a result of intense industrial activities. Thus, the degradation of this crucial "stepping stone" for migrant waders has had a great impact on the biogeographical populations of the species dependent on it.

This is especially apparent in the drastic decline of the Curlew Sandpiper and Little Stint on the east coast of India. These species were never observed at any of the coastal wetlands of India in such huge concentrations as those observed at Point Calimere. The linkage between this coastal wetland and other major wader habitats both within India and abroad has been well established through ringing recoveries. Recoveries outside India involve not only other countries in the Central Asian/South Asian Flyway, but also countries in neighbouring flyways. Hence, the role of this wetland in maintaining the global populations of some wader species is unquestionable.

The occurrence of globally threatened waders, such as the Spoon-billed Sandpiper *Eurynorhynchus pygmeus,* Spotted Greenshank *Tringa guttifer* and Asian Dowitcher *Limnodromus semipalmatus*, at Point Calimere also emphasizes its global importance. Hence, there is an urgent need for more and better population monitoring. In the first instance, and as a minimum requirement, an adequately funded national monitoring programme needs to be established, to develop an internationally co-ordinated research initiative to discover more about the causes of the declines.

RECOMMENDATIONS

1) A permanent bird migration study centre should be established in India to impart training on bird migration and related studies, and to strengthen collaboration with other countries in the Central Asian/South Asian Flyway and neighbouring flyways in the dissemination of knowledge on bird migration.
2) The monitoring of flyway populations in collaboration with other countries in the Central Asian/South Asian Flyway should be improved by strengthening and streamlining the mid-winter waterbird counts and through joint expeditions.
3) Species study groups should be formed for the species identified for further research under the Indo-Russian Protocol.
4) Further analyses of the status of waders in the Central Asian/South Asian Flyway should be carried out, using existing data and information, to highlight common patterns and processes in the declining populations.

Recommendations relevant to Point Calimere

1) Dialogue should be initiated between the Wildlife Department, local communities, environmentalists and corporate bodies operating in the area, as a confidence building measure.
2) Areas of common concern and mutual benefit for industrial ventures, conservationists and other stakeholders should be identified, to reduce loss and modification of habitat as a result of commercial activities.
3) Detrimental practices, especially with regard to the salt/chemical industry, should be highlighted and appropriate mitigation measures elaborated after mutual consultation with such industries in the Great Vedaranyam Swamp.
4) A Joint Working Group comprising the stakeholders (Wildlife Department, local communities, corporate bodies and NGOs) and specialists should be set up to monitor modification of the habitat in the Great Vedaranyam Swamp. The

Joint Working Group would suggest and implement measures for the restoration of the swamp.

5) Restoration measures should be implemented in the known traditional wintering and passage sites for waders with the involvement of local communities and NGOs.

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Ruddy Turnstone *Arenaria interpres*. Photo: Rob Robinson.