



# Avian Diversity in Coastal Wetlands of India and their Conservation Needs

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## Introduction

Coastal wetlands are special types of wetlands that are influenced by the fluctuating water levels provide a habitat for a vast array of organisms, including many endangered species. These critically important features act as water purifier, fish spawning area and feeding grounds and habitat for many animal species. Some birds depend on wetlands almost totally for breeding, nesting, feeding, or shelter during their annual cycles. Birds that need functional access to a wetland or wetland products during their life cycle can be called "wetland dependent". The important migratory birds utilizing the coastal wetlands are ducks, shorebirds, gulls, terns and flamingos. The birds of any coastal wetlands can be divided into at least four groups based on their seasonal occurrence. 1. Summer (breeding) residents 2. Winter residents (occurring throughout the winter) 3. Transients (passing through during either fall or spring migrations or both); and 4. Permanent residents. Furthermore, because of their frequently high abundance and their substantial food requirements resulting from high metabolic rates, birds often have a substantial impact on the infaunal invertebrates of coastal habitats (Schneider 1978). Many birds that inhabit intertidal habitats are migrants and travel annually along the Central Asian-

Flyway (CAF)- the flyway which extends from Central Siberia through the Himalayas to the Indian subcontinent). During peak annual migration periods, hundreds of thousands of birds migrating along the Central Asian Flyway descend upon the coastal wetlands of India in search of refuge and food. Some shorebirds (waders) weighing as low as 25g fly as far as 9,000, km from the arctic breeding grounds and South Indian wintering grounds. Prior to breeding, they again fly northwards to their nesting grounds, thus, in one year they may fly 18,000 km.

Coastal birds play the role in the coastal ecosystem both as primary and tertiary consumers cum predators to maintain the ecological balance. Their role in recycling the nutrients to the ecosystem through guano deposition is commendable and helpful to enhance the local fisheries. Many coastal birds for instance sea gulls play a scavenger role and many shorebirds feeding on harmful insects play role in vector control.

During the annual migrations, the birds depend on a great diversity of habitats, ranging from Arctic tundra to forests, grasslands, rivers and estuaries, lakes and marshes, sandy beaches, intertidal mud flats, coral reefs, atolls, and mangroves most of which are wetlands. Such long distant migrant coastal birds frequent in more



numbers in the coastal wetlands along the south-east coast than the wetlands of other regions in India. During the migration flights, the birds need to feed (refuel) and to do this they stop (and feed) at a number of sites along the route. These sites need to be productive (to provide enough food) and also undisturbed (to provide a safe roosting area). The major traditional wintering grounds for the waders of the Central Asian Flyway are located in India. Besides waders, coastal wetlands provide wintering and passage sites for hundred thousands of ducks, terns, gulls and flamingos, which migrate from central and west Asia, and Europe. The wintering population at these traditional wetlands in the last three decades had shown a decline trend in most of these species. In India, coastal birds are one of the least studied groups among the wildlife. The Bombay Natural History Society has undertaken several field projects specially to study the migratory movements between the Arctic breeding ground and the Indian wintering grounds through bird ringing for the last five decades and generated baseline information on the population status and movement of migratory waterbirds in major coastal waterbird habitats. The important coastal wetlands along the east coast of India are, Gulf of Mannar, Point Calimere, Pulicat, and Chilika. Population decline in waders and Greater Flamingo *Phoenicopterus roseus* during the last three decades, the major causes for the decline and measures for restoration of coastal wetlands are discussed in the paper.

## Major Coastal Bird Habitats of India

### 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. The Great Vedaranyam Swamp (henceforth referred to as GVS or swamp) stretches parallel to the Palk Strait for about 48 km, and is separated from it by a sand-bank. In total, it has an area of about 349 km<sup>2</sup>. Among the coastal wetlands, Point Calimere has been well studied through bird ringing.

The linkages of Point Calimere with other wetlands during migration within India and across the country were well established through the studies conducted

during 1980s. Waders ringed at the breeding grounds in the Arctic tundra of Russia and in Kazakhstan Uzbekistan, were recovered at Point Calimere in the same and subsequent seasons. Common Terns *Sterna hirundo* ringed in Poland, Lesser Crested Tern *Sterna bengalensis* Ringed in Saudi Arabia, Caspian Tern ringed at Caspian sea, Flamingos ringed in Iran and Caspian Sea were recovered at Point Calimere. Curlew Sandpiper *Calidris ferruginea* ringed in Australia was also recovered at Point Calimere. Waders ringed at Point Calimere were recovered in all the SAARC countries, China, Russia, and other former USSR countries. Within India, birds ringed at Point Calimere were recovered in many wetlands in northern India and vice versa. The Point Calimere is of great importance as a staging place for migrants on their way to and from Sri Lanka and other wintering grounds. No other waterbird refuge in India can claim to share this distinction with the Vedaranyam Swamp.

### Pulicat Lake

The Pulicat wetland is situated in south coastal Andhra Pradesh (13° 25' to 13°55' N and 80° 03' to 80° 19'E) on the eastern seaboard of India with an area of about 450 sq. km thereby making it the second largest brackish water lagoon in India next to Chilika Lake. The lake was declared as a bird sanctuary by the Andhra Pradesh Forest Department in the year 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 Sri Harikota Island.

The major groups of birds wintering in Pulicat Lake are ducks, terns, gulls flamingos and waders. Over 200,000 waterbirds were recorded during 1988 and 1989 at Pulicat. Out of them, over 30,000 were Greater Flamingo. Other dominant waders were Little Stint, Curlew Sandpiper and Lesser Sand Plover, Black-tailed Godwit and Ruff. A total of 88 species of birds has been recorded from Pulicat Bird Sanctuary during a BNHS Study (Rao and Mohapatra 1993). The population data available for the last two decades showed the declining trend (Table 4).

### Gulf of Mannar

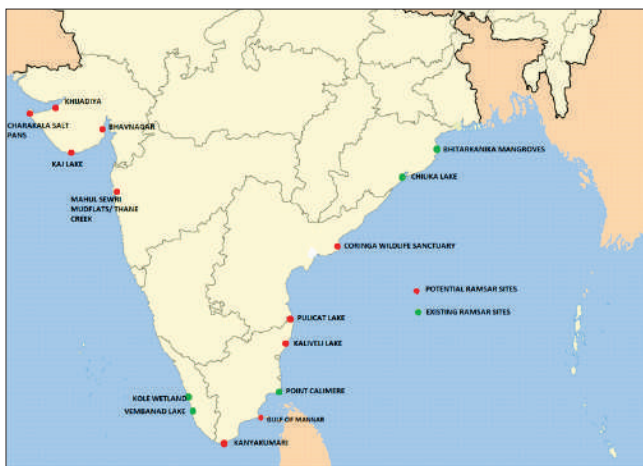
At distances ranging from 5-8 km from the mainland, the Gulf of Mannar has a chain of islands



running roughly parallel to the coast. These islands are mainly of coral origin probably of the nature of fringing reefs. Among the islands Manali Island, Hare Island, and Dhanuskodi Lagoon of Rameshwaram are the major bird congregation areas along the Gulf of Mannar. It supported overall 50,000 coastal birds (waders, terns and other wading birds) including 13,000 flamingos during 1980s (Balachandran, 1990 and 1995) and it ranks third as an important wintering ground for Greater Flamingos *Phoenicopterus ruber* along the East Coast. Its proximity to Sri Lanka makes Mandapam as an important site in the Central Asian Flyway for migratory birds. Among the waders, the Lesser Sand Plover *Charadrius mongolus*, Curlew Sandpiper and Little Stint were the most abundant. Red Knot *Calidris canutus* and Great Knot *Calidris tenuirostris* are the regular winter visitor in small numbers, and these species are not vagrant species as reported previously.

### 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. Chilika is also renowned for the vast numbers of migratory waterfowl congregating in India



Existing and Potential Coastal Ramsar sites in India

(Scott 1989). A total of 226 species of both migratory and resident birds, including nine threatened species (Balachandran *et al.* 2005), have been recorded here.

The various habitats include marshes, mudflats, freshwater pools and areas of open water with varying

depths and salinity. A submergible island (Nalabana Island) with extensive mudflats (c. 19 sq.km), exposed only during the dry season (December to May), attracts over 300,000 waterbirds. The island supports the largest concentrations of waders in the lake, and a few thousands of flamingos.

Altogether the lake support over 800,000 waterbirds predominantly ducks. The commonest duck species for which the population exceeds over 100,000 are the Northern Pintail, Gadwall, Northern Shoveller, Eurasian Wigeon, and tufted duck. The numbers exceeded over 50,000 in three duck species namely Garganey, Common Teal, Common Poacard. In Waders, the Black-tailed Godwit is the only species for which the numbers exceeded over 50,000.

Table 1. Population trend of common waders at Point Calimere

Species Name	1980s	1990s	2000-2008
Curlew Sandpiper	>1,50,000	> 80,000	< 25,000
Little Stint	> 2,00,000	> 1,00,000	< 30,000
Lesser Sand Plover	> 1,00,000	> 75,000	< 40,000
Ruff	> 1,00,000	30,000	< 10,000
Black-tailed Godwit	> 50,000	> 40,000	>15,000
Black-winged Stilt	> 15,000	3,000	>1,000
Pied Avocet	> 7,000	> 500	< 100

### Decline of Migratory Waterbirds

In east coast of India, due to the degradation of wetlands habitats, populations of various waterbird species are dwindling in their traditional wintering sites. One of the greatest threats to the sustainability of the coastal wetlands and the survival of the flora and fauna, which depend on this unique habitat, is human disturbance to the shoreline. In India, due to the degradation of wetlands habitats, populations of various waterbird species are dwindling in their traditional overwintering sites.

The decline in Greater Flamingo numbers was well pronounced since 1990s, as the numbers between 2000 and 2007 never exceeded 5500. However, the peak





Table 2. Population trend of common waders at Gulf of Mannar

Species Name	1985-1988	1993	2001	2005-2007
Curlew Sandpiper	>10,000	>8,000	>5,000	< 1,000
Little Stint	>8,000	>3,000	>2,000	< 1000
Lesser Sand Plover	>13,000	>8,000	>4,000	< 2,500
Crab Plover	900	150	65	< 20
Eurasian Curlew	450	120	67	55
Grey Plover	970	230	180	100
Great Knot	350	140	450	< 200
Red Knot	300	85	90	< 50
Common Greenshank	250	>3,500	180	< 50

Table 3. Population of trends of waterbirds in major coastal wetlands

Site	1980s	1990s	2000	2011-12	Major groups
Point Calimere	10,00000	6,00000	2,50000	4,50000	Shorebirds, ducks, Gulls, terns, flamingos, storks, egrets and herons, ibises, spoonbill
Pulicat	3,00000	2,00000	1,50,000	1,50,000	Shorebirds,, Ducks, flamingos, Gulls, terns, egrets and herons
Chilika	12,00000	6,00000	8,00000	9,00000	Ducks, Shorebirds,, Gulls, terns, flamingos, storks, pelicans egrets and herons
Bhiterkanika	-	-	1,50,000	150,000	Ducks, shorebirds, storks egrets and herons.
Kaliveli	50,000	35,000	15,000	15,000	Shorebirds, Pelican, Ducks, terns, flamingos, Gulls, egrets and herons
Sundarbans			40,000	-	Shorebirds,, Ducks, terns, Gulls, egrets and herons
Gulf of Mannar	75,000	50000			Gulls, terns, flamingo, shorebirds.
Saltpans of Kanyakumari	25,000	25,000	30,000		Terns, ducks, storks, pelicans, ibises, flamingo, egrets and herons

numbers are seen only for a short duration of two months (January - February). It is interesting to note that in the 1980s and early 1990s two to three thousand Greater Flamingos were regularly observed during the summer also. For last three years, during summer the number is less than 50.

Among the migratory waterbird groups, the decline in numbers for waders is drastic and worldwide which varied from 60 to 80% for most of the species during the last three decades. The similar kind of decline also reported from the major wetlands like Point Calimere, Gulf of Mannar and Pulicat.



### Population estimates of waders in Chilika

Common Name	2001-2005	2005-2010	2010-2012
Black-tailed Godwit	32000-55000	44000-60,000	55,000-65000
Curlew Sandpiper	25,000-54000	12000-20,000	5000-8000
Lesser Sand Plover	40,000-45,000	11,000-29,000	8,000-14,000
Ruff	3,000-10,000	1500-3200	4,000-6000
Marsh Sandpiper	2,100-12000	2,300-4,000	3000-3500
Grey Plover	200-2500	400-1600	350-850

The maximum number of Greater Flamingo recorded during the three years study undertaken between 1985 and 1988 at Gulf of Mannar was 14,000, 5,000 and 7,000 respectively (Balachandran, 1990). The regular fortnightly bird population monitoring carried out between August 2005 and April 2006 from the same area has recorded the maximum of 5500.

The Greater Flamingo was an abundant winter visitor to Nalabana Island, arriving in August and departing in July. A dramatic decline (from 5000 to 150) during 2003-2004 was observed in the Greater Flamingo numbers from the stable peak numbers of the previous two years. In 2004-2005, though an increase in numbers was noticed, the peak never matched that of the first two years.

### Reasons for the population decline in waders in Point Calimere

The extension of salt based industries; the diminishing rainfall and disturbances caused by fishermen have altered the habitats

### Depletion of ground water and salt intrusion

The ground water extraction has increased manifold to cater the needs of the floating fisherfolk population, which is on the increase at Point Calimere. The ground water recharge is inadequate due to the consistently diminishing rainfall in the area over the last two decades. The ingress of seawater into larger areas of the swamp affected by the strong summer wind, made the swamp not only habitable for the waterbirds

### Population trend of Greater Flamingo

Species Name	1980s	1990s	2000-2008
Point Calimere	> 40,000	> 10,000	1,500-5,500
Pulicat	> 30,000	> 8,000	3,000-15,000
Dhanushkodi Lagoon	>14,000	> 7,000	3000 - 5,500
Chilika Lake	7,000	6,500	150 - 5000

during summer, but also helped to prevent the mudflats from drying up completely.

### Conclusion

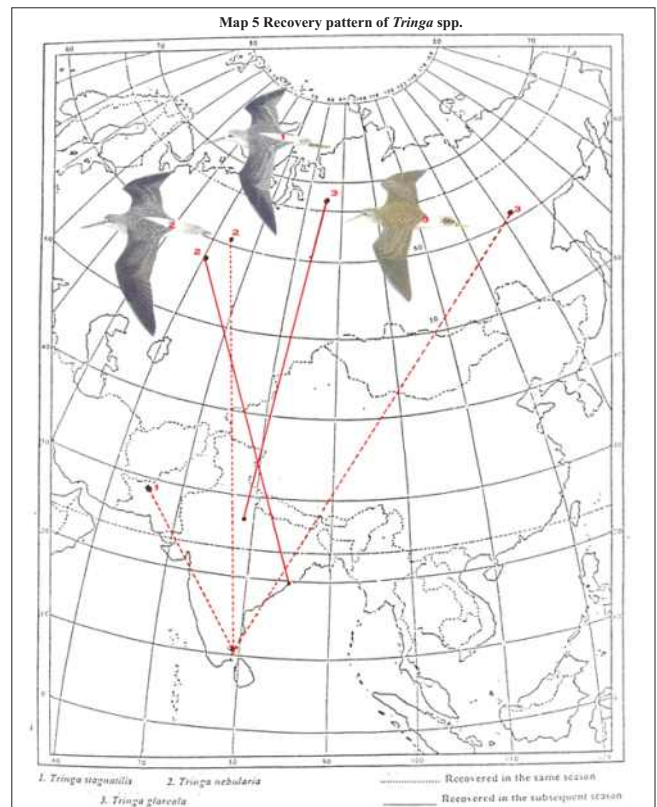
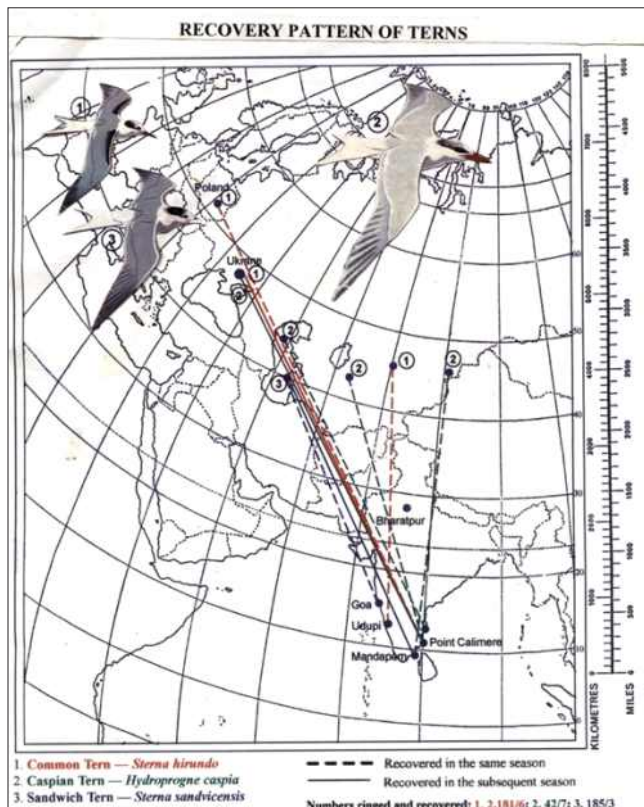
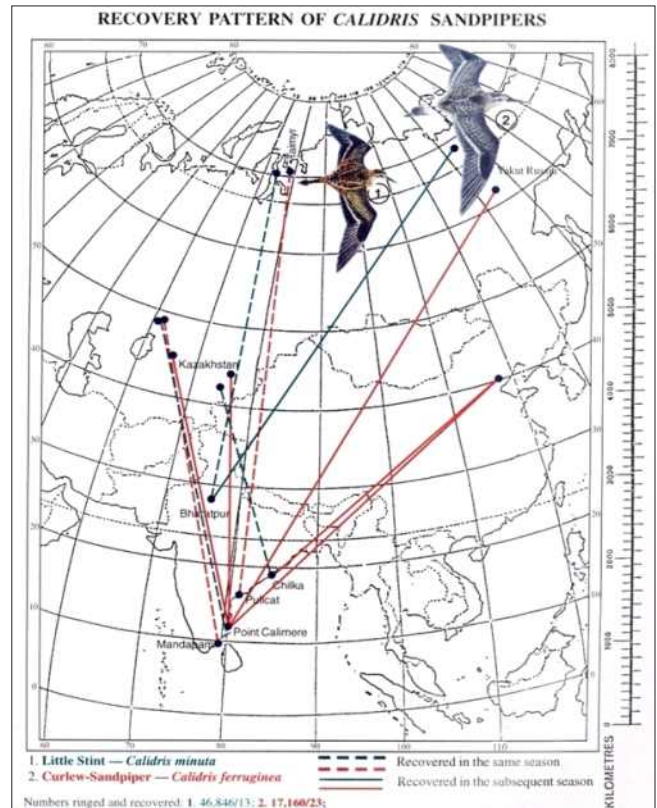
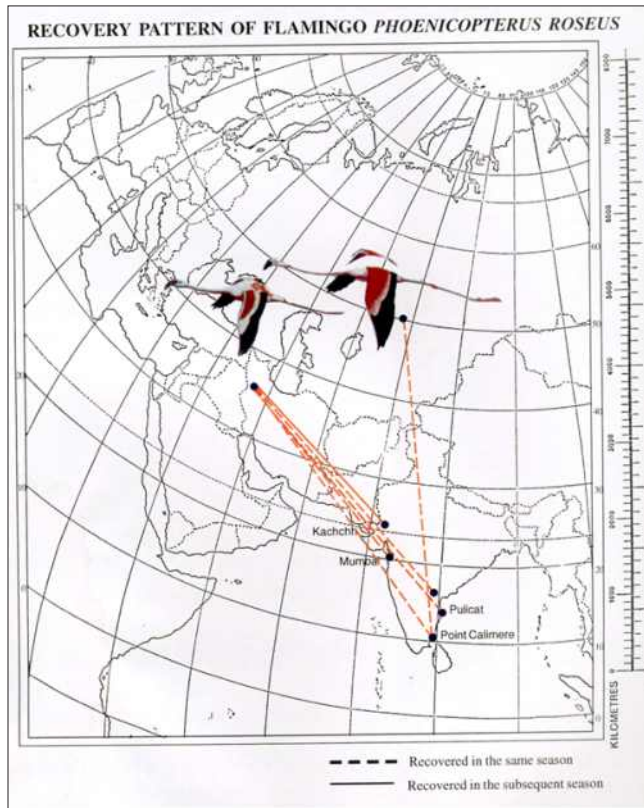
The migratory waterbirds connect continents and countries and are therefore excellent environmental indicators at both global and local scales. There are indications of serious problems along the Flyway Reduction in overall flyway population for the coastal birds was evident as their numbers are on the decline globally. Most of the threats are either at the wintering and staging/refueling sites whereas threats (natural and human-induced) at the breeding grounds are negligible due to the inaccessibility. Hence, habitat degradation complemented by poaching (at unprotected buffer zone) form the major threats during their migration journeys.

Coastal birds, with their range of specialized feeding and migration ecologies are sensitive indicators of change in their environments. Knowledge of the status of coastal bird populations can provide important information on the wider environment, including that caused by climate changes as well as from habitat loss,





Coastal birds migratory routes







### Lesser Crested Tern Migratory routes Through Ringing Recoveries



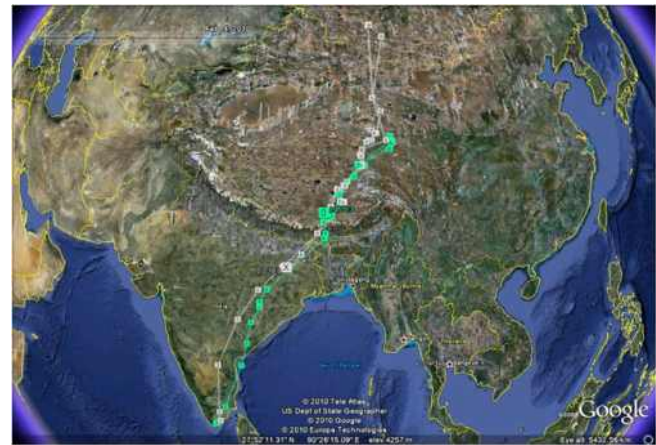
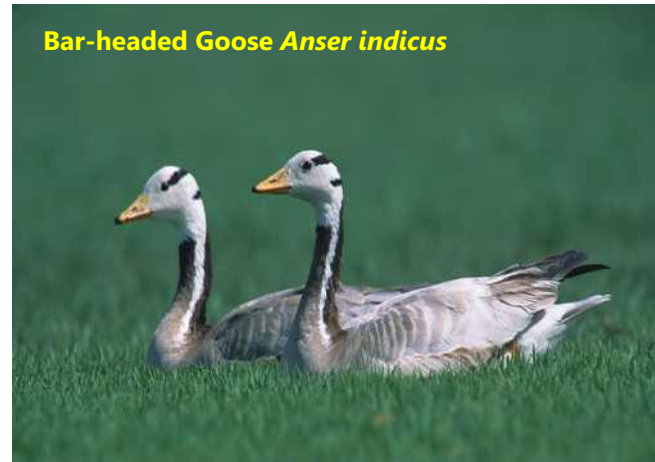
harmful industrial developments, unregulated agricultural practices, human disturbance, climatic and environmental changes, they are becoming scarce at many key sites.

### Need for the conservation of coastal birds and their habitats

#### The role of Indian coastal wetlands for the maintenance of global waterbird population

As many as 89% of all monitored populations of Arctic breeding shorebirds in northeastern Russia now show decline (Syroechkovskiy 2012).

### Migratory Routes of Bar-headed Goose through Satellite Tracking



Coastal wetlands in India provide winter refuge for migratory waterfowl from different parts of the world such as north, central and west Asia, Europe and Mediterranean regions. Birds migrating from Arctic to east Africa use the coastal wetlands of northwestern India as a stopover sites. Coastal wetlands of Gulf of Kachch and the intertidal zones of Saurashtra coast, and Gulf of Mannar are the favourite wintering haunts for the Crab Plover an uncommon and restricted range species which breeds in Iran and Persian Gulf. These two wetlands also support large population of Lesser Crested and Large Crested *Sterna bergii* terns, which migrate from Persian Gulf to India. All the coastal wetlands of India are frequented by arctic breeding shorebirds such as Curlew Sandpiper, Little Stint, Ruddy



Turnstone *Arenaria interpres* and Grey Plover *Pluvialis squatarola* and temperate breeders such as Common Greenshank *Tringa nebularia*, Redshank *Tinga totanus*, Lesser Sand Plover and Kentish Plover.

Among the ducks the Arctic breeding species such as Northern Pintail, Garganey *Anas querquedula* and Northern Shoveller *Anas clypeata* Eurasian Wigeon *Anas Penelope* migrate to the coastal wetlands up to the southernmost part of India.

Coastal wetlands in India also provide habitat for several federally listed threatened and near threatened bird species. The threatened species, namely Spotted Greenshank *Tringa guttifer*, Spoonbill Sandpiper *Calidris pygmeus*, Dalmatian Pelican *Pelecanus crispus*, Spot-billed Pelican *Pelecanus philippensis*, Pallas's Fish-eagle *Haliaeetus albicilla*, Wood Snipe *Gallinago nemoricola* and Indian Skimmer *Rynchops albicollis* and the near threatened Darter *Anhinga melanogaster*, Painted Stork *Mycteria leucocephala*, Lesser Flamingo *Phoenicopterus minor*, Asian Dowitcher *Limnodromus semipalmatus*, Beach Stone-Plover *Esacus magnirostris* and Black-bellied Tern *Sterna acuticauda* are some of the important species, which are found in the coastal wetlands.

The body mass (weight) gained at the wintering and staging areas generally help the migratory birds to breed successfully at their northern breeding grounds. In India, most of the freshwater bodies dry up during the spring passage (return migration to their breeding grounds in March and April), and hence, migratory birds depend only on the coastal wetlands to build up their body mass.

## Population decline of some common waders

Over one million migratory waders and ducks were reported from Point Calimere during the 1980s which declined to less than 150,000 in the late 1990s. However, in recent years the population goes upto

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3,50,000 which may be due to the shifting of population from other coastal wetlands which traditionally supported more coastal birds.

It is clear that different species utilise different suites of sites during northbound and southbound migration. Therefore, protection of only the best sites will not provide an adequate site network for all migratory species and broader protection of as many sites as possible is required.

## Management recommendations

### Protect coastal bird habitats

- Enhance and maintain coastal bird habitats,
- Avoid further degradation or loss of critical wintering and staging sites,
- Restrict coastal development to areas where its impact on coastal bird habitat is minimal.

### Community education

- Educate the community about coastal birds conservation,
- Collaborate with the primary stakeholders (wildlife division) in the delivery of key messages about coastal birds conservation.
- Encourage establishment of eco-tourism programs that provide coastal bird education and interpretation.

### Research and monitoring

- Monitoring population of coastal birds in key wintering and staging sites.
- Collaboration with relevant organisations (BNHS, ZSI, SACON etc).
- Investigate the use of coastal birds as bio-indicators in ecosystem health assessment.
- Encourage research on shorebird migration and conservation

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