CONSERVATION OF WADER HABITATS IN INDIA

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India has many important coastal and inland wetlands that have large wintering populations of waders, especially Little Stints *Calidris minuta*, Curlew Sandpipers *Calidris ferruginea* and Lesser Sand-plovers *Charadrius mongolus*, as well as many other species of migrant waders, wildfowl and other waterbirds. This paper focusses on the importance and conservation measures safeguarding two of the major sites, Vedaranyam Swamp and Chilka Lake. Although major wetlands such as these have some protection through legislation, there remain many and increasing threats and pressures from human usage and over-exploitation that continue to cause damage to wetlands.

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INTRODUCTION

Most migrant waders that overwinter in the Indian subcontinent must cross the great Himalayan mountain chain to reach their winter quarters from breeding grounds in northern Asia. The Himalayas may provide a major barrier to such migrants, and migration may be focussed along three main routes through the mountains: the Kashmir-Afghan flyway in the west, the Kosi-Gandak flyway through the mid-Himalayas, and the Brahmaputra valley in the east. Some migrants in the west may continue along the Gulf of Kutch and on to the East Africa. Many migrants through central and easten India probably continue on to Sri Lanka.

Despite any barriers presented by the Himalayas, the Indian sub-continent is an important wintering area for many species of shore and wading birds, and especially waders (Charadrii). In all, 49 species of migrant waders occur on the Indian subcontinent. Most migrant waders overwinter on coastal wetlands, although most species are also found on inland freshwater wetlands, especially during migration periods. For example the extensive swamps at Bharatpur in Rajasthan (see Figure 1) have substantial wintering populations of waders such as Little Stints *Calidris minuta*, Temminck's Stints *Calidris temminckii*, Ruffs *Philomachus pugnax*, Common Snipe *Gallinago gallinago* and Wood Sandpipers *Tringa glaeola*. Ruffs and Wood Sandpipers are the most abundant wintering waders of freshwater sites. On coastal sites, the most abundant species are Little Stint, Curlew Sandpiper *Calidris ferruginea* and Lesser Sand-plover *Charadrius mongolus*.

This paper summarises the most important wetland sites in India, and then focusses on the conservation of two of the major coastal sites, the Vedaranyam Swamp in Tamil Nadu, and Chilka Lake in Orissa. The locations of major Indian wetlands are shown in Figure 1. Major threats to the natural ecosystems of coastal wetlands in India include commercial fisheries, industrial developments, inshore oil exploitation and land reclamation.

MAJOR WETLANDS

In the north, many wetlands in the Kashmir Valley and the Indo-Gangetic plains provide wintering grounds for species feeding in freshwater sites. Coastal waders are

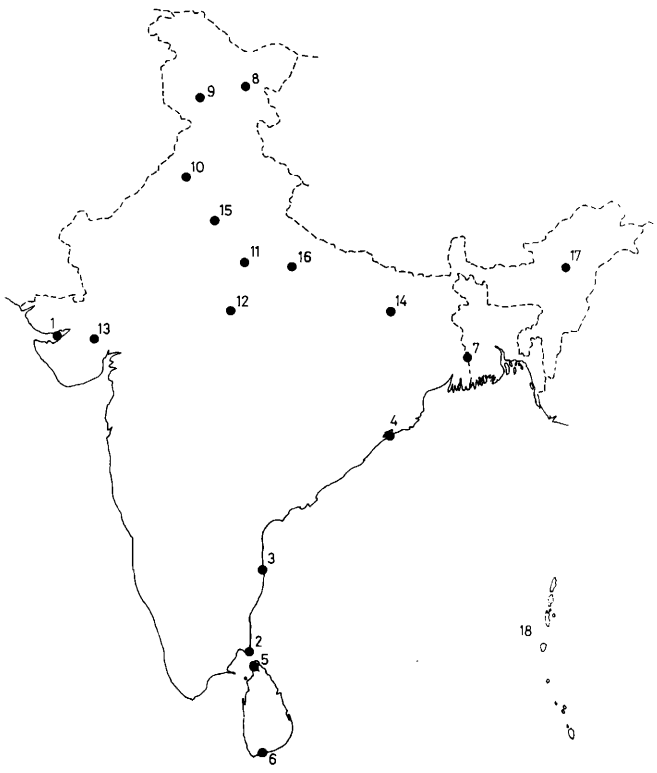

Figure 1. Major wetlands in the Indian peninsula. Coastal wetlands: 1 Gulf of Kutch (Gujarat), 2 Vedaranyam Swamp (Tamil Nadu), 3 Pulicat Lake (Tamil Nadu/Andhra Pradesh), 4 Chilka Lake (Orissa), 5 Jaffna Peninsula (Sri Lanka), 6 Bundala (Sri Lanka), 7 Sunderbans (West Bengal/Bangladesh). Freshwater/inland wetlands: 8 Tso Moriri, Tso Kar and Pangong Lake (Ladakh), 9 Dal Lake (Kashmir), 10 Harike Barrage (Punjab), 11 Keoladeo Ghana Bharatpur (Rajasthan), 12 Karera (Madhya Pradesh), 13 Nalsarovar (Gujarat), 14 Khabertal (Bihar), 15 Sultanpur Jheel (Uttar Pradesh), 16 Nawabjanj (Uttar Pradesh), 17 Brahmaputra basin (Assam), 18 Andaman Islands and Nicobar Islands.

distributed along both the east and west coasts of India, and also in Sri Lanka, and the Andaman and Nicobar Island groups. India has a vast coastline stretching for over 3600 km. It has a variety of coastal habitats including sandy shores, mangrove swamps, estuarine mudflats and sandflats, and large brackish and saline coastal lagoons. The most important coastal wetlands are the Gulf of Kutch, the Vedaranyam estuary, Pulicat Lake and Chilka Lake (Figure 1).

Jammu & Kashmir, and Ladakh

In these northern areas, around high altitude (4000-5000 m) lakes there are important breeding areas for waders such as Lesser Sand-plover and Redshank *Tringa totanus*, as well as for waterfowl such as the Bar-headed Goose *Anser indicus*. As these areas are remote and largely uninhabited, there are few threats to these breeding populations. However, the lakes around Srinagar (Kashmir), which support a large number of waterfowl, have faced increased hunting pressure and disturbance from tourism. Protection measures have now been implemented there by the State Forest and Wildlife Service.

Harike Barrage

This is an important wintering area in Punjab, south of Kashmir. It supports large numbers of ducks and coots, as well as waders, especially Ruffs and Wood Sandpipers. The two major conservation problems at Harike Barrage are the rapid spread of water hyacinth, and the commercial fisheries. The State Wildlife Board, composed of legislators, bureaucrats, scientists and voluntary conservation groups, recommended the site as a sanctuary. This was achieved in 1982. The Board recommended also that there should be efforts to control the water hyacinth and regulate fisheries. The Harike Barrage has been recommended for designation as a Ramsar site.

Gulf of Kutch

This is one of the three most important coastal wetland areas for waders. There are large wintering populations of Curlew Sandpipers, Little Stints, Redshanks, Ruffs, Black-tailed Godwits *Limosa limosa*, Bar-tailed Godwits *Limosa lapponica*, Grey Plovers *Pluvialis squatarola* and Lesser Golden Plovers *Pluvialis dominica*. The area faces a number of threats, particularly from changing land use practices and pollution. Pollution threats come from the recent development of off-shore oil extraction. In recognition of the importance of the wetlands, the State Government has declared the entire Gulf area as a marine national park, and protection measures are now being implemented.

Pulicat Lake

Pulicat Lake is on the coast just to the north of Madras City in Tamil Nadu. It is the third most important wetland for waders on the eastern seaboard, after the Vedaranyam swamp and Chilka Lake, and it is especially important during spring and autumn migration periods. Threats to the natural wildlife of the area come from human activities such as fishing, and the impact of adjacent industrial activities, but some efforts are now being made to protect some parts of the lake from over-exploitation and disturbance.

Bharatpur

Keoladeo National Park, Bharatpur, in Rajasthan, is an artificially-created freshwater wetland covering a total area of 29 km², with about 9 km² of open water. It supports large wintering and breeding bird populations; at least 94 species of waterfowl occur in the park, including 48 long-distance migrant species. Maintenance of wetland habitats in the park is dependent on careful management, since the park is fed by water released from an irrigation reservoir. The main management problems concern inadequate water supply, siltation and growth of emergent vegetation. The stopping of cattle grazing 3 years ago has increased the problem of excessive growth of grasses. Attempts to control grass growth are under way, but it is not yet clear how effective these will be. The loss of deep water areas due to this growth of grasses especially threatens the populations of diving ducks and Siberian Cranes *Grus leucogeranus*.

Vedaranyam Swamp

The Vedaranyam-Muthupet swamp belt in the Thanjavur district in Tamil Nadu is one of the major sanctuaries in India for migratory and resident water birds. Its importance as a wintering area was little known until the Bombay Natural History Society (BNHS), with grant aid from the World Health Organisation and the Smithsonian Institute, began winter bird-ringing camps in 1969, and discovered substantial migrant populations of waders and other birds (BNHS unpubl. reports). Prior to this there were only a few notes on the occurrence of wildlife on Point Calimere sanctuary in the western part of the estuary (Ali 1963, Daniel 1967, Melluish 1969, Krishnan 1971). Apart from a working plan for the sanctuary prepared by the Forest Department of Tamil Nadu, there was little ecological information about the estuary. Since then, several reports on the birds and other parts of the estuarine ecosystem have been published (Abdulali and Hussain 1971, Raju and Shekar 1971, Hussain 1976, Ali and Hussain 1981, 1982, Sugathan 1982).

The Vedaranyam swamp stretches westwards from the promontory of Point Calimere (10°18'N 79°51'E). Its western borders are mangrove swamps. Most of the remaining area is chiefly open mudflats and lagoons. There are numerous scattered islets throughout the 24 000 ha swamp. The swamp is separated from the Palk Strait along its southern boundary by a long sand bar, with tidal inlets in several places. There are 5 freshwater inflows into the large lagoon in the centre of the swamp. To the north the swamp is bordered by an artificial bund, with villages and farmland beyond. The Point Calimere Sanctuary is a low promontory that was originally isolated from the mainland by several channels. It is mostly a patch of low xerophytic scrub forest, dissected by shallow tidal channels. As it is situated on a promontory, the area bears the brunt of the periodic cyclonic storms that lash the Coromandal coast. Soon after the monsoons begin in October, the entire estuary and forest is flooded with freshwater, and the salinity decreases. This low salinity regime continues throughout the winter. Rapid summer evaporation then increases the salinity, and much of the freshwater area dries out. Most of the commercial salt production (see below) takes place at this time.

The salt pans and mudflats are used by a large variety of waders, many of which overwinter there. Others occur on passage in spring and

autumn, and many of these probably overwinter in Sri Lanka. Vedaramyam Swamp supports large populations of Lesser Sand-plovers, Little Stints, Curlew Sandpipers and Redshanks. It is important also for Broad-billed Sandpipers *Limicola falcinellus*, Ruffs, Marsh Sandpipers *Tringa stagnatilis* and Greenshanks *Tringa nebularia*, and the scarce Spoon-billed Sandpiper *Eurynorhynchus pygmaeus* also occurs there in winter.

The whole of the Vedaranyam swamp and its surroundings is exploited in several ways by the populations of 10 villages in the surrounding area. There are 4 main types of exploitation: sea fishing; estuarine fishing; salt manufacture; and forest produce and cattle grazing.

Salt manufacture and associated industries have had a major impact on the Vedaranyam swamp, although the artificial salt lagoons are used as feeding areas by waders and other water birds. Three techniques of salt manufacture are used: direct pumping of seawater into lagoons close to the shore; pumping from creeks into reservoirs inland; and channelling of seawater from the coast to inland lagoons. The first method provides the best feeding opportunities for birds, since it provided shallow lagoons of low salinity during the winter months, with large invertebrate and fish populations that form a abundant food supply for the birds.

The whole swamp faces continued over-exploitation of its natural resources, and alteration of its natural habitats from human activities. These threaten to reduce greatly the importance of the swamp unless urgent action is taken to safeguard the area. Recently, on the advice of the BNHS, the Department of Industries of Tamil Nadu have shelved a proposal to establish a large-scale salt extraction complex over the entire swamp. BNHS have also encouraged the State Government to set up a committee to monitor the developments that are taking place in the area. This committee has recommended that the whole swamp should be declared as a sanctuary, so giving better control of the area. The Tamil Nadu Government is now taking steps to control land acquisition and enact legislation to establish the sanctuary. The BNHS is conducting some research in the swamp, especially on the bird populations, but a more comprehensive study of the swamp ecosystems is urgently needed if the area is to be managed effectively.

Chilka Lake

Chilka Lake (19° 35'N 85° 20'E), with a surface area of 1040 km², is the largest brackish lake in India. Different parts of the lake range from nearly freshwater to saline. Salinities vary seasonally very greatly: they are lowest in August and highest in May. Its rich ecological diversity and size make Chilka Lake one of the most important coastal wetlands in India, and a major wintering area for migrant waders and wildfowl. However its size, and the great mobility of the waterbird flocks, have made it very difficult to assess accurately the total numbers using the area. Many waders and waterfowl concentrate around Nalban Island, a shallow marshy area of about 10 km² in the middle of the lake; this provides a variety of shallow and deeper water feeding habitats. As at other coastal sites, the largest migrant wader populations are Little Stints, Curlew Sandpipers and Lesser Sand Plovers. In addition, Nalban Island has breeding populations of Black-winged Stilts *Himantopus himantopus* and Pratincoles *Glareola pratincola*. Various aspects of the natural ecosystem of Chilka Lake have been reported in Annandale and Kemp (1915), Jhingren (1963), Banerjee and Raychoudhery (1971), Patnaik (1971), Rajan (1971), Blanford (1972) and Ali and Hussain (1981).

There are many threats and pressures to the natural ecosystem of Chilka Lake. Its natural resources are being increasingly exploited by both Government agencies and the private sector, and the State Government plans to develop the area as a tourist attraction. The human population on the islands in the lake, as well as on the surrounding mainland has increased considerably. The establishment of an Indian Navy training centre on the shore, which was feared to be a potential source of pollutants, has proved to be of little problem. Indeed, it has brought some benefits to the bird populations: large numbers of ducks congragate nearby, since there they are protected from disturbance by fishermen and poachers.

The most important commercial activity is a major fishery. The lake is leased out each year to about 12 000 fishermen, and 24 villages depend exclusively on fishing, chiefly for prawns. The large number of fishing vessels is a major source of disturbance to the birds, particularly around Nalban Island, which is a focus of activity for fisherman as well as the birds. The problem has become more severe recently with the increase in night-time fishing using lights. Birds feeding and roosting around Nalban Island suffer disturbance also from the large number of buffaloes grazed there by local villagers from a few km away on the mainland.

Chilka Lake was declared a sanctuary in October 1979. However, the very large size of the lake, and limited conservation resources, including the small staff and the lack of patrol boats, make it very difficult to control illegal activities. Uncontrolled shooting, netting and snaring of birds is a widespread activity amongst fishermen and other local people around Nalban Island and elsewhere.

The Government of India has begun moves to designate Chilka Lake, as one of the major wetlands in India, under the Ramsar Convention on the Conservation of Wetlands especially as Waterfowl Habitat. This will give valuable recognition of the international importance of the lake. However, even with this designation there will remain many practical problems for the effective conservation of the natural environment of the lake. In particular, the lake is too vast to allow effective conservation measures to be undertaken readily. There will remain a major conflict between the conservation of the natural environment and the fishery interests, which produce substantial revenue for the State Government as well as providing the living for many in the local human population and conserving the natural environment. Just declaring the area as protected may have little practical effect on the conservation of the lake. A number of further measures will be vital to give better management and protection to the area in the face of increasing human pressure on the natural ecosystem. These will need to include controlling human activities such as fishing and grazing around the core area of Nalban Island, in which fishing would be prohibited during the winter months. Continued research on the various parts of the ecosystem will be needed to develop effective management of the

lake, and increased Wildlife Department manpower would be needed to control human activities on the lake.

THE FUTURE FOR WETLAND CONSERVATION IN INDIA

Two major wetlands in India, Bharatpur and Chilka Lake, have already been designated aS Ramsar sites. Whilst Bharatpur has considerable protection, much remains to be done at Chilka Lake. However, the Orissa State Government has now implemented all the recommendations for conservation made by the Bombay Natural History Society (Hussain, Mohapatra and Ali 1984), and plans to fund long-term research studies.

Three major factors that threaten the wetlands of India and their birds are drainage and land reclamation for agriculture; pollution from waste disposal; and in freshwater wetlands, siltation and the spread of exotic weeds such as water hyacinth. Coastal mangrove forests are under great pressure from land reclamation, industrial effluents, and from cutting for firewood. The huge demand for domestic firewood has resulted in large-scale destruction of mangroves around Bombay in Maharashtra, Point Calimere and Pitchavaram in Tamil Nadu, Sunderbans in West Bengal and around Jamnagar in Gujarat.

The Bombay Natural History Society has been conducting field studies in the 2 Ramsar sites, and in other important proposed Ramsar sites. There are now moves to consolidate these research programmes into a series of permanent research stations which will form the basis for wetland ecosystem monitoring studies in India. In addition, there are also several Government institutions, including the Central Marine Fisheries Institute, the Central Inland Fisheries Institute and the Centre for Advanced Studies in Marine Biology, studying wetlands, and several universities carry out fundamental wetland research. The Government of India has recently initiated a massive programme for the conservation of the Ganges river system. The increasing awareness of the importance of natural wetlands gives hope that the wetland systems of the country will be protected.

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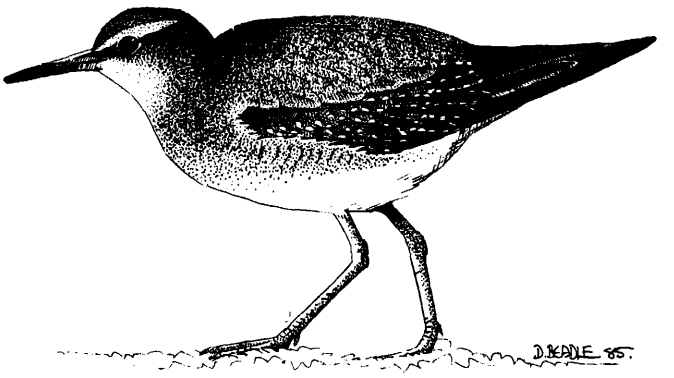

Grey-tailed Tattler