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APRIL-JUNE 2017

The Central Asian Flyway

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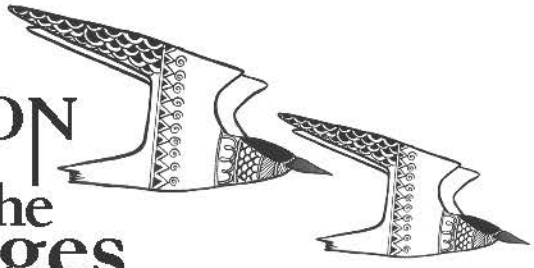


DEEPAK APTE
S. BALACHANDRAN
P. SATHIYASELVAM

Bird migration, one of the most fascinating aspects of the avian world, has captured the imagination of humankind for centuries. When winter sets over the Arctic region and the Himalaya, millions of migratory birds begin an arduous southward journey of thousands of kilometres to warmer climes in tropical countries, one of which is India.

The classic method to study bird migration was through bird ringing/banding. In India, BNHS has been the pioneering organization studying bird migration, and for the last nine decades we have been painstakingly ringing and tagging birds. Our first bird ringing programme was undertaken way back in 1927. Till date, BNHS has ringed over 7,00,000 birds in India, resulting in recoveries from 29 countries, spanning five continents. The data generated from these ringing operations has contributed significantly to the understanding of the origins and migration routes of winter migrants of the Indian subcontinent. It has helped mark the boundaries of the Central Asian Flyway (CAF), which ranges from Arctic Russia to the Indian subcontinent, to delineate it from the boundaries of other flyways. The recoveries reveal the significance of traditional sites in India and Eurasia that are crucial for migratory birds to complete their annual cycle within the CAF. The data also provides information on the connectivity between stop-over and wintering sites that are important in strategizing conservation activities globally.

To highlight the findings of bird migration studies over the decades, BNHS will soon publish INDIAN BIRD MIGRATION ATLAS, a compendium of ringing recovery data of the past 90 years. This publication, besides its contribution to Indian Ornithology, will provide ornithologists and amateur birders information on the origins, migration routes, as well as stop-over and wintering sites of waterbirds migrating into the Indian subcontinent. Such information is essential to take management measures for protecting migratory birds and their habitats in the CAF. We are working to release the book during the Convention on the Conservation of Migratory Species of Wild Animals (CMS) Conference of Parties (COP) meeting in Philippines in October 2017.

The advancement of technology, including satellite telemetry applications, has the potential to provide more precise information on the movement pattern of bird species. There is an urgent need to undertake these studies on a larger scale, especially since they can help fine tune conservation strategies for migrant birds. A combination of traditional bird ringing and satellite telemetry data can provide more precise policy inputs for migratory bird conservation. BNHS aims to develop a 'Decision Support Tool' for bird flyways within the next three years as mandated by Ministry of Environment, Forest and Climate Change (MoEFCC). This is especially binding on India as it is a signatory to the Convention on the Conservation of

Migratory Species of Wild Animals (CMS), by which India has pledged to protect migratory species and their habitats.

Climate Change has added new dimensions to bird migration. The consequences of climate change not only influence migratory movements but also destroy traditional wintering sites. We are already seeing erratic patterns in some species, both in flock sizes and movements. Thus, it is all the more important to work on the CAF and the sites that are vital wintering sites in India. The body of scientific work done by BNHS is proving crucial for developing conservation strategies for wetlands, both inland and coastal, that are most vital for CAF. The working draft recently prepared by BNHS identifying 20 important wetlands and 28 sites within 9 wetland clusters across 14 states of India was appreciated at the MoEFCC, and will be used to undertake regional consultation and to develop site specific action plans. More specifically, this initiative will help to abide by the CAF Action Plan (Actions 3 to 5).

The BNHS Wetlands Programme aims to undertake sharply focused advocacy work. We are diversifying our bird ringing programme, and we have already received necessary permissions from most of the coastal states of India, some of which have identified BNHS as the nodal agency for bird ringing in their states.

Compared to the other flyways of the world, designing and implementation of management strategies in CAF has been a challenge, as this flyway extends along regions that include highly populated, polluted, and rapidly developing nations. Although the CAF Action Plan has been framed, there is insignificant progress among the Range States (the countries that come under the flyway). Since one-third of the 30 range states in the CAF are among the world's least developed countries, there are numerous practical difficulties that need to be addressed for the successful implementation of the Action Plan. BNHS has been working with the MoEFCC for successful implementation of the actions envisaged in the CAF Action Plan, and this has been recognized by MoEFCC in the CAF country reports. The implementation of the CAF Action Plan in India could also be of help to replicate the conservation strategies in all other CAF range countries.

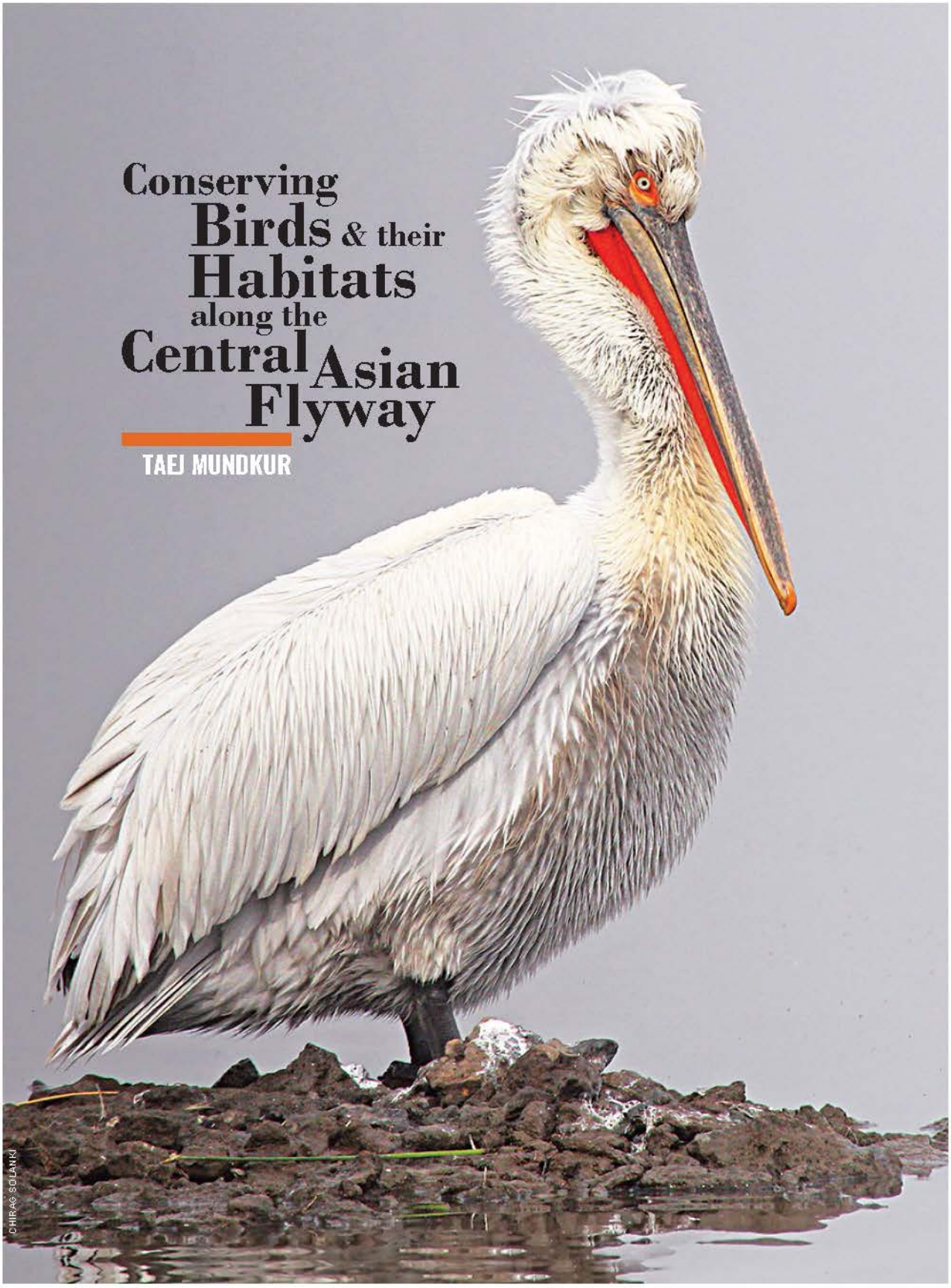
BNHS has been participating in various CAF and CMS meetings, workshops, and scientific committee meetings and has been actively involved in the framing of science-based action plans for the conservation of migratory birds and their habitats. BNHS participated in a meeting to conclude and endorse the CAF Action Plan conducted in New Delhi from June 10–12, 2005. BNHS also played a crucial role in formulating single species action plans for globally threatened species, like Spoon-billed Sandpiper and Great Knot. Many of the BNHS's flagship programmes are extremely helpful for addressing flyway-level conservation issues. These include our nine-decade bird migration studies and our two-decade Important Bird Areas (IBA) programme.

This special issue of *Hornbill* aims to provide readers with information on the CAF, and on the CAF Action Plan and its sister agreements, implementation strategies and issues to be addressed by the implementing agencies, and to garner national and international cooperation for successful implementation of the CAF Action Plan and its sister agreements. It is also an effort to reach a wider constituency of scientists, institutions, and individuals.

We also aim to use Citizen Science to document bird migration. To illustrate, very recently in June 2017, one of our members sent some images of Curlew Sandpiper with rings and colour flags from Navi Mumbai. These were birds ringed by BNHS in 2014 at Sewri in Mumbai. All the birds were in full breeding plumage. The images provided valuable evidence that species like Curlew Sandpiper are not only wintering but oversummering at traditional sites. Such information is extremely vital for conservation. Incidentally, the Mangrove Foundation of Maharashtra has extended BNHS financial support to ring migratory birds and study the coastal wetlands of Maharashtra. We appeal to our members and photographers to look for birds with rings or other tags and send us their images with mention of the location and date of sighting.

Conserving Birds & their Habitats along the Central Asian Flyway

TAEJ MUNDKUR



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Taej Mundkur is currently Chairman, CMS Flyways Working Group Wetlands International.

The beauty, calls, and spectacle of cranes, swans, geese, and many other birds have been interwoven into traditional art, music, and dance across cultures in the world. Besides amazing us with their variety of forms, colours, and interesting behaviours, birds play a range of complex and vital but lesser known roles in the ecosystem. These services range from being predators and herbivores that serve to maintain the diversity of other life forms, providing meat, feathers, and eggs for predators, controlling pests, as pollinators and dispersers of seeds, and small invertebrates. They also serve as indicators of ecological conditions or outbreaks of disease.

The warm climate and rich food resources of the Indian subcontinent's coastal and inland wetlands, grasslands, forests, and vast agricultural lands support an amazing diversity and abundance of birds. In addition to resident species or those that move around locally, the Subcontinent provides an attractive draw to a multitude of bird species that nest across northern and central Eurasia, and each year need to escape the freezing conditions of the northern winter.

Viewed from space, the Indian subcontinent appears as a large cone-shaped land mass attached to the vast expanse of Eurasia. To reach their non-breeding (northern wintering) grounds in the Indian landmass, migratory birds are challenged by huge geographic barriers – the formidable Hindu Kush and Himalayan ranges, western Tien Shan range and Altai mountains, and the vast frozen Tibetan Plateau, that are contiguous to the deserts and plains of Central Asia and western China. Migratory birds adopt different routes and survival strategies to deal with these topographical challenges. Some fly around the mountains, others funnel through narrow mountain passes, but some like the Bar-headed Goose *Anser indicus* and Demoiselle Crane *Grus virgo* just fly over the Himalaya and are known to reach the height of the summit of Mount Everest!

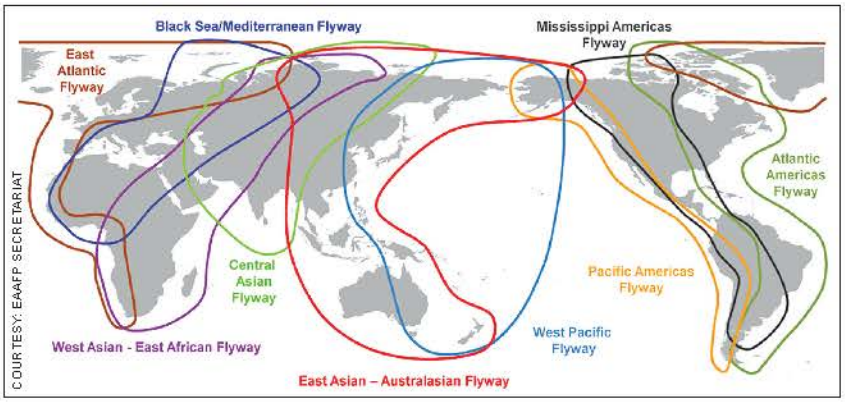
To conserve these amazing creatures, ornithologists and conservationists have delineated the routes the birds take as "flyways" and have helped to formulate international policies and frameworks for governments and civil society to work together to protect birds and their habitats along the flyways. These flyways can be defined as "the entire range of a migratory bird species (or groups of related species or distinct populations of a single species) through which it moves on an annual basis from the breeding grounds to non-breeding areas, including intermediate crucial resting and feeding places, as well as the area within which the birds migrate".

Given the large size of the country and wide diversity of habitats, it should come as no surprise that India can "lay claim" to several flyways. India lies at the heart of the Central Asian Flyway (CAF), which is one of the nine

◀ The largest among the eight species of pelicans, the Dalmatian Pelican is also one of the heaviest flying birds. A graceful flyer, this heavy bird can fly up to a height of 3,000 metres.

RAMSAR CONVENTION

The global Convention on Wetlands of International Importance, adopted at Ramsar (Iran) in February 1971, popularly known as Ramsar Convention, aims to preserve and protect wetland ecosystems together with dependent waterbird species and ensure the wise use of wetlands for the benefit of people. The Ramsar Convention defines guidelines for the formulation and implementation of wetland polices that help in identifying national inventories of wetlands, determining priorities for each site, undertaking impact studies of projects which may affect wetlands, regulating the use of wild fauna and flora to avoid over-exploitation, and drafting legislations that ensure wetland conservation. Sites given the status of Ramsar Sites are deemed as wetlands of international importance. India signed this Convention in 1982 and 26 wetlands of India have been declared as Ramsar Sites, while 100s more qualify and urgently need improved management. For list, please check the link http://www.wiienvis.nic.in/Database/ramsar_wetland_sites_8224.aspx or http://www.ramsar.org.



The Central Asian Flyway (CAF), the shortest flyway, is one of the nine global waterbird flyways. It covers a large continental area of Eurasia bound by the Arctic and Indian oceans and the associated chains

CONVENTION ON THE CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS (CMS)

The CMS, also known as the Bonn Convention, came into force in 1983. Its fundamental objective is to protect migratory species (including, wild birds, land and aquatic mammals, reptiles, fishes, and insects) that cross one or more borders, where conservation deficiencies in one state will affect the measures undertaken by other range states. Under the Convention, migratory species are defined as those that periodically and predictably cross one or more jurisdictional boundaries. The Convention also facilitates international agreements between states for the protection and management of migratory species that have an unfavourable conservation status and would benefit from international cooperation. Agreements are the main tools for implementing the Convention and are more specific and focused than the Convention itself. States need not be party to the Convention itself to sign a particular agreement. CMS is governed by the Conference of the Parties (COP), which holds an international meetings once every three years. Actions for conservation of migratory birds are prioritized under a global Programme of Work on Migratory Birds and Flyways 2014–2023 with actions specified for the CAF. In 1983, India acceded to this Convention as well as several agreements since then, for Siberian Crane, birds of prey (raptors), dugong and marine turtles. For details, see: http://www.cms.int/

major global flyways. The CAF covers a large continental area of Eurasia bound by the ice-cold Arctic Ocean and warm Indian Ocean. It comprises several important migration routes of birds, most of which extend from the northernmost breeding grounds in Siberia to the southernmost non-breeding grounds in West and South Asia, east to Myanmar and south to the Maldives and Chagos atolls, spanning about 30 countries and territories.

For several species that breed in northern and eastern Eurasia, their annual migrations take them to the Andaman & Nicobar Islands, Southeast Asia, and Australasia, via more eastern routes across the Himalaya and the plains of north-eastern India and Bangladesh. These birds are generally recognized to be part of the East Asian-Australasian Flyway system. Many others that breed in northern Asia migrate to Africa and only stop in northwest India and form part of the Asian-East African flyway. For a few species like the Amur Falcon *Falco amurensis* that amass in astounding numbers in October each year in Nagaland, the migration story is quite different. These species are among a select few (including the Common Cuckoo *Cuculus canorus*) that amazingly migrate from far north-eastern China, diagonally across Asia to Africa, with the Indian subcontinent providing a crucial staging ground and spring board before they fly across the Arabian Sea.

Across the length and breadth of these migratory routes, birds are increasingly challenged by many man-made threats as they need to fight for space and food amidst an ever-growing human population. These threats include increasing degradation, destruction, and loss of crucial links along the chain of critically important habitats and landscapes that provide a much needed "ecological network" for birds to nest, feed, and rest during migration and at non-breeding sites at the terminus of their annual migration. The threats range from urban, port, and industrial developments that replace intertidal mudflats and mangroves, damming and canalization of rivers and floodplains, to conversion of grasslands, wetlands, and forests to support urban and industrial expansion. Agricultural intensification with increased use of toxic pesticides and agrochemicals, and growing pollution of water and land through chemical wastes and sewage affect birds negatively, or affect the food chains on which they rely. Additionally, thermal,

nuclear, as well as renewable energy generation schemes (hydropower, wind, and solar farms) and their powerlines, especially located across key migratory "bottlenecks", can take a heavy toll on migratory birds (see pp. 24–31). And not least is the continued legal and illegal capture/killing for food, sport, and trade of many birds (see pp. 32–39). Finally, global climate change brings with it a range of factors that influence bird migration patterns and affect their survival. These include loss of intertidal habitat through rising sea levels, changing weather conditions, including drought and floods, leading to degradation and loss of inland wetlands and forests, as well as storms that can affect migration.

In the last few decades, India has seen a rapid decline and the near extinction of many of its birds, with 88 species currently being listed in the IUCN global Red List of Threatened Birds. This includes the Great Indian Bustard *Ardeotis nigriceps*, Bengal Florican *Houbaropsis bengalensis*, Indian Vulture *Gyps indicus*, Red-headed

CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

The Convention on Biological Diversity (CBD) was adopted in Nairobi (Kenya), in 1992 and came into force in 1993. More than 190 countries/parties, including India, have signed this Convention. The objectives of the Convention are the conservation of biological diversity, the sustainable use of natural resources, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The primary approach of the Convention is conservation in the wild. Parties have to identify components of biodiversity, such as threatened species, and ecosystems and habitats containing high diversity, large numbers of endemic species, or wilderness areas. Article 8 of the Convention urges Parties to establish a system of protected areas, to restore degraded ecosystems, to maintain viable populations of species in natural surroundings, and to develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species. The main tools for the implementation of CBD at the national level are the National Biodiversity Strategies and Action Plans (NBSAPs). CBD is governed by the Conference of the Parties (COP), which holds biennial international meetings to discuss wide-ranging issues on biodiversity conservation, and sustainable use and sharing. For details, see http://www.cbd.int

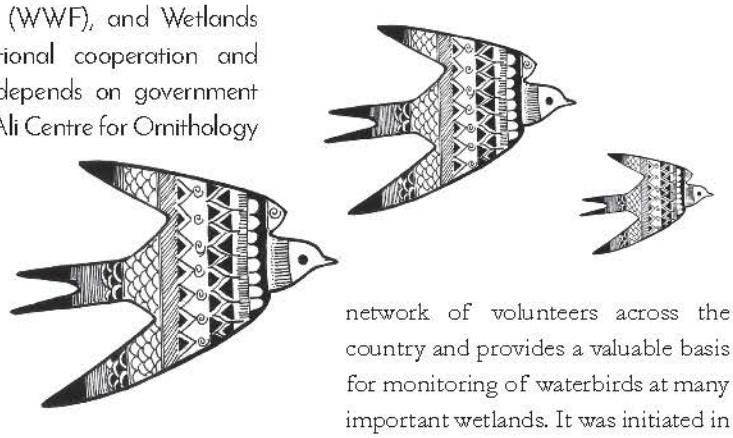
▼ The Amur Falcon is well-known for making the arduous journey from south-eastern Siberia and northern China to South Africa every year. It has one of the longest migration routes of all birds of prey – up to 22,000 km a year – often flying through the night

CAF ACTION PLAN FOR MIGRATORY WATERBIRDS AND THEIR HABITATS

The CMS Action Plan to conserve migratory waterbirds and their habitats in the Central Asian Flyway (CAF) was launched in 2006. This follows agreement reached on priorities and actions in an international meeting of flyway countries that was hosted by the Ministry of Environment, Forest and Climate Change, in New Delhi, in 2005.

The Action Plan sets the agenda for enhanced regional environmental cooperation among the 30 CAF countries (officially called Range States) to promote the conservation of migratory waterbirds and their habitats. It contains provisions for species and habitat conservation, single species action plans, and emergency measures. Priority issues for conservation of migratory waterbirds and their habitats include the lack of information on population status and trends of waterbirds, information on precise migration routes of populations, limited capacity of local agencies and communities to monitor and manage wetlands, and the need to balance the needs of conservation against the needs of local people.

The Action Plan provides the basis for countries to undertake individual and coordinated region-wide activities. It builds on and complements actions that are being undertaken by national governments to promote conservation. In addition, at flyway level, it builds on and complements programmes and actions that are being undertaken by various international conventions (including CMS, AEWA, Ramsar, and CBD), development agencies (including UNEP, UNDP, World Bank, and Asian Development Bank), and international NGOs, including BirdLife International, International Crane Foundation (ICF), World Conservation Union (IUCN), World Wide Fund for Nature (WWF), and Wetlands International, to promote regional and national cooperation and conservation action. At the national level, it depends on government agencies working closely with universities, Sálim Ali Centre for Ornithology and Natural History (SACON), Wildlife Institute of India, NGOs such as the BNHS, and many others to implement actions. For details, see: http://www.cms.int/en/legalinstrument/central-asian-flyway.



Vulture *Sarcogyps calvus*, Slender-billed Vulture *Gyps tenuirostris*, White-rumped Vulture *Gyps bengalensis*, Black-bellied Tern *Sterna acuticauda*, Indian Skimmer *Rynchops albicollis*, and White-bellied Heron *Ardea insignis*. The plight of many of its long distance international migrants is also bleak, with the loss of the enigmatic Siberian Crane *Leucogeranus leucogeranus* that no longer graces Keoladeo Ghana National Park in Bharatpur, and the rapid decline of the Spoon-billed Sandpiper *Calidris pygmaea*, among others. There may be fewer than 200 pairs of this tiny sandpiper left worldwide and in recent years it is only rarely reliably reported in India. On the positive side, there have been effective actions to stop the large-scale killing of Amur Falcon in Nagaland, taken by community, government, religious leaders, and NGOs working together, and this bodes well for the future of this amazing migrant. Hopefully, this provides inspiration for reversing the declines of many others.

Conservation of birds requires reliable and up-to-date information on population sizes and trends to assist in prioritization of species for conservation action, and help assessing the impact of conservation efforts. However, information on the status and trends of most migratory bird populations in the CAF area is limited and outdated and in urgent need of updating. One mechanism for collecting information on their distribution has been the Asian Waterbird Census (AWC). This annual large-scale monitoring programme is being implemented by an extensive network of volunteers across the country and provides a valuable basis for monitoring of waterbirds at many important wetlands. It was initiated in India in 1987 and coordinated jointly by Wetlands International and the BNHS. Such monitoring programmes need to be enhanced and gaps filled to ensure that all important wetlands are adequately monitored. Parallel schemes to monitor all other bird groups are required to support science-

With a global population of less than 500 individuals, Spoon-billed Sandpiper is one of the most endangered migratory waterbirds on the planet. It breeds in the coastal tundra region in far eastern Russia, makes important stops to rest and feeds on the mudflats along the Chinese and Korean coasts of the Yellow Sea, and spends the non-breeding period in South and Southeast Asia, covering an impressive distance of 8,000 km along part of the East Asian-Australasian Flyway

based conservation actions, and some of these needs are being addressed by programmes developed by BNHS, Indian Bird Conservation Network (IBCN), and others.

Secondly, much more research on identification of precise migratory routes and strategies used by species and to understand changes in environmental conditions and their links to human development activities is needed to improve the management of these species and their habitats. Pioneering work has been undertaken by the BNHS, Wildlife Institute of India, and many groups in other countries along the flyways, through the use of colour flags and satellite tracking of waterbirds and raptors, that allow for more precise information on annual movements of individual birds. This builds on decades of bird ringing by the BNHS that has provided valuable baseline information on several species. However, more effort is urgently needed to promote collection and analysis of data at the flyway and national levels to provide the basis for improving our knowledge and prioritization of sites for conservation, and to respond to ongoing changes in the environment.

A suite of international intergovernmental cooperation mechanisms and legal instruments has been developed over the last few decades, which provide a strong basis for implementation of conservation measures for migratory birds and sustainable management of their habitats. This is largely established under the Convention on Migratory Species of Wild Animals (CMS) and links to shared priorities of the Ramsar Convention and the Convention on Biological Diversity (CBD), and prioritized under the global *Programme of Work on Migratory Birds and Flyways 2014–2023*.

India and the other CAF countries are well placed to take advantage of these existing instruments and programmes and, where necessary, to develop others to deal with new challenges. To ensure their long-term success, their implementation will require national multi-sectoral planning involving government and the private sector, as well as local involvement to ensure that the needs of local people are taken into consideration.

Three multi-species international plans, including the CAF Action Plan for Migratory Waterbirds and their Habitats, the Memorandum of Agreement for Migratory Birds of Prey (raptors), and the African-Eurasian Migratory Landbirds Action Plan, cover a wide range of migratory species of importance to the Indian region. In addition, targeted international single-species action plans prioritize conservation measures for at least 12 threatened species, including Siberian Crane, Black-necked Crane *Grus nigricollis*, Saker Falcon *Falco cherrug* (which was recently found to breed in Ladakh), Eurasian Spoonbill *Platalea leucorodia*, Lesser Flamingo *Phoeniconaias minor*, Macqueen's Bustard *Chlamydotis macqueenii*, White-headed Duck *Oxyura leucocephala*, Ferruginous Duck *Aythya nyroca*, Sociable Lapwing *Vanellus*

gregarius, and Spoon-billed Sandpiper. Action plans for the Critically Endangered Baer's Pochard *Aythya baeri*, that migrates to northeast India from China, and the Vulnerable Dalmatian Pelican *Pelecanus crispus* that migrates from Kazakhstan to north-west India are currently being finalized.

To promote the conservation of important sites used by migratory bird species, India and other countries along the flyway have developed and are managing important sites, many of which are designated as national parks and sanctuaries, or afforded other local protected status, with some even listed internationally as Ramsar Sites and World Heritage Sites. For example, India has listed Chilika Lake, Vembanad Kol, and Harike wetland as Ramsar Sites, and the Sundarban National Park, significant parts of the Western Ghats, and Keoladeo Ghana National Park as World Heritage Sites. Additionally, India has joined other countries in Kazakhstan in 2007 to establish the *Western/Central Asian Site Network for Siberian Cranes and Other Waterbirds*, to focus attention on the special needs of improving the management of internationally important sites used by cranes and other waterbirds from the Arctic across to India, to ensure their connectivity. Improving management of these listed sites and other existing protected areas to meet the specific needs of migratory birds can provide a powerful basis for strengthening their conservation and should help to reverse the decline of some species.

Clearly, India has been actively involved in fostering flyway cooperation and has also organized inter-governmental meetings that have been critically important in developing and taking forward agreements and plans. This includes the comprehensive CAF Action Plan for migratory waterbirds and their habitats under the CMS that was hosted in Delhi by the Ministry of Environment, Forest and Climate Change and organized jointly by Wetlands International and Wildlife Institute of India in 2005. Many of these meetings have involved key stakeholders, including ministries of environment and forests of the main flyway countries, international NGOs, and conventions that foster an international partnership approach that is crucial to progress, development, and implementation of these flyway-wide plans.

Since then, India and other CAF countries as Parties to the CBD have adopted a revised and updated Strategic Plan for Biodiversity, including the now famous "Aichi Biodiversity Targets", for the 2011–2020 period in Aichi, Japan. This includes targets for implementing actions to conserve species (including migratory birds) and their habitats, links to achieving agreed priorities,

Despite having a wide distribution across the Himalaya and other high mountain ranges of central Asia, the Ibisbill is an enigmatic species because of its highly specialized habitat preference, of running streams and river beds round the year and is seldom seen in large flocks. An altitudinal migrant, it is found in higher reaches of the mountains up to 4,400 m where it breeds during the northern summer season while it may descend as low as 100 m in winters

Sanderling is one of the most widespread migratory shorebird species which breeds in the Arctic circle and spends the non-breeding period almost all over the world along sandy beaches and sometimes on inland lakes. Its peculiar habit of chasing the receding wave line, with characteristic "bicycling" action of its legs, make it an easy bird to sight

improving the status of biodiversity by safeguarding ecosystems, species, and genetic diversity, and reversing the decline of the most threatened species (Aichi Targets #11 and #12).

The conservation of biodiversity is not a stand-alone issue and strongly benefits from being integrated into the larger development debate. Governments worldwide have agreed on the 2030 Sustainable Development Goals (SDG), including goals that relate to conservation and sustainable use of marine resources for sustainable development (Target #14), protecting, restoring, and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, and halting and reversing land degradation and halting biodiversity loss (#15), and strengthening the means of implementation and to revitalize the global partnership for sustainable development (#17). These goals offer a renewed opportunity for new resources to be identified and mobilized in innovative ways through closer collaboration of government in partnership with corporates, academia, NGOs, and civil society to benefit conservation of migratory birds.

The upcoming meetings of governments of the CAF region and other flyways at the CMS Conference of Parties to be held in the Philippines in October 2017, and the Ramsar Conference of Parties in the United Arab Emirates in November 2018, provide important opportunities to set and achieve ambitious milestones to progress this internationally important agenda.

It is critically important that a mechanism to finalize an institutional framework for the CAF Action Plan is moved ahead, especially since an earlier call from CAF countries to extend the African Eurasian Waterbird Agreement (AEWA) to cover the southern CAF states has stalled. Only strong leadership by the main CAF countries to re-initiate an international dialogue to upgrade the CAF Waterbird Action Plan into a more functional and vibrant cooperation framework can achieve practical conservation outcomes for this flyway.

Within the CAF, India stands to gain the most from strengthened international cooperation frameworks and effective measures to protect its birds and habitats. Looking ahead, the country urgently needs to take a strong international lead and to work with other governments and key stakeholders to forge ahead, using the existing building blocks to rapidly promote implementation of prioritised actions and develop other initiatives. We need to ensure that birds can continue their amazing annual migrations from the Arctic to Kanyakumari and beyond and to serve as ambassadors for peace and international cooperation across the Subcontinent and the Central Asian Flyway for generations to come.

Conservation Perspectives of Migratory Birds: Challenges & the Way Forward for India

K. SIVAKUMAR

BNHS CHILIKA PROJECT

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The Central Asian Flyway (CAF) covers a large area of Eurasia between the Arctic and Indian Oceans. This flyway comprises several important migration routes of waterbirds, including the breeding grounds in the Russian Federation (Siberia) to the southernmost non-breeding grounds in West and South Asia. Geographically, the flyway region covers 30 countries.

CAF harbours at least 279 populations of 182 migratory waterbird species, which breed, migrate, and winter within the region (http://www.cms.int/en/legalinstrument/central-asian-flyway). Many waterbird populations are declining rapidly and the wetlands, grasslands, and other habitats upon which they depend are seriously threatened in the region due to habitat degradation, poaching, unsustainable water management, and lack of law enforcement and conservation capacity.

◀ Out of 15 recoveries of Greater Flamingo in India, 14 are from Iran and one from Kazakhstan. The annual Flamingo Watch organized by the BNHS helps to raise awareness and interest in waterbirds and their conservation

INDIA AND CAF

India is one of the recognized mega-diverse countries of the world, harbouring three of the 34 globally identified biodiversity hotspots. Its unique biological diversity is reflected by the great heterogeneity of natural ecosystems and habitats. Thus, India's avifauna is diverse, comprising at least 1,300 (about 12%) of the total of 10,064 bird species globally, including 49 endemic species and 187 globally threatened birds.

At least 370 species of migratory birds are reported to visit the Indian subcontinent during winter, of which 310 are wetland birds (243 waterbirds and 67 wetland dependent species), the rest being terrestrial birds. Of these, 175 species undertake long-distance migration using the Central Asian Flyway (CAF) area, which includes central Siberia, Mongolia, the Central Asian Republics, Iran and Afghanistan, the Gulf States and Oman, and the Indian subcontinent. Most of these wintering birds arrive in India by October and leave by March/April.

India is a signatory to the Convention on Conservation of Migratory Species (CMS), which aims to provide better protection to all migratory species, including the birds of CAF. India is also a contracting Party to the Ramsar Convention (Convention on Wetlands); 26 wetlands in India have already been notified as Ramsar sites, and a management regime is in place to conserve these sites. Some important bird habitats in India have been notified as Protected Areas under the Wildlife (Protection) Act, 1972 for better conservation and protection of birds and their habitats. India has already listed all its migratory birds under various Schedules of the Wildlife (Protection) Act, 1972 and killing of these birds is strictly prohibited. However, there have been reports of illegal killing of migratory birds (see pp. 32–39), and one such case was the large-scale hunting of Amur Falcon *Falco amurensis* in Nagaland in October–November. The State and Central Governments quickly responded to the issue and through the district administration and the State Forest Department brought a complete halt to the hunting, with the active support of local communities (see pp. 32–39).

India is also a signatory to the Siberian Crane MoU of CMS, and has signed this MoU for the conservation of the threatened migratory Siberian Crane *Leucogeranus leucogeranus* with other range countries. The MoU aims to protect the species through concerted, coordinated action in order to prevent disappearance of the remaining population. India is the lead nation in implementing the conservation action plan for the Central Asian Flyway. India has been monitoring the status of these migratory waterbirds by financially supporting several research organizations. The research and monitoring of these migratory birds have been promoted by the government through governmental organizations like Wildlife Institute of India (WII) and Sálim Ali Centre for Ornithology and Natural History (SACON). In addition, NGOs like BNHS, Wetlands International-South Asia, the Ashoka Trust for Research in Ecology and the Environment (ATREE), and World Wildlife Fund (WWF)-India have been working on migratory bird research and

WILL SIBERIAN CRANES RETURN TO INDIA?

The Critically Endangered Siberian Crane used to spend the non-breeding period in Bharatpur, India; photographed in 2002, this is possibly among the last few images of this bird at Keoladeo National Park

According to the International Crane Foundation, this Critically Endangered species is now found only in two populations, the Eastern (Siberia to China) and the Western. The last recorded observation of Siberian Cranes from the Central Asian flock that wintered in Keoladeo National Bharatpur, India, was in 2002. Apparently, they were victims of hunting along the 4,000 mile migration route between the Russian arctic and India. The loss of the central population and the decline of the western population to single digits is also undoubtedly a consequence of hunting, especially during migration.

An international effort is underway to save this Critically Endangered species for the last two decades, coordinated under an agreement of the Convention on the Conservation of Migratory Species of Wild Animals (CMS). This effort includes a sustained release programme for captive-bred birds in Russia and Iran, a major international project to safeguard the main breeding, staging, and wintering areas of the western/central population, and development of a site network in Western/Central Asia under CMS. These efforts will benefit millions of other migratory waterbirds that rely on the same sites, as well as other wetland biodiversity and local communities.

conservation. As part of the effort to appraise the status of avifauna in India and to identify potential habitats for their protection, BNHS has identified 554 'Important Bird and Biodiversity Areas (IBAs)' that would help in monitoring avian populations and their habitats in the country (see pp. 44–45).

India has so far been the lead country in CAF conservation initiatives. However, there has been no definitive progress due to the lack of an international as well as national framework for the conservation of migratory waterbirds in the Central Asian Flyway, and given that the bulk of these birds migrate to India, there is need to take up more effective planning for long-term conservation of migratory birds in the country and for the region. India has already lost one of its winter visitors, the Siberian Crane, largely due to lack of support for the international framework for conservation in the region.

CHALLENGES

According to the latest Asian Waterbird Census (AWC) coordinated by Wetlands International, the populations of threatened migratory birds in the region are either decreasing or stable. The long-distance migratory species that winter in the Indian region primarily use the CAF. The major reasons for decline in the numbers of these bird species are: habitat loss, modification, fragmentation and degradation, environmental contaminants, poaching, land use change particularly conversion of large areas to intensive cultivation, irrigation schemes (to convert areas to rice paddies), increased pesticide usage and livestock-grazing, and high levels of disturbance from developmental activities like mining and hydel projects. Threats posed by infrastructure development, such as collision with vehicles, power-lines, and wind turbines, further exacerbate the situation. Wetland reclamation is also believed to be the most destructive cumulative threat to wetlands and their

Humans compete for resources not only among themselves, but also with other living organisms. This is currently one of the biggest challenges for conservation (View from Loktak lake, Manipur)

use by waterbirds. Moreover, terrestrial migratory birds such as raptors have also shown declining populations in most of their range in India due to poisoning (agricultural pesticides, etc.) or habitat degradation.

The main hindrances to the conservation of migratory waterbirds and their habitats are the lack of information on their population status and trends, lack of information on the precise migratory routes of populations, limited capacity of local agencies and groups to monitor and manage wetlands, and the need to balance the needs of conservation against the needs of local people living around wetlands.

According to the information provided by the Range States of CAF, there are numerous threats to waterbirds and their habitats, and the main priorities include the need for monitoring waterbirds, development of action plans for conservation of threatened species, accession to or ratification of conventions/agreements including CMS, AEWA (Agreement on the Conservation of African-Eurasian Migratory Waterbirds), and Ramsar, establishment of new protected areas/ sanctuaries, establishment of a network of sites, establishment of species working groups, information exchange, provision of training on waterbird and wetland management, and raising of awareness (http://www.cms.int/en/ legalinstrument/central-asian-flyway).

THE WAY FORWARD

Important Bird and Biodiversity Areas (IBAs) and Important Coastal and Marine Biodiversity Areas (ICMBAs), that have been identified by BNHS and WII respectively, need to be brought under a well-planned management regime for the long-term conservation of birds in the region, as many of these sites are known to accommodate migratory birds.

As an active party of the CMS, the Ministry of Environment, Forest and Climate Change hosted the 2nd international meeting of CAF states in New Delhi in June 2005, which agreed on the CMS CAF Action Plan. The "CMS CAF Action Plan to Conserve Migratory Waterbirds and their Habitats" was developed with technical support from Wetlands International and was finally adopted in January 2008. The plan provides the basis for the 30 Range States in CAF to take up individual and coordinated region-wide activities to conserve waterbirds and their habitats. This Action Plan has been implemented in India but it is time to evaluate its effectiveness for developing similar plans.

Bogs and lakes, marshes and riverine wetlands to brackish salt flats, as well as coastal mudflats, mangroves, rice fields and other artificial wetlands provide foraging habitats for migratory species and breeding habitats for diverse resident species and local migrants

On its own, India needs to act to mitigate the impacts of climate change and invasive species on migratory birds, including addressing immediate threats that might reduce adverse impacts, ensure adequate environmental safeguards for renewable energy projects, monitor the status of migratory birds and their habitats, develop indicators to identify the effects of climate change, promote adaptive management, seek new partnerships with other international bodies, and assess how to assist species to adapt to climate change (http://www.cms.int/en/legalinstrument/central-asian-flyway).

It is important to strengthen cooperation with the corporate sector to promote development and inclusion of flyway considerations into their operational guidelines, to take up stewardship of areas directly linked to or associated with their footprint and beyond, to consider compensation of residual impacts along flyways, to strive for net positive impact, and to be pro-active in using international best practices.

In India, there are multiple governance frameworks and structures that administer wetlands. While these are intended to yield positive outcomes, the overlapping jurisdictions, divergent mandates, and limited coordination hinders multiple agencies from working effectively in managing them. An assessment on management effectiveness of a few Ramsar wetlands by WII concluded that there was little inter-sectoral coordination among various stakeholders who manage wetlands. Further, it was found that protection, catchment area treatment, control of invasive species, reduction of resource dependence, treatment of sewage and pollutants, awareness generation and nature education, integrated planning, and ecotourism are among the activities that need strengthening. There is also a need to recognize the livelihood dependency of people who live in and around wetlands. Accordingly, all wetlands and their birds need to be managed sustainably with participation of all stakeholders.

India needs to strengthen the monitoring of migratory bird populations and the important sites they rely upon (see pp. 42–46), and to increase capacity for and sustainability of such monitoring in the long term, in order to provide key stakeholders up-to-date information on the distribution, status, and trends of migratory birds and the routes that they follow.

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THE Central Asian Flyway

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The survival of a species primarily depends upon the availability of food resources, besides other optimal conditions in its habitat. When food resources become scarce during certain periods/seasons, some species learn to adapt to the prevailing conditions, while others choose to undertake to and fro journeys, which are broadly termed as migration.

There are different kinds of migrations in birds. Nomadic or local migration is the shortest on the scale of migration, in which the movements are tuned to fruiting phenology of certain tree species or other food resources that become seasonally available. This movement is within a geographical location. Greater than this is altitudinal migration, where birds breeding in the upper reaches of mountains move down to the foothills to avoid the harsh winter, and return to their breeding grounds once conditions are suitable again. But the most spectacular and well-known is the migration that takes place on a much larger scale – the continental level – where millions of birds migrate from north to south during winter and return during spring to their breeding grounds. Birds migrate not only from north (breeding grounds) to south (wintering grounds) and back, but also south to north, east to west, or southwards with sideways deflections.

Birds use certain specific 'flyways' or routes to reach their wintering or breeding grounds. These flyways are located across many geographical barriers, oceans, continents, or even at certain times down a mountain slope. The flyways are of immense importance for the migrating species to complete their annual cycle.

The Central Asian Flyway (CAF) is a major flyway covering the Indian subcontinent. It stretches between the Arctic and Indian oceans, extending across 34,089,399 sq. km, from Siberia in the north (breeding ground), reaching as far south as Maldives and other south Asian countries bordering the Indian Ocean (wintering ground). The CAF is the shortest flyway in the world. Lying entirely within the Northern Hemisphere, it connects a large swathe of the Palaearctic with the Indian subcontinent. The CAF covers 30 countries of North, Central, and South Asia.

Some species using the CAF have to cover difficult terrains to complete their migratory cycle, such as Bar-headed Goose *Anser indicus*, which is known to fly past the Everest, one of the highest mountain in the world. Some species follow other migration routes along the CAF to avoid extreme weather conditions in the Himalaya.

◀ The Ruddy Shelduck is one of the important species of conservation concern

CAF ACTION PLAN – AN UPDATE

According to recent population assessments, the status of three species, namely Corncrake *Crex crex*, Spot-billed Pelican *Pelecanus philippensis*, and Pygmy Cormorant *Microcarbo pygmaeus* has been downgraded from Vulnerable to Least Concern, Vulnerable to Near Threatened, and Near Threatened to Least Concern respectively, because of best reliable scientific evidences from the Range countries. At the same time, the population status of Great Knot *Calidris tenuirostris*, Common Pochard *Aythya ferina*, and Velvet Scoter *Melanitta fusca* has been upgraded from Least Concern to Endangered and Vulnerable categories. The status of the migratory species given in the CAF Action Plan needs to be revised periodically, based on the status assigned by the International Union for Conservation of Nature (IUCN). This would be helpful for developing single species action plans, which is envisaged under Action 2 of the CAF Action Plan for the better protection and conservation of the species.

BIRD SPECIES RESTRICTED TO CAF

Species such as the Critically Endangered Sociable Plover *Vanellus gregarius*, Endangered White-bellied Heron *Ardea insignis*, Vulnerable Black-necked Crane *Grus nigricollis* and Indian Skimmer *Rynchops albicollis*, Least Concern Bar-headed Goose *Anser indicus* and Ibisbill *Ibidorhyncha struthersii*, and Brown-headed Gull *Larus brunnicephalus* are completely or largely restricted to the Central Asian Flyway region.

In addition, the breeding range of some species including the Critically Endangered Siberian Crane *Leucogeranus leucogeranus*, Slender-billed Curlew *Numenius tenuirostris*, and Spoon-billed Sandpiper *Eurynorhynchus pygmaeus*, Vulnerable Relict Gull *Larus relictus*, Near Threatened Spot-billed Pelican *Pelecanus philippensis*, Black-winged Pratincole *Glareola nordmanni*, and Asian Dowitcher *Limnodromus semipalmatus*, and Least Concern Caspian Plover *Charadrius asiaticus* are largely restricted to the region, although the non-breeding ranges overlap with adjoining flyways (CAF Action Plan, New Delhi, 2005).

There are 279 migratory waterbird populations of 182 species, including 29 globally threatened and near threatened species that breed, migrate, and spend the non-breeding (winter) period within the region (CAF Action Plan, New Delhi, 2005). Of the 29 threatened waterbird species, the global population of five species, namely Baer's Pochard *Aythya baeri*, White-bellied Heron *Ardea insignis*, Northern Bald Ibis *Geronticus eremita*, Slender-billed Curlew *Numenius tenuirostris*, and Spoon-billed Sandpiper *Calidris pygmaea* are below 1,000 mature individuals and listed as Critically Endangered.

In all, nine species, namely White-headed Duck *Asarcornis scutulata*, Masked Finfoot *Heliopais personatus*, Siberian Crane *Leucogeranus leucogeranus*, Greater Adjutant *Leptoptilos dubius*, Lesser Adjutant *Leptoptilos javanicus*, Dalmatian Pelican *Pelecanus crispus*, Wood Snipe *Gallinago nemoricola*, Nordman's Greenshank *Tringa guttifer*, and Indian Skimmer *Rynchops albicollis*, have a global population estimated between 1,000 and 10,000 mature individuals. For 15 species, namely Red-breasted Goose *Branta ruficollis*, Lesser White-fronted Goose *Anser erythropus*, Marbled Teal *Marmaronetta angustirostris*, Ferruginous Duck *Aythya nyroca*, Lesser Flamingo *Phoeniconaias minor*, Corncrake *Crex crex*, Black-necked Crane *Grus nigricollis*, Spot-billed Pelican *Pelecanus philippensis*, Black-headed Ibis *Threskiornis melanocephalus*, Socotra Cormorant *Phalacrocorax nigrogularis*, Pygmy Cormorant *Microcarbo pygmaeus*, Sociable Lapwing *Vanellus gregarius*, Asian Dowitcher *Limnodromus semipalmatus*, White-eyed Gull *Larus leucophthalmus*, and Relict Gull *Larus relictus*, the global population is estimated above 10,000 mature individuals.

Birds along the flyways depend upon a multitude of factors; viable feeding and roosting areas being the most important. Many waterbird populations are declining rapidly as the wetlands, grasslands, and other habitats upon which they depend are seriously threatened along the CAF due to habitat degradation, unsustainable water management, and lack of law enforcement and conservation capacity. They are also decimated by uncontrolled hunting. In recent

CONSERVATION OF MIGRATORY SPECIES (CMS) APPENDICES

As per the CMS Articles III & IV, migratory species are listed in two appendices based on (a) the degree of their conservation status and (b) migratory species to be the subject of the Agreement:

Appendix I: List of migratory species which are endangered / threatened. A migratory species may be listed in Appendix I provided that reliable evidence including scientific evidence is available which indicates that the species is endangered. A migratory species may be removed from Appendix I when the Conference of the Parties (COP) determines that: reliable evidence, including the best scientific evidence, is available which indicates that the species is no longer endangered, and the species is not likely to become endangered again because of loss of protection due to its removal from Appendix I.

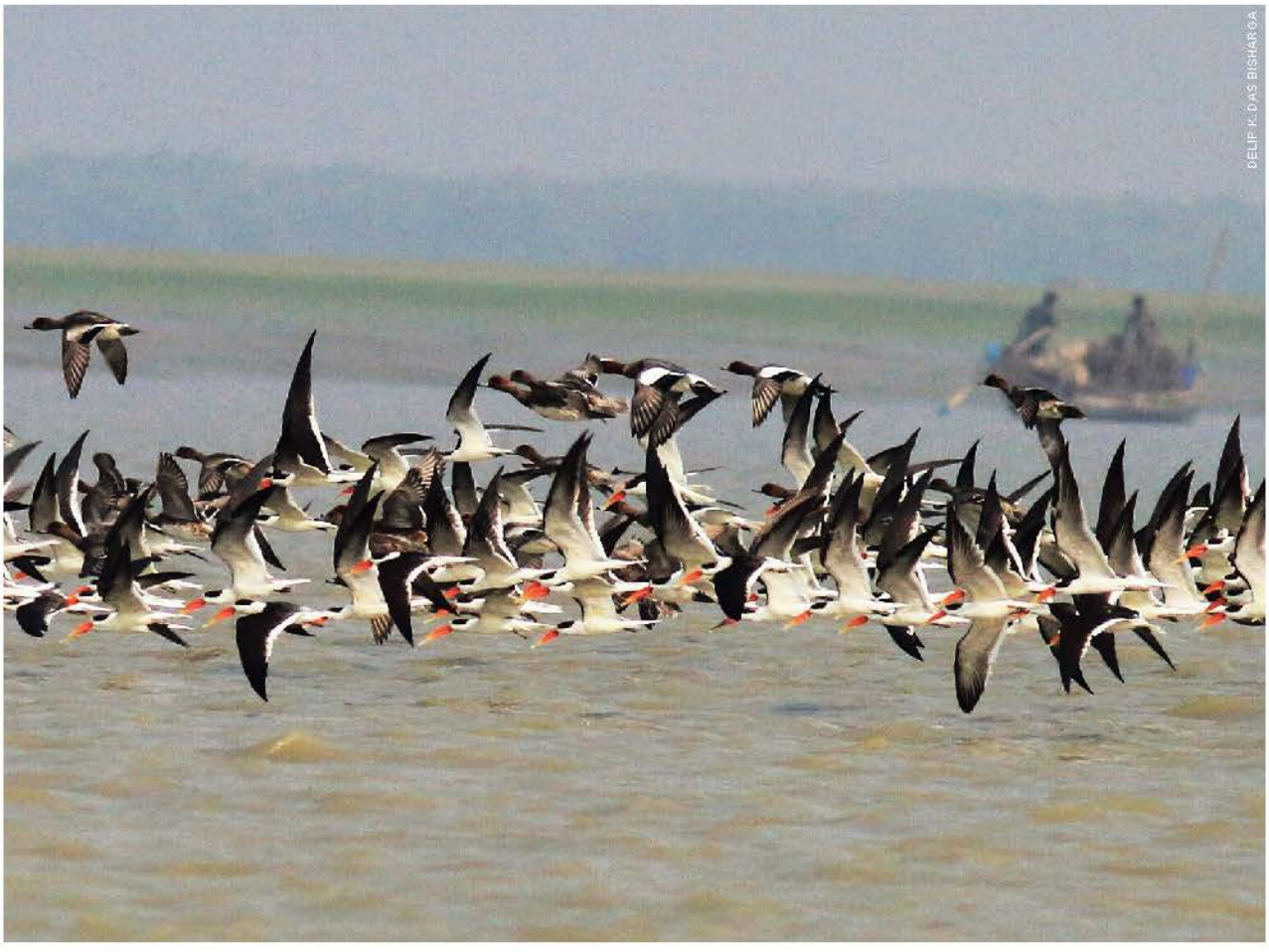
Appendix II: List of migratory species which have an unfavourable conservation status and require international agreements for their conservation and management. The conservation status of migratory species which would significantly benefit from the international co-operation that could be achieved by an international agreement.

Of the 182 species covered by the CAF Action Plan for the conservation of migratory waterbirds and their habitats, 17 are included in Appendix I and 103 in Appendix II of the CMS (CMS/CAF/Report/Annex 4/2005).

years, behavioural changes have been observed worldwide in bird migration, like overwintering or late departure, arrival prior to the start of the season, and alteration in regular migration routes. These changes in migration pattern can also be attributed to the rapidly changing climate regime and irregular monsoon which take a toll on these birds (Galbraith *et al.* 2014 CMS Technical Series No. 27).

Since migratory birds travel across international borders, it is vital that all the countries lying within their flyway paths should come to a common understanding to protect the habitats of these birds. Key areas important for the survival of these migrants in each biogeographical and political domain need to be identified, and management strategies need to be

Asian Dowitcher (above) and Indian Skimmer (below) are species largely restricted to the Central Asian Flyway



VISION AND MISSION OF THE STRATEGIC PLAN FOR MIGRATORY SPECIES 2015–2023 (SPMS)

The vision of the SPMS is "Living in harmony with nature – where populations and habitats of migratory species (along with all biodiversity) are valued, conserved, restored and wisely used, thereby contributing to global sustainability."
The mission is "To promote actions to ensure the favourable conservation status of migratory species and their habitats, and to ensure the ecological integrity, connectivity, and resilience of migration systems."
Five goals and fourteen targets are given in the SPMS for conserving migratory birds.

designed accordingly on a landscape level, maintaining the connectivity of the wetlands in consideration. Species-specific action plans for globally threatened species, which depend exclusively on these key sites, also need to be given importance. Compared to other flyways of the world, designing and implementation of management strategies in CAF has been a challenge, as this flyway extends along regions that include highly populated, polluted, and rapidly developing nations.

In this regard, the first Central Asian Flyway workshop took place in Tashkent, Uzbekistan, in 2001 to discuss the cooperative actions between the flyway countries for conservation of migratory waterbirds, with representatives from 15 countries. This meeting discussed a draft action plan for the CAF and various legal and institutional options to support the implementation of the action plan. The second CAF meeting was a follow-up meeting organized in Delhi, India, in 2005, in which 23 countries participated. The draft action plan identifying the priorities was finalized in the meeting. The draft identified the priorities for the action plan, which included a directory of sites of international importance, a monitoring strategy, and recommendations on strengthening monitoring capacity. It also provided an overview of the status of the Flyways, establishing a network of key contacts in the Flyways and the need for development of Single Species Action Plan for threatened species. Although the Action Plan has been framed, there is insignificant progress among the Range States (the countries that come under the flyway). Because,

Major breeding grounds of the Spot-billed Pelican lie within India

The Brown-headed Gull is largely restricted to the Central Asian Flyway, and congregates in large numbers in Indian wetlands

one-third of the 30 range states in CAF are among the world's least developed countries, a lot of practical difficulties need to be addressed for the successful implementation of the action plans.

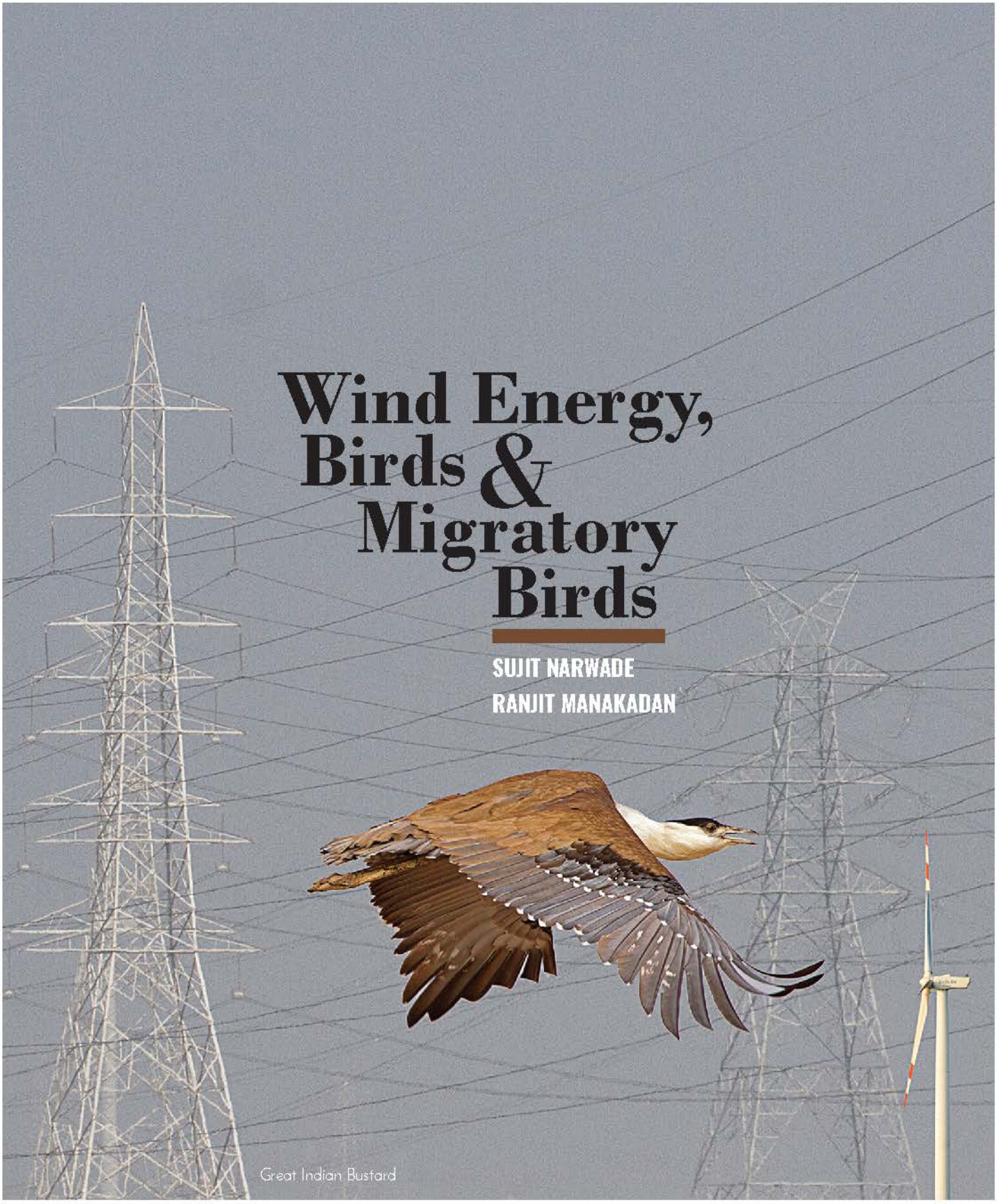
The third meeting was conducted in Abu Dhabi in 2012, which was preceded by the first meeting for the Raptor MoU. Representatives from 17 countries took part in the meeting, in which the considerable overlap between CAF and the Africa-Eurasia Flyway to its west and East Asian-Australian Flyway to its east was established, and the need to combine CAF action plans with African-Eurasian Migratory Waterbirds (AEMW) was discussed. Unlike other flyways such as the Africa-Eurasia Flyway (AEF) which has been well-developed and successful, CAF action plans still lack strength in several areas in terms of international cooperation.

In 2014, CMS approved the Strategic Plan for Migratory Species 2015–2023 (SPMS) with goals to address the cause of decline of migratory species, reduce direct pressure on migratory species and their habitat to improve their conservation status and ecological connectivity. These conservation efforts are expected to enhance the benefit to all stakeholders, through participatory planning, knowledge management, and capacity building. Identifying and securing key sites with the help of various management tools will not only secure the rapidly declining population of migratory birds during the peak migration time, but yield various associated benefits. Studying the migratory patterns of the birds along the flyway will be helpful to determine the crucial role played by the wetland and in turn to determine the health of the wetland ecosystems. Diseases like avian influenza can be monitored according to international protocols. The key to any successful conservation programme is to garner maximum support of the major stakeholders, mainly the locals living in and using the same sites as the migratory birds. And hence, not only is it imperative to develop site-specific plans to address the ecological threats, but to also have a landscape approach across borders to address species-specific conservation issues.

Owing to the decline in migratory waterbirds, BNHS is working closely with the MoEFCC to formulate a landscape level Wetland Conservation Plan for the prioritized wetlands to maintain the waterbird population in the flyway level (see pp. 47–51). Stakeholder participation and policy intervention is to be implemented in order to tackle the pressures on the habitat and species to safeguard migratory species.

Wind Energy, Birds & Migratory Birds

SUJIT NARWADE
RANJIT MANAKADAN



Great Indian Bustard

DEVESH GADHAVI

Sujit Narwade, Project Scientist, BNHS, executes projects relating to conservation of bustards and floricans. He also helps Forest Departments execute conservation plans.

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Wind-powered turbines that generate electrical energy are helpful in achieving 'greener energy', as they do not pollute or cause other forms of environmental degradation. Wind energy also has the benefit of being a renewable and easily available energy source. These are clear advantages compared to the burning of fossil fuels (coal, oil, and gas) for power generation, which pollute the air, land, and water, and additionally entail mining/extraction of these non-renewable resources from the earth, degrading the environment and causing the destruction of wilderness areas. Many of these energy sources also need water resources to operate, which is not the case for wind-power generation.

However, the rapid expansion of wind energy generation in many parts of the world, and in recent years in India, has revealed that wind-power generation poses threats to wildlife, particularly to birds and bats. Among birds, besides soaring birds, migratory species tend to be at a higher risk of collision, since they move in flocks while migrating, and there is special risk if the windmill farms are located in the midst of their migration routes. The increasing realization that wind turbines kill birds and bats on an enormous scale has tarnished the 'green image' of this energy sector. Now let us get into the nitty-gritty of wind energy, its presence in India, and its impacts on birds in general, and on migratory birds in particular.

WIND ENERGY

Wind energy generation, though in the limelight only in recent years, has early beginnings. The precursor of wind-power mills had its origin in the wind-powered machines used to grind grain or to pump water in the Netherlands, and the arid regions of USA and Australia. The first windmill used for the production of electric power was built in July 1887 by James Blyth of Anderson's College, Glasgow, Scotland. By the 20th century, from small battery-charging windmills for farms and residences to massive onshore or offshore wind farms to contribute to national power grids were established.

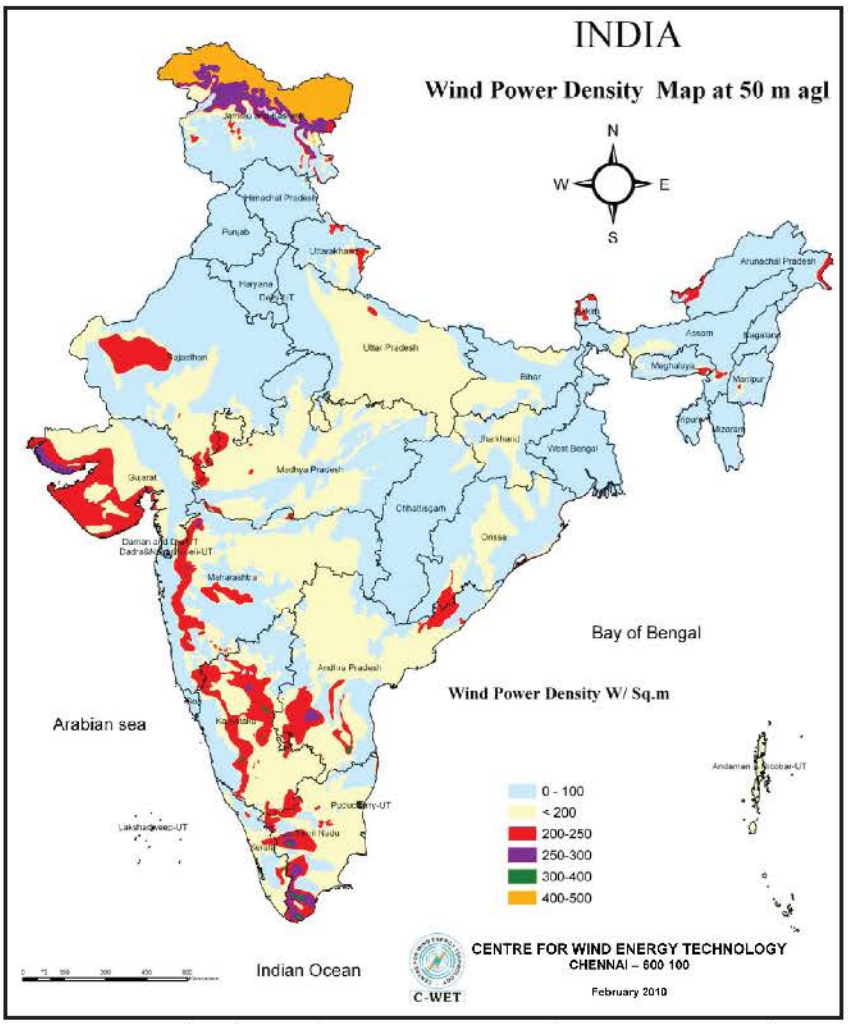
Wind energy is obtained by harnessing the kinetic energy of wind to rotate the blades of wind turbines, to mechanically generate electric power. Wind turbines have a typical design of a tall tubular tower, on top of which sits the wind turbine having an upwind rotor with blades. Wind power projects or farms comprise a number of wind turbines that are connected to a power-transmission network and may be located onshore or offshore. Since wind energy output is wind dependent, which can be inconsistent with the weather, seasons, and years, wind power is generally used in conjunction with other power sources for a country's needs. Nevertheless, for its benefits of being a clean and renewable energy source, wind energy (as is the case of solar energy) is being increasingly adopted in many countries.

A wind farm, either onshore or offshore, is typically comprised of a group of wind turbines in a location. The land in-between the turbines could be grazing land, agricultural land, forest land, 'wasteland', or land under other classification/uses. Large wind farms may have several hundred turbines spread over a large area – the upcoming Gansu Wind Farm in China, which will be the largest wind farm in the world, will comprise several thousand turbines!

WIND ENERGY IN INDIA

Because of the fluctuation in prices and availability of crude oil, the Government of India is encouraging and promoting the use of renewable energy (wind and solar) to match the country's growth requirements. Since it has the tag of 'green' energy, the Government provides various incentives and benefits for setting up such projects. The Ministry of Non-conventional Energy Sources, now renamed the Ministry of New and Renewable Energy (MNRE) was established in 1992 for research, development, and promotion of renewable energy sources such as wind power, small hydro, biogas, and solar power. The broad aim of the ministry is to develop and deploy new and renewable energy to supplement the energy requirements of India.

The land in-between the turbines could be grazing land, agricultural land, forest land, 'wasteland', or land under other classification/uses



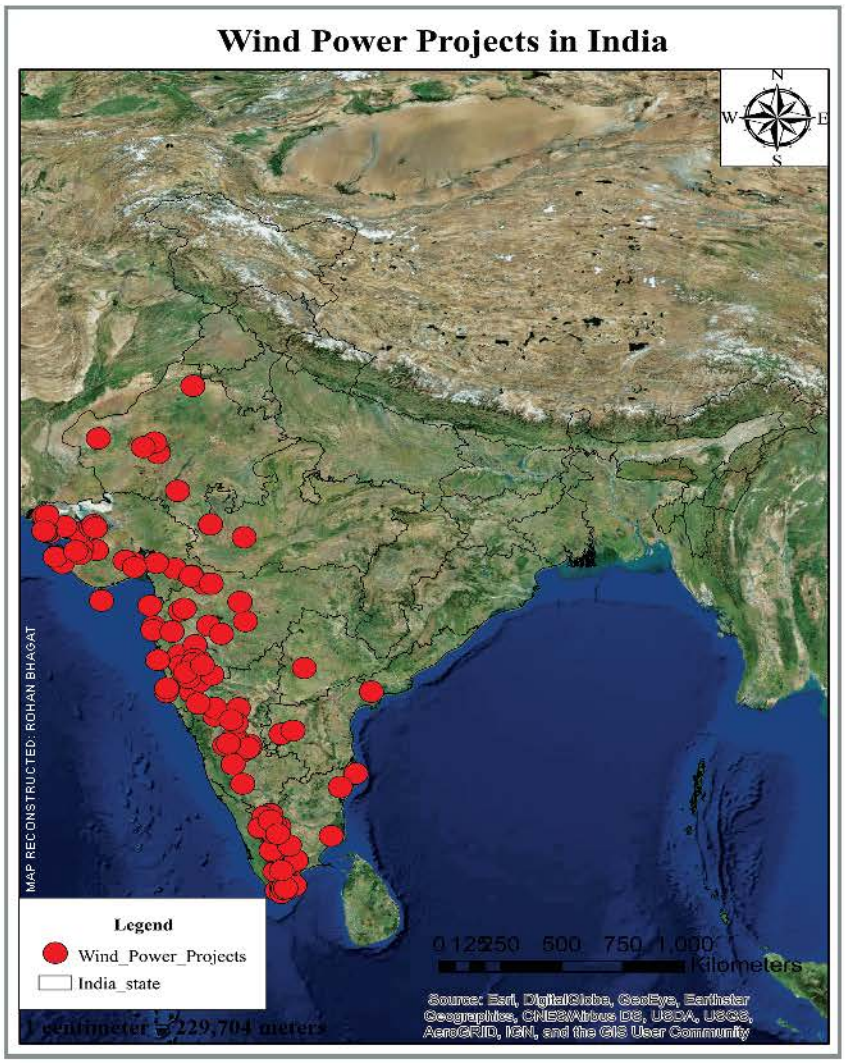
Assessment of wind power density at a site is essential prior to construction of a wind farm. There is a possibility of increased wind density with increased height; the map gives wind velocity at 50 m above ground level

Since the climate of the Indian subcontinent is monsoonal, nearly 70% of wind energy generation is during the rainy season and dominated by states with wind energy resources.

The development of wind power in India began in 1986 with wind farms being established in the coastal areas of some states (Ratnagiri in Maharashtra, Okha in Gujarat, and Tirunelveli in Tamil Nadu). These three pioneer states are still major contributors to the generation of this power source, followed by Andhra Pradesh, Rajasthan, Karnataka, Madhya Pradesh, and Kerala. Wind power now accounts for nearly 9% of India's total installed power generation capacity, and India is placed fifth in the global scenario (Source: Ministry of New and Renewable Energy <http://mnre.gov.in/schemes/grid-connected/solar-thermal-2/> and Indian Wind Energy Association <http://www.inwea.org/>).

Besides these onshore farms, India also plans to enter into offshore wind power, starting with a farm located off the coast of Gujarat.

To facilitate the growth of this industry, the Ministry of Environment, Forest, and Climate Change issued



In India, commercial wind energy production started in early 1990s. In 1993, India had an installed wind energy capacity of 79 MW. Currently, India is the 4th largest wind power generator in the world with an installed capacity of 32,280 MW as of March 2017 (India Wind Power 2017). Ministry of New and Renewable Energy, Government of India has set up a target of 60,000 MW installed capacity by 2022 (India Wind Power 2017). Among the states, Tamil Nadu has maximum installed capacity of 7,861 MW followed by Gujarat (5,340 MW)

guidelines in 2013 (and amendments thereafter) for diversion of forest land for promoting wind energy. In fact, wind energy does not come within the purview of obtaining "Environment Clearance" under the Environment Protection Act 1980. The guidelines for declaration of eco-sensitive zones around national parks and wildlife sanctuaries also suggest promotion of green technology and the use of renewable energy in these zones. Moreover, there is no mandate to submit an EIA report (especially on biodiversity) if a wind farm is to be set up in non-protected areas. If a windmill is permitted to come up in Eco-Sensitive Zones of Protected Areas and reserve forests, wildlife managers can ask for the biodiversity EIA report before an approval is given for the project, which is rather a matter of wind power companies approaching organizations of their choice (usually with tender process) to get this done. These EIA studies tend to be based on rapid assessment surveys without covering different seasons, and often result in reports that are overtly favourable to the proposed windmill farm, instead of providing a balanced view of the pros and cons of the project on birds and bats. In fact, some of the projects seem to suggest that the power projects face risks from birds and bats due to hits, and not vice-versa!

WIND ENERGY AND BIRDS

The fact that wind farms are a threat to birds (and bats) has been borne out by many studies throughout the world. Birds and bats get killed or injured when they collide with the windmill blades. Though apparently appearing to move at a slow pace, wind-turbine blades move quite rapidly, and the distal tips of the blades can reach a speed of more than 280 kmph. Soaring large raptors are especially susceptible, since they tend to look downwards for prey or sideways during movement and do not notice the swift, swirling blade approaching from the top/ front that knocks them clean out of the skies. [See http://www.youtube.com/watch?v=8NAAzBArYdw for a video recording of such an incident] Evolution has not prepared birds to adapt to the neo-threat of wind-turbines. Moreover, the older models of wind towers offer perching sites for large raptors, and the structure also creates shelter/niches/habitat for small mammals like rodents, which attract these birds to the death trap.

In general, bird collision probability depends on species, turbine height

(taller, more hits), and the elevation above sea level (higher, more hits), implicating species-specific and topographic factors in collision mortality. Large birds with poor manoeuvrability are generally at greater risk of collision, and also species that habitually fly at dawn and dusk or at night as they are not likely to detect and avoid the turbines. Collision risk may also vary for a particular species, depending on age, behaviour, and stages of its annual cycle. For example, birds making regular foraging flights to provision their chicks are more susceptible to collision with overhead wires, because they tend to fly closer to these structures at this time.

Other than direct kills from the rotors of turbines, wind farms also impact birds in other ways by altering/fragmenting/degrading/destroying habitats, obstructing movements of birds, disturbing birds by the humming noise of the rotating blades, besides marring the aesthetics of landscapes (e.g., a scenic grassland getting 'pock-marked' with windmills). All these perturbations have the potential to result in changes in behaviour, cause birds to avoid or abandon the area, and impact survival and breeding success. Additionally, since wind farms tend to be located in remote or wilderness areas, the 'footprint' of the wind farm extends to areas much beyond its confines, as a consequence of the resulting network of power lines, towers, and other infrastructure of wind farms, road network established, movement of people and vehicles, and the socio-economic and other impacts of the establishment of wind farms on local communities. In fact, a number of studies in Europe have reported that bird densities near windmills declined or/and were overall significantly lower than at reference sites. Similarly,

As per guidelines, windmills are permitted to come up at defined distances from national parks and sanctuaries, sites of archaeological importance or other landscapes of special interest

The 'footprint' of a wind farm extends far beyond its confines, due to its extensive associated infrastructure

By 2030, besides onshore windmills there are plans to develop offshore windmills. The Gulf of Khambat in Gujarat and the Gulf of Mannar in Tamil Nadu are potential sites for the first offshore wind farms in India

Unlike European countries there is no comprehensive study of the established wind farm sites, collision data needs to be gathered to understand impact of migratory birds in India. European countries are developing bird sensitivity maps to ensure that wind energy does not impact their protected habitats and species

other studies suggest that wind farm development could lead to the displacement of migrating and breeding waterfowl and shorebirds, probably due to the disturbance associated with the wind farm construction and post-construction maintenance.

WIND ENERGY AND MIGRATORY BIRDS

Wind-energy generation is reported to take a heavy toll on migratory birds. These casualties especially occur along narrow passes on the migratory route of birds. According to the California Energy Commission, 1,300 raptors (including more than 100 Golden Eagles *Aquila chrysaetos*) still die every year from wind turbines located in Altamont Pass, California, despite preventive measures that have been taken over the years. This farm, lying in the middle of an important migratory route for birds, was notorious in the past for being one of the deadliest wind farms in the world. Other than it being situated along an important migratory route, experts blame the relatively small size of the farm's nearly 5,000 turbines, many of them built in the 1970s, as a reason for the high casualty rate. Another site known for kills of migratory birds due to wind turbines is in the Strait of Gibraltar, a migration bottleneck site for birds migrating between Europe and Africa. Besides casualties of birds along migration routes and especially migration bottleneck sites, kills tend to be higher if the turbines are situated near wetlands.

Cases of bird kills from windmills, involving either resident or migratory species, are getting reported more frequently in India with the increase in birdwatchers. Birders have reported

BIRD SENSITIVITY MAPPING

Renewable energy, including wind, is currently the answer globally to the single greatest long-term threat to birds and other wildlife – climate change. However, it is well-known that poorly sited wind farms can also have negative impacts on birds, leading to potential conflict where proposals coincide with areas of activity for species of conservation concern.

To help minimize this conflict, many European countries (http://www.rspb.org.uk/Images/EnglishSensitivityMap_tcm9-237359.pdf) have produced a GIS map and formulated guidelines to aid the planning process for onshore wind energy development. The maps developed are based on distributional data for sensitive bird species, plus statutory SPAs (Special Protection Areas), and sites containing nationally important populations of breeding waders and seabirds, or wintering waders or wildfowl. Increasing demands for wind energy development globally to combat greenhouse gas emissions (IPCC, 2007) make strategic planning for renewable energy an important requirement, and sensitivity mapping is a useful tool to assist this process.

MoEFCC has selected BNHS to make similar guidelines for India based on its nine-decade bird migration studies, Important Bird Areas, and Wetlands and Protected Area Conservation Programme. BNHS will have the mandate to develop a bird sensitivity map (i.e., identify red, amber, and green zones) for establishing new onshore wind farms in India.

The upcoming CMS COP 12, scheduled to be conducted from October 23–28, 2017, in the Philippines, is likely to discuss the impacts of offshore windmills on migratory birds.

bird deaths from windmills in the Thar Desert in Rajasthan and Rann of Kachchh in Gujarat. Data is also being obtained from a few EIA studies, but these are more or less rapid biodiversity inventories undertaken to obtain sanction for setting up the power plant in contention. There is a need to carry out in-depth and long-term studies of bird kills from windmills in the different regions of India.

The MoEFCC is aware that migratory birds are especially prone to windmill hits, and in EIA studies, it is necessary to assess if the wind farms are located along the migratory routes of birds or where other concentrations of birds occur. To get around this, EIA reports use terms like "not even close proximity" and "safe distance" to claim that migratory birds would not be affected, but this ignores the fact that birds (and migratory birds) with their power of flight may not stick to the exact same route each year – the distribution of rainfall in the Indian subcontinent being an important factor.

GREEN ENERGY?

Wind turbines kill an estimated 140,000 to 328,000 birds each year in North America. Despite this, wind energy is one of the most rapidly expanding energy industries in USA, with more than 49,000 wind turbines distributed across 39 states (http://www.audubon.org/news/will-wind-turbines-ever-be-safe-birds). An estimate by the Pennsylvania Game Commission puts the number of bats killed by wind turbines in USA at 10,000 per year (http://www.livescience.com/31995-how-do-wind-turbines-kill-birds.html).

As for India, hardly anything is known about this mortality factor and studies have just started to be conducted, but there is no reason to assume that it is not significant now, or will not be in the future, considering the promotion of wind energy production by the government. It should also be noted that even low levels of mortality may be significant for long-lived species with low productivity and slow maturation rates, especially in the case of Critically Endangered species like the Great Indian Bustard with less than 300 individuals now surviving. Can we consider an energy source as 'green energy' if it kills hundreds of thousands of birds each year, and has the potential to contribute to making rare species extinct? A serious point to ponder!

However, there are silver linings in the dark clouds of windmill energy. One is bladeless wind turbines under development by a Spanish company, Vortex Bladeless, which will be based on vorticity, an aerodynamic effect that produces a pattern of spinning vortices (https://www.wired.com/2015/05/future-wind-turbines-no-blades). Another, by a Tunisian company, Saphon Energy, is a new design of bladeless turbine, inspired by the sails on ships from ancient Carthage, which they claim is quieter, safer, and more efficient than traditional wind turbines and is capable of capturing twice as much wind energy (http://www.dailymail.co.uk/sciencetech/article-3548127/Revolutionary-turbines-inspired-BOATS-ancient-Carthage-spell-end-offshore-wind-farms.html).

Illegal Trade in Wild Migratory Birds in India

ABRAR AHMED

BNHS CHILIKA PROJECT

Abrar Ahmed is an authority on bird trade in India and has worked as a consultant with TRAFFIC India, WWF-India.

On January 9, 2014, before sunrise, along with my colleagues Mohit Kalra and Nikhil Shinde, I headed from Lucknow to Valmiki Tiger Reserve in Bihar, to survey grassland tracts for the possibility of Bengal Florican *Houbaropsis bengalensis* occurring there. Barely 50 km from Valmiki, we almost lost our way while traversing huge grassland patches on the Uttar Pradesh-Bihar border. As these grasslands are generally not visited by ornithologists, we were also on the lookout for the White-throated or Hodgson's Bushchat *Saxicola insignis*, a Vulnerable species that winters in the *terai* of Nepal and India, especially in the *terai* of Uttar Pradesh and Bihar.

It was getting dark, and just as we were about to reach the main road, a group of boys ran away seeing our vehicle. We managed to get hold of one of them who we found out belonged to the *Mirshikar* clan of bird trappers. He brought out the almost dead bird from his pocket, which turned out to be the Common Stonechat *Saxicola torquatus* (sometimes treated as a separate species, Siberian Stonechat *Saxicola maurus*). The Common Stonechat is a migratory species and this was a new addition to my checklist of Indian birds in the bird trade.

◀ Bird trappers catch a wide variety of waterbirds, using various trapping techniques, for sale in bird markets, including large species like the Black-tailed Godwit (L) and flamingos

While working as an undercover investigator for TRAFFIC India some years ago, I conducted more than 300 field surveys, covering 283 trading and trapping areas across 195 Indian cities, towns and villages, and recorded 900 shops/hawkers in 26 Indian states and two union territories selling birds. I had documented more than 3,000 wild native birds of 53 species on sale during my first bird trade survey in Lucknow's infamous Nakhas Bird Market in October 1992. This was not a village level trade in birds that could be ignored, but comprised a whole syndicate of people involved in organized state level trading of birds, that is active even today. A day after the trip to Valmiki, I saw more than 100 individuals of migratory waders for sale in Bettiah in the *Mirshikar toli* mohalla. Sometimes, these waterbirds are sent to prominent markets through a network of dealers and sub-dealers. One would be surprised to know that Uttar Pradesh by itself had 191 licensed dealers and trappers prior to the ban on trade, with an estimated 32,000 families involved in trapping and trading of birds.

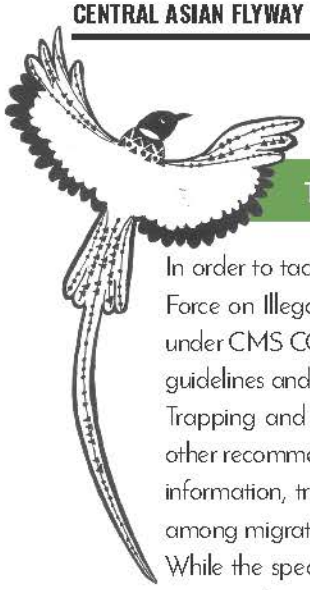
THE INDIAN BIRD TRADE

During 1990–91, the Government of India banned the trade in wild birds as per the amendment to the Indian Wildlife (Protection) Act, 1972. Now, except for the House Crow *Corvus splendens*, which is listed as Vermin, no Indian bird can be hunted, trapped, caged, or traded. However, despite 25 years of a blanket ban on the trade in Indian birds, the trade still continues. As there are no restrictions on the sale and rearing of exotic (foreign) birds within the country, most bird markets in India now openly sell domesticated exotic species. This 'legal' trade involves a huge investment, and is generally handled by upper class bird dealers, who nowadays comprise a new breed of smart and educated hobbyist-turned-dealers. The trade in wild Indian birds still continues – hidden under the umbrella of the exotic birds in traditional bird markets and village haats.

REASONS FOR TRADE

Fuelling the demand for the organized trade of birds are: the pet trade, aviculture, for food, merit release for religious reasons, for black magic and sorcery, medicinal use, sport (fighting, singing competitions, and falconry), zoos, taxidermy, for circuses and street performances, and for use of body parts, including feathers.

A major reason why the wild bird trade is still prevalent in India is that not less than 5,000 families are dependent on this trade, particularly the *Baheliya* and *Pathami* in north India, *Mirshikaris* in eastern India and *Pardis/Pashe-pardis*, *Bawarias/Harries* in peninsular India, and *Narrikorava* and *Hakkipukki* in southern India. These traditional bird trappers still eke out a living by regularly trapping birds, such as munias, galliforms, doves, parakeets, and waterbirds. They are wary of investing in the exotic bird trade, largely due to the fear of seizure of birds, and prefer continuing their traditional business in a clandestine manner. Apart from these professional trappers, there are a number of communities involved part time in bird trapping and hunting.



TASK FORCE ON ILLEGAL KILLING AND TRADE OF MIGRATORY BIRDS

In order to tackle the issue of illegal killing and trade of migratory birds efficiently, an 'Intergovernmental Task Force on Illegal Killing, Taking and Trade of Migratory Birds' in the Mediterranean (MIKT) has been created under CMS COP Resolution 11.16 to facilitate international cooperation, as well as the implementation of existing guidelines and action plans, in particular the Tunis Action Plan 2013–2020 for the 'Eradication of Illegal Killing, Trapping and Trade of Wild Birds'. The MIKT will also consider whether any new guidelines, action plans, or other recommendations to respond to specific problems are necessary. Moreover, it will enable the exchange of information, training and education, law enforcement, deterrence, and prevention to reduce the mortality rate among migratory birds.

While the specific measures needed to tackle bird crime will vary for each country, the Task Force has agreed to strengthen three key areas: focusing on immediate measures from a legal perspective, continuous monitoring and conservation actions, and increased awareness campaigns and educational schemes. MIKT will work as a catalyst to gather the information scattered amongst diverse international organizations, and will help experts coordinate their work, offering among other things a remote online workspace.

The Mediterranean basin is currently a hotspot for illegal killing and trapping, and MIKT is the first Pan Mediterranean Task Force to be developed, having a distinctly regional focus and aiming to be replicated in other parts of the world. It is expected that during CMS COP 12 there will be a proposal to adopt Terms of Reference for an equivalent Asian Task Force (proposed by Philippines), on illegal hunting, taking, and trade of waterbirds in Asia. The first task for the Asian Task Force is likely to be a situation analysis of illegal hunting and taking, building on the exercise undertaken by BirdLife for the Mediterranean, and underway for the rest of Europe and West Asia. NGOs like BNHS and TRAFFIC India can support the MoEFCC to generate information on a 'situation analysis' in India. This will help MoEFCC to support international bodies for developing guidelines for an Action Plan suitable for the Asian Task Force.

MIGRATORY BIRDS IN TRADE

In recent years, the exposé on Amur Falcon *Falco amurensis* by Conservation India, of how thousands of falcons were 'harvested' each year for a month or so during migration, shocked the conservation world (p. 68). This exposé highlighted the enormity of how one species of bird was trapped and traded for food on such a massive scale in one isolated pocket of India by part time bird trappers.

Similarly, last year, there was international concern about the 90% global decline of Eurasia's Yellow-breasted Bunting *Emberiza aureola* that is trapped in thousands to be sold for food in its wintering range, principally across China. It is now listed as an Endangered species because of this unsustainable trade.

Back again in our own country, the most recent surveys show that a majority of wild birds traded in India are now retailed for food, a practice that is not uncommon in almost all parts of India. Prior to the ban on the trade, the majority of trappers and traders focused on a large variety of species that were exported from India for the ornamental cagebird trade, catering to the demands of exporters who sent the birds worldwide through Delhi and Kolkata. With the ban, open trade became restricted to the sale of budgerigars, lovebirds, and domesticated finches, along with Japanese Quail *Coturnix japonica* for meat. Even this option has been affected since the last five years or so with increased vigilance, animal activism, and 'wrongful seizures' of domesticated exotic birds in the name of preventing cruelty to animals.

All these developments have pushed the professional bird selling tribes to underground markets. Now the focus is mainly on munias and parakeets for the (illegal) pet trade, on waterbirds and galliforms for food, and on species that can be easily sold and need no transportation. 'Meat birds' can be easily sold within a


ABRAR AHMED

Above: Common Stonechat (L) and Red-throated Flycatcher (R) caught by village trappers near Valmiki National Park, Bihar. Note the plucked flight feather from both sides. Even if such species are seized and transported to a rescue centre, the major problem is releasing them back in the wild as they will need a month or so before they can fly again. Since these birds are highly insectivorous, there is hardly any rescue centre or zoo in India that can keep such species in captivity and cater the right food in captive condition. This is one of the biggest challenges of bird rescue / rehabilitation


RAMKI SREENIVASAN | CONSERVATION INDIA

Below: In 2012, the world witnessed a massacre of up to 12,000-14,000 Amur Falcons in Nagaland, every day during the peak season

locality, and trappers catch a wide variety of species preferred by their customers. There are higher possibilities of a traditional trapper getting caught while hawking birds for the pet trade – such as parakeets or munias, and harassed by the public and enforcement personnel.

The migratory Common Quail *Coturnix coturnix* is a favourite trade species for meat and is caught along with the resident quails and francolins using drive nets set in legume plantations. The migratory Common Starling *Sturnus vulgaris* and Rosy Starling *Pastor roseus* are caught with the clap trap or funnel net.

Out of the 450 species of native birds caught, traded and utilized in India, more than 150 species are targeted for food, especially during winter. I recorded more than 40 species of waterbirds, mainly migratory species, for sale in various bird markets across India especially in Bihar, Uttar Pradesh, Gujarat, Odisha, Assam, Manipur, Telangana, Andhra Pradesh, and Tamil Nadu. The actual number of migratory species in the trade is probably higher, as species/numbers hunted for food are difficult to document. During field surveys, the average number of waterbirds traded in an area was estimated around 100 per week (400 a month). If the waterfowl season lasts for about five months, it indicates that 2,000 birds are sold by 8–10 trappers from a single market in a state. If there are ten such markets in a state, 20,000 birds are sold every season. If this data is collated from all over the country wherever the bird trade is high, it would reveal that several thousand migratory waterfowl are killed each year.


ABRAR AHMED


S. BALACHANDRAN


K. MAHESWARA RAO

MIGRATORY 'MEAT BIRDS' IN THE TRADE

Avian meat is sold under the following names in northern and eastern India:

Murgabi (waterfowl; large duck-sized bird species including storks, egrets, herons, ibises, spoonbills, ducks and geese).

Totanna and *Chaha* (waders, snipes, sandpipers [*Tringa* spp.], pratincoles and stilts. These groups are often substituted with dressed doves, babblers, and mynas).

Bageri (all small sparrow-sized birds such as pipits, larks, wagtails, buntings, weaverbirds, sparrows, and munias).

Titar / bater (francolins and quails).

The main table birds caught for food trade are the Bar-headed Goose *Anser indicus*, Greylag Goose *Anser anser*, Ruddy Shelduck *Tadorna ferruginea*, Common Teal *Anas crecca*, Garganey *Querquedula querquedula*, Indian Spot-billed Duck *Anas poecilorhyncha*, Gadwall *Mareca strepera*, Northern Pintail *Anas acuta*, Northern Shoveller *Spatula clypeata*, Eurasian Wigeon *Mareca penelope*, Tufted Duck *Aythya fuligula*,

Top: *Bageri* – small wild bird meat especially migratory birds sold in eastern Uttar Pradesh, Bihar and Jharkhand

Centre: The illegal trade in waterbirds for meat continues undocumented and goes over secretly in various places in India, involving large numbers of threatened species

Bottom: Sale of waterbirds for food is still rampant in many cities and village weekly bazaar or haats. Picture taken in Kakinada, Andhra Pradesh

Common Pochard *Aythya ferina*, terns, gulls, herons, and egrets.

Red-crested Pochard *Netta rufina* males are sold for aviculture as exotic birds. Similarly, the Demoiselle Crane *Grus virgo*, Sarus Crane *Grus antigone*, and the Common Crane *Grus grus* are caught for aviculture and for meat. A kilogram of crane meat may sell up to INR 400, while live ducks are sold for anything between INR 400 to 800 per bird. Waders and lapwing-sized birds sell between INR 50 to 200 each. Small sparrow-sized birds sell between INR 15 to 25 each.

Other waterbirds, resident or migratory, that are occasionally caught for zoos, and more so for food, include the Black-necked Stork *Ephippiorhynchus asiaticus*, Black Stork *Ciconia nigra*, Painted Stork *Mycteria leucocephala*, Woolly-necked Stork *Ciconia episcopus*, Asian Openbill *Anastomas oscitans*, Black-headed Ibis *Threskiornis melanocephalus*, Purple Swamphen *Porphyrio poliocephalus*, White-breasted Waterhen *Amaurornis phoenicurus*, cormorants and pelicans.

Bageri is a local term in bird markets applied to several species/groups of winter migrants caught for meat, especially the Red-headed Bunting *Emberiza bruniceps*, Black-headed Bunting *E. melanocephala*, wagtails and pipits *Anthus* spp., the migratory race of House Sparrow *Passer domesticus*, and finch-larks. Several resident species of weavers and larks are also sold as *bageri*. These birds roost communally in sugarcane fields or *Typha* reeds in winter, from where they are captured in bulk using funnel nets.

As for the method of sale, in some places, the trappers carry a water pot along with them and hawk the birds door to door in bird baskets. On finalizing the deal with a buyer, the birds are drowned in the pot and cleaned in front of the customer. At large bird trading establishments, such as in *Babeliya toli* in Varanasi and *Mirshikar toli* in Patna, where there is little fear of apprehension, some of the large dealers have small ponds in their homes. Here, about 300 live birds are stuffed into a sack and killed by drowning them in the pond. Later, they are skinned and cleaned. These

VANISHING BIRD TRAPPING METHODS IN INDIA

ABRAR AHMED

A *Muria* tribal in Bastar poses with his prize trained Shikra used for trapping birds. The art of training raptors for capture of other birds is almost extinct in India

The conservation movement in India, and the subsequent blanket ban on wild bird trade in 1990–91, resulted in labelling the bird trapper as a much despised individual, scorned by conservationists, animal rights activists, and law enforcement officials. However, it has not been realised that bird trapping tribes have vast traditional knowledge that can be put to alternative uses in the service of nature conservation and wildlife research. For instance, chemical restraint with dart guns is used to capture mammals for radio-collaring, but capture of birds with dart guns for fitting satellite-transmitters or bird-rings to study their movement is not feasible or economical. BNHS set a splendid example by using the expertise of bird trappers, when *Mirshikar* tribals from Bihar, including the legendary Ali Husain, were inducted into the BNHS bird migration project, where their traditional bird trapping skills have been put to good use. Thus, the provision of a respectable and economically viable livelihood has been ensured for at least some of the former bird trappers.

Trapping birds requires a lot of skill and ingenuity, and Indian trapping communities have devised various methods, some of them rather unique. Indian trapping methods can be broadly classified into four major categories: i) Nets, ii) Latex method, iii) Nooses, and iv) Miscellaneous methods.

birds are then sold either by weight (up to INR 600–800 per kg) or by count (INR 250 to 300 per dozen without cleaning).

Waterbirds are caught from wetlands in and around bird sanctuaries or other such refuges at night, using fine nets strung across waterways hung on bamboos. In eastern India, professional bird catching tribes are masters in catching waterfowl by throw-net in combination with flickering-light-and-sound method on moonless nights. In daytime, some waterbirds such as waders are caught using clap-traps. Large waterbirds such as storks, cranes, pelicans, and egrets are caught using leg snares. In more recent times, shockingly increased use of pesticides or poison in bait for killing waterfowl *en masse* is a cause of concern. Generally, the pesticide Furadan™ (Carbofuran) is mixed with paddy, and these grains are broadcast on small wetland islands.

Carbofuran is known to be toxic to birds. In its granular form, a single grain will kill a bird. Birds often eat the granules, mistaking them for seeds. The liquid form of the pesticide is less hazardous to birds since they are not as likely to ingest it directly. In some areas, the birds are often poached using this chemical on grains

Ali Husain – a trapper working in the BNHS ringing team – setting a leg snare for waterbirds

This is usually done just before the main market day, and the poisoned birds are sold with their throats slit to make them appear as if they have been killed by the *halal* method for the table.

Collection of chicks of Sarus Crane, Black-necked Stork, and Painted Stork was also observed during some visits. Trapping in the breeding season is very destructive. For instance, on a single field visit, 14 Greater Painted Snipe *Rostratula benghalensis* were observed caught in one night from a single site during the breeding period. Such pressures can cause local extinction.

Apart from migratory waterbirds and raptors, the threatened Yellow-eyed Pigeon or Pale-backed Pigeon *Columba eversmanni* may be lured by Blue Rock Pigeons *C. livia* tied to clap-traps as bait. There is little difference in coloration between the Yellow-eyed Pigeon and Blue Rock Pigeon. Therefore, trade in such species goes totally unnoticed. Other than these are the Macqueen's Bustard *Chlamydotis macqueenii* and the migratory sandgrouse that are occasionally shot by hunters in winter, in western India, rather than being trapped or traded by professional bird-catchers.

MIGRATORY 'NON-MEAT BIRDS' IN THE TRADE

Falcons, victims of accidental catch during trapping of doves and pigeons, have to wait for visiting smugglers to take them to the Middle East for retail sale. If customers do not turn up, the falcons die in the custody of trappers or sub-dealers, as they are not displayed in the market for buyers due to fear of prosecution. The Saker Falcon *Falco cherrug* and Peregrine Falcon *Falco peregrinus* are the most sought after by Middle East falconers for hunting the

Trapping is one of the major threats in the wintering grounds to shorebirds; a trapper with Lesser Sand Plovers

Arabian Houbara. The falcons are first smuggled to Pakistan concealed in baskets of betel leaves, and then to their final destination in the Gulf countries.

THE WAY AHEAD

Continuous unsustainable exploitation of wildlife for commercial gain, along with local consumption, and shrinking habitats are proving detrimental for several rare species. The Indian Wildlife (Protection) Act, 1972 has officially banned trade in all native birds (which includes birds migrating into India) since 1991. Despite this, capture and trade continues for the domestic markets, and to some extent, for cross border smuggling of certain rare species to cater to the high international demand.

A serious issue that goes unnoticed – in comparison with the pet trade – is the local consumption of several threatened birds, and substantially migratory birds in winter, for food, some of which may be due to ignorance of the locals. For instance, in Bangladesh, eight bird trappers (who may not have been aware of the threat level to the species) claimed to have caught 22 Spoon-billed Sandpipers *Calidris pygmaea* between October 2009 and April 2010 in Sonadia Island for the table. To address this issue, there need to be regular awareness campaigns through local media / NGOs targeting both trappers and consumers. Additionally, there has to be more awareness about the trade in birds with more identification material and training workshops involving multiple enforcement agencies.

There also needs to be stricter policing and intelligence gathering to curb the illegal bird trade, especially in rare and endemic species. A specialized bird crime prevention cell with a nodal office to monitor and share sensitive information would be a worthwhile initiative by government agencies and NGOs.

There is also a great need to have centralized rescue centres for seized birds, for their speedy recovery and facilitation in terms of upkeep for individual birds subject to court cases, and urgent measures required to release and rehabilitate seized wild specimens. In the absence of such facilities, most seized birds perish, either in inexperienced hands or due to wrong aviculture practices. Zoos in the concerned state can actually benefit from seized birds, especially threatened species, provided they have the basic knowledge, infrastructure, interest, and funds to keep such birds.

There is also a pressing need for the rehabilitation of traditional communities attached to bird trade into other acceptable trades/jobs. State governments need to look into schemes that could help people who wish to leave their traditional occupation and opt for other legitimate sources of livelihood.

DING LI YONG

Linking the BirdLife Asia Partnership through Migratory Birds: the CAF

DING LI YONG
HUM GURUNG

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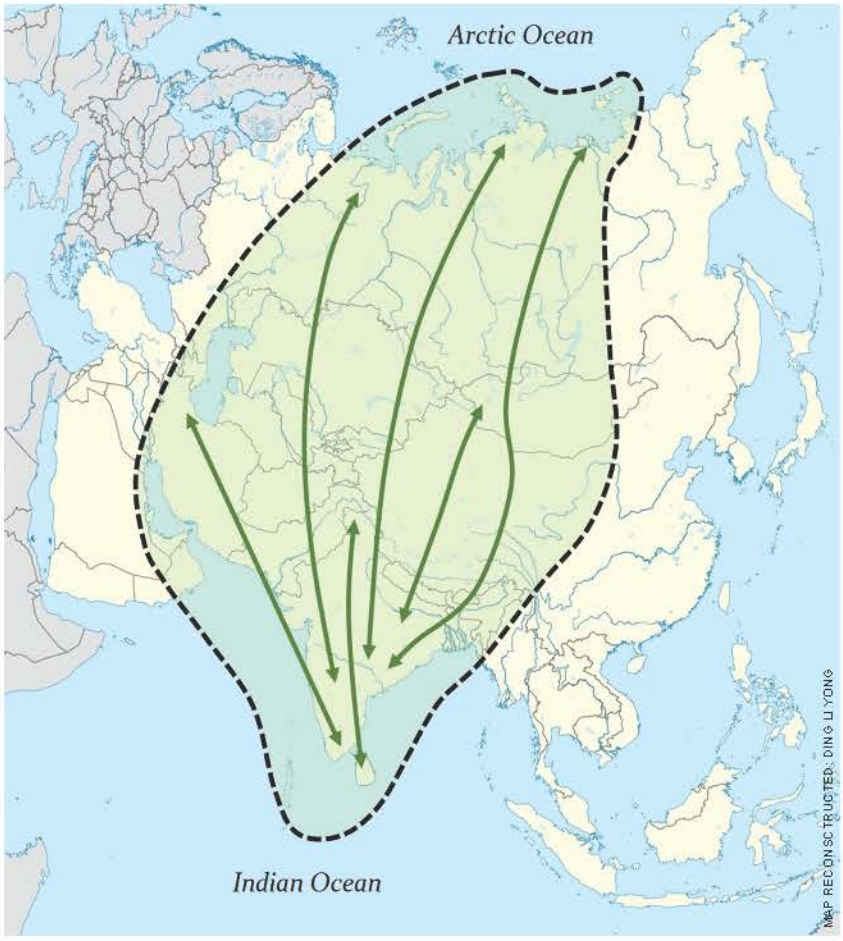
BirdLife International is the world's largest nature conservation partnership programme. Altogether, there are 122 'BirdLife Partners' worldwide at present, and this network continues to grow steadily each year. Each BirdLife Partner functions independently as a not-for-profit, non-governmental organization, maintaining its distinctive identity within the wider BirdLife Partnership while collectively bringing together critical knowledge and experience to support global biodiversity conservation on many different fronts.

Given its exceptionally high levels of biodiversity, including many of the world's most threatened bird species, Asia presents a particular challenge, and at the same time, a region of great opportunity for the work of the BirdLife Partnership. As the world's most populous continent now going through a period of rapid economic expansion, Asia's forests, deserts, grasslands, and wetlands are increasingly being imperilled by agricultural expansion, as well as urban and infrastructural development. The critical conservation work of the BirdLife Partnership in Asia is currently being led by 13 partners and Country Programmes through the coordination and direction of the BirdLife Asia regional secretariat. A priority for conservation work in Asia is increased engagement with the region's governments and the wider public to solicit stronger political support and awareness, and to strengthen the conservation of more than 2,000 Key Bird and Biodiversity Areas (KBA) distributed across the continent.

REGIONAL COLLABORATION IN CONSERVATION

Unlike people and their settlements, biodiversity is seldom, if ever, bounded



Left: Seen here in their breeding grounds in the Kyzyl Kum desert, south Uzbekistan, Collared Pratincoles are among the many waders that use the Central Asian Flyway

Right: Central Asian Flyway is the shortest of the major flyways, lying largely north of the equator with over 180 species of waterbirds passing through the route. Protection of key bottleneck sites on the CAF is essential to securing the populations of these migratory waterbirds

Migrating to the deserts of western Rajasthan in large numbers, Demoiselle Cranes are some of the best-known travellers on the Central Asian Flyway

by political boundaries. Species that are seemingly well-conserved in one state or country may not necessarily be adequately protected in others, or face different threats from habitat loss and hunting. This means that the actions and plans designed to conserve birds can only be truly effective if there is collaborative work that transcends national borders. The conservation of migratory species presents even greater challenges. Many species of migratory birds travel vast distances across the world, spending time in different places across many countries along their journey from their breeding areas to their wintering grounds. With this in mind, effective conservation of migratory bird populations would thus demand the coordinated protection of habitats across many countries. While this poses major logistical and political challenges for conservationists and scientists, it also presents numerous opportunities for collaborative work. This is not impossible.

One prime example of collaborative effort to conserve migratory birds is through the work of different government and non-governmental organizations in the East Asian-Australasian Flyway Partnership, of which BirdLife International is a partner. Under the umbrella of this regional partnership, different stakeholders involved in nature conservation have collectively put together technical knowledge and other experiences to develop strategic plans to conserve migratory birds. Furthermore, governments of different countries have also collaborated by being Parties to bilateral or multilateral treaties designed to conserve migratory species (e.g., the Convention on the Conservation of Migratory Species of Wild Animals). It is thus clear that regional collaboration is critical to identifying priorities, and organizing resources for where they are likely to make the greatest difference to conserving species, or groups of species.

CAF AND BIRDLIFE'S PARTNERS IN THE REGION

The Central Asian Flyway is the least known of the three major migratory bird flyways that overlap with Asia. This important flyway spans the breadth of Central Russia, the countries of Central Asia, Mongolia, and western China, as well as the countries of the Indian subcontinent. The geographical scope of the Central Asian Flyway overlaps with four countries with national partners in the BirdLife Asia partnership, all in South Asia. They include the Bombay Natural History Society (BNHS) in India, the Field Ornithology Group of Sri Lanka (FOGSL) in Sri Lanka, Bird Conservation Nepal (BCN) in Nepal, and the Royal Society for Protection of Nature (RSPN) in Bhutan.

More than 300 species of migratory birds, of which at least 182 are waterbirds, have been known to use this flyway, including many of the most familiar birds in the Indian subcontinent. Every autumn, millions of wild geese, cranes, pelicans, shorebirds, and many songbirds fly across the snowbound peaks of the Himalaya, Tien Shan, Hindu Kush, Ladakh, and the Qinghai-Tibetan Plateau to spend their winter in the forests and wetlands of India, Pakistan, Nepal, Sri Lanka, and Bhutan. Familiar to many birdwatchers in the region is the Demoiselle Crane *Grus virgo*, a stately bird which breeds across the steppes of Central Asia. Each year, many thousands of these elegant cranes overfly the Himalaya to spend their winter in the desert dunes of western India (e.g. Kheechan) and parts of Pakistan. Another charismatic Central Asian Flyway traveller familiar to many in the region is the majestic Steppe Eagle *Aquila nipalensis*. Birdwatchers

from across Nepal, Bhutan, and India can encounter this bird in numbers as they cross the mighty Himalaya, eventually settling down to spend the winter across the plains and deserts of northern India. Less known travellers on the Central Asian Flyway are many smaller songbirds such as the Kashmir Flycatcher *Ficedula subrubra*, Tickell's Thrush *Turdus unicolor*, and Common Rosefinch *Carpodacus erythrinus*.

OPPORTUNITIES FOR COLLABORATION AMONG SOUTH ASIAN PARTNERS

As the geographical scope of the Central Asian Flyway currently overlaps with four countries that are BirdLife partners, there are numerous exciting opportunities for cooperation and collaborative learning in many aspects of migratory bird conservation. This is enhanced by the fact that many species have geographic distributions that span the countries of South Asia, making it necessary for bird conservation efforts to traverse political boundaries. Here, we present a vision of how BirdLife Partners in South Asia can connect and collaborate to conserve migratory species. We list some of the actions that can be achieved in the short term, and a number of potential long-term follow-up actions that can be considered too.

1. The identification of key threatened flyway species shared by the four countries could be a first step in developing regional species action plans in collaboration with the respective government agencies. Potential action plans could be developed for threatened migratory species such as the Endangered Steppe Eagle, Critically Endangered Sociable Lapwing *Vanellus gregarius*, as well as other species that are widely distributed in South Asia, such as Bengal Florican *Houbaropsis bengalensis*, and the various vulture species.

2. Collaborative observation of migratory bird related events (e.g. Migratory Bird Day) and other Communication, Education, and Public Awareness (CEPA) activities can be made possible, using jointly developed educational materials. As migratory bird conservation becomes increasingly prominent on the global conservation agenda, there is an increase in educational or awareness-building events focused on migratory species. BirdLife partners in South Asia could tap these opportunities to develop education materials focused on migratory bird conservation of species in the Central Asian Flyway. Because many species are shared between countries in South Asia, it is not difficult for participants of these events to identify with these species, and develop a greater sense of ownership in their conservation.

3. Workshops and conferences focused on sharing of best practices, latest research findings, and other resources, and facilitated by BirdLife partners could form a common platform for further interaction and cooperation. Partners could take turns to organize such workshops. The BirdLife Asia Regional Partnership Meetings held in Thailand in 2014 and in Sri Lanka in 2016 have addressed the need for sharing of knowledge and for promoting collaborative actions through the formation of technical working groups.

4. Phased involvement and participation of other BirdLife partners along the Central Asian Flyway (e.g. Association for the Conservation of Biodiversity of Kazakhstan, Uzbekistan Society for the Protection of Birds) could further link up other key stakeholders in this flyway. As it takes time to build up collaborations, activities focused on Central Asian Flyway bird conservation should be developed in phases. Through the lessons and experiences gained from the initial phases, activities could then be improvised and extended to other BirdLife partners and mega biodiversity countries in other parts of the flyway.

CONCLUSION

The scope of the Central Asian Flyway represents many untapped opportunities to develop collaborative projects and synergies among BirdLife's partners in South Asia. Bringing together a wealth of expertise and a large membership base, BirdLife partners in South Asia are established and dynamic leaders in wildlife conservation in their respective countries. We envision that through a conservation framework focused on migratory birds in the Central Asian Flyway, cooperation between BirdLife partners could be further enhanced and synergized. Such cooperation could start with collaborative projects focusing on the conservation of key threatened migratory species that occur across South Asia. This could be supported by research and joint development of CEPA activities and materials by the partners. In the long term, as the framework for cooperation matures, this could be further extended to BirdLife partners further north in the Central Asian Flyway.

BNHS — BIRDLIFE INTERNATIONAL PARTNERSHIP

Chhari Dhand, which spreads up to 80 sq. km after good rains, attracts more than 100,000 birds in some years. Nearly 40,000 Common Crane *Grus grus* are found in the Banni area

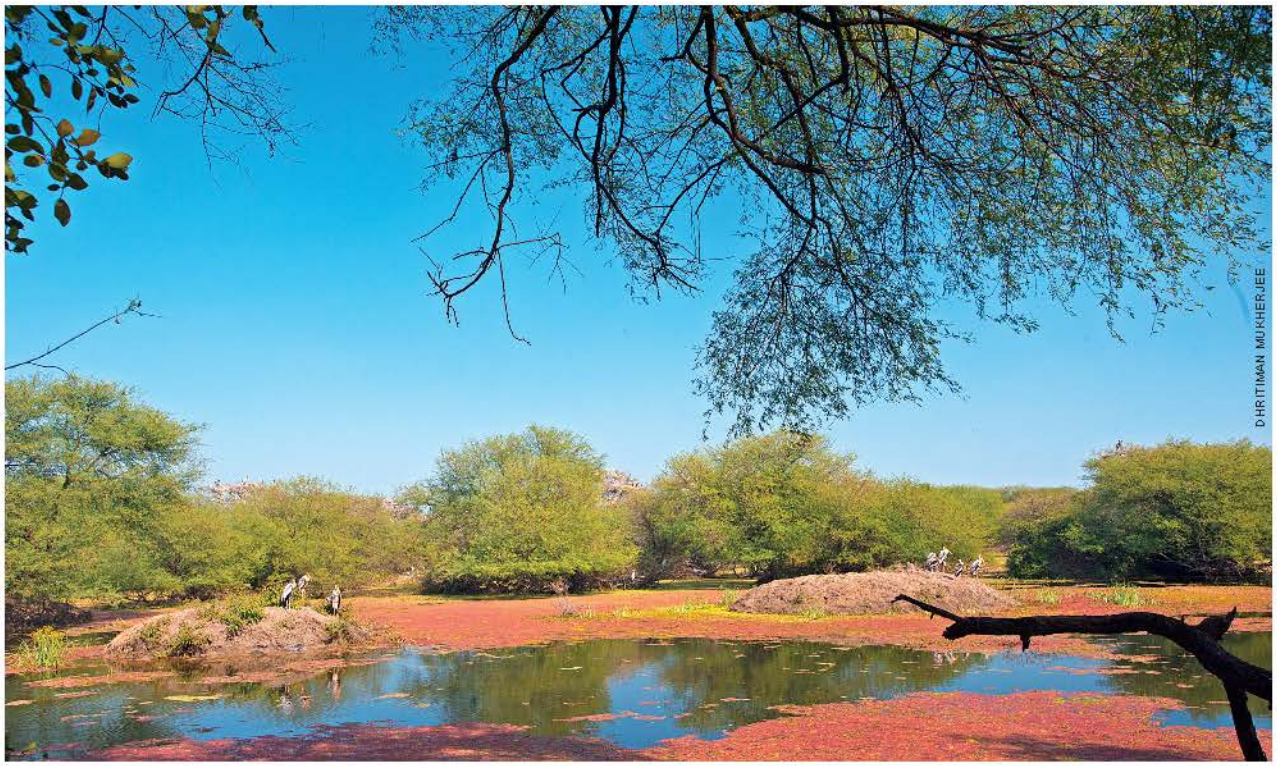
BNHS and BirdLife International, UK, became partners in 1998. The BNHS-BirdLife Partnership was launched to facilitate studies on the status of birds, their habitats, and the issues and problems affecting them. It has resulted in creating a network of ornithologists, birdwatchers, and organizations working for bird conservation in India. Important Bird and Biodiversity Areas (IBAs) have been the focus of the BNHS-BirdLife Partnership. BNHS works closely with the Flyways Programme of BirdLife International, which is working to protect chains of Important Bird & Biodiversity Areas (IBAs) that are critical for migratory birds, and to reduce threats along these routes.

Through its IBA programme, the BNHS has produced an inventory of internationally recognized sites vital for the conservation of birds. These sites were identified using a set of four standard global criteria: (a) presence of globally threatened species, (b) restricted range or endemic birds, (c) biome restricted assemblages, and (d) sites having large congregations of birds.

The IBA programme addresses site-oriented research and action, encompassing management, monitoring, education, advocacy, and national and international legal protection. The BNHS has also established this programme to protect Important Bird Areas and biodiversity through the Indian Bird Conservation Network (IBCN) network.

The first exhaustive text of the inventory entitled "Important Bird Areas of India" covering 466 IBAs was published in 2004 and uploaded on the website of BirdLife International to make it accessible worldwide. The inventory is extensively used in conservation advocacy. Over the course of the last decade, however, the social, political, economic, and ecological context of this region has changed significantly. There was, therefore, a necessity to update the IBA inventory. With the addition of all the available new information, a mammoth 2,000+ page two-volume inventory, published in 2017, has information on 554 IBAs, i.e. an additional 88 sites have been added to the inventory of IBAs in India.

For the conservation of important flyway sites IBA programme has created a network of more than 300 Local Conservation Groups (LCGs) and individuals across the country. The Network is made of individuals as well as organizational partners



The marshes of Keoladeo National Park are world famous for the number of waterfowl. Keoladeo is a World Heritage Site, a Ramsar Site, a National Park, and an extraordinary IBA

of the IBCN, which was established by BNHS in 1998. Many workshops were organized by IBCN across the country to train the birding community to conduct bird surveys and for participation in the Asian Waterbird Census (AWC). We need to strengthen the network to reinforce the activities of IBCN towards a better monitoring of the sites and strengthening the conservation initiatives to be taken up by the research institutes and government agencies.

What is needed now is to create a network of the site managers (Forest Department personnel, Field Directors, etc.) across the country for the better management and networking of the important flyway sites spread on a pan-India scale.

with inputs from Raju Kasambe, IBA Programme Manager, BNHS

ASIAN WATERBIRD CENSUS (AWC)

The Asian Waterbird Census was started in 1987 in the Indian subcontinent and has grown rapidly to cover the Asian region, and a large part of the Central Asian Flyway. The AWC is a coordinated pan-India level voluntary effort for collection and updating of current data on waterbird populations worldwide and wetland habitat status. The AWC forms a part of the International Waterfowl Census, a global effort coordinated by Wetlands International and conducted once a year, during the 2nd and 3rd week of January.

The AWC encourages people to count waterbirds in wetlands around them and collect information that would help promote the designation and management of internationally important sites such as nationally protected areas, Ramsar Sites and Important Bird and Biodiversity Areas (IBAs). The data collected through the AWC would also helps in identifying and protecting new sites of importance for waterbirds.

BNHS collaborates the activities of AWC with Wetlands International in India. If you wish to participate for the AWC write to iba@bnhs.org.

GANESH PALLELA

Great Knot is an endangered species uncommon to Indian wetlands

Important Migratory Waterbird Areas of India

P. SATHIYASELVAM
S. BALACHANDRAN

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S. Balachandran is currently Deputy Director, Ornithology, BNHS. He has been involved with the bird migration studies of the BNHS since the 1980s.

Wetlands are among the most productive ecosystems and play a significant role in the ecological sustainability of a region. Wetlands are also a rich repository of biodiversity, and most well-known for their fish and waterbird wealth. Wetland birds are ideal and easily observable indicators of the health of wetlands. The waterbirds of the Indian subcontinent roughly comprise around 23% of the 1,300-odd species, with about 50% of these (mainly ducks, plovers, and sandpipers) being migrant species.

The Indian subcontinent, due to its geographical location and diversity of climatic and physical features, is richly endowed with wetlands in the form of coastal wetlands and inland wetlands, along with a vast network of streams, canals, and rivers. India is reported to have around 50,000 natural or man-made small and large wetlands. Till date, 26 of India's wetlands have been declared as Ramsar Sites (i.e., wetlands of international importance), and proposals to obtain Ramsar status for many more sites have been forwarded for consideration.

Chilika is one of the crucial wintering sites for migratory ducks like Gadwall

Till the latter part of the 19th century, India's wetlands and waterbirds (and other associated flora and fauna) managed to survive in significant abundance in landscapes with large human presence. However, with the burgeoning human population and economic growth, and pressures on natural resources, India's wetlands are highly threatened. This is an unfortunate tragedy, especially since wetlands are vital components of our ecosystem. The pressures on land and water can only be expected to multiply as India's economy grows and its human population increases. Along with the loss and degradation of wetlands, populations of both resident and migratory birds have been dwindling. The protection and management of wetlands in India is, therefore, vital for the long-term survival of many wetland species, and for the maintenance of waterbird populations, including the migratory birds of the Central Asian Flyway (CAF).

An important initiative towards identifying, documenting, and garnering support for wetlands important for waterbirds in India was through the Important Bird and Biodiversity Areas (IBA) programme since 1998 of the BNHS, in partnership with BirdLife International. 554 Important Bird and Biodiversity Areas (IBAs) were identified and documented in India, of which more than 190 sites are wetland IBAs. Through this exercise, and from the decades long studies and surveys by BNHS in wetland sites spread throughout India, under the Bird Migration flagship programme and other research-conservation projects, BNHS concluded that it is necessary

Map showing the 29 sites, including 20 major wetlands and nine wetland clusters that have been identified as critical, crucial and bottleneck sites for migratory waterbirds in India

STATE-WISE INVENTORY OF IMPORTANT WETLANDS AND WETLAND CLUSTERS OF THE CENTRAL ASIAN FLYWAY IN INDIA

State	Important Major Wetlands	Important Wetland Cluster
Tamil Nadu	1. Great Vedaranyam Swamp (Point Calimere Wildlife and Bird Sanctuary) 2. Gulf of Mannar Marine National Park and Adam's Bridge 3. Karaivetti Bird Sanctuary 4. Pallikaranai	1. a) Suchindram b) Theroor c) Vembanoor d) Manakudi Estuary e) Saltpans of Puthalam & Kovalam
Pondicherry	-----	2. a) Ousteri Lake b) Bahour Lake c) Kaliveli Tank (Tamil Nadu)
Andhra Pradesh	5. Kolleru Lake Wildlife Sanctuary 6. Pulicat Lake Wildlife Sanctuary 7. Coringa Wildlife Sanctuary	-----
Odisha	8. Chilika Lake 9. Bhitarkanika Wildlife Sanctuary and National Park	-----
Maharashtra	10. Jaikwadi Bird Sanctuary 11. Gangapur Dam and Grassland 12. Nandur Madhmeshwar Wildlife Sanctuary	3. a) Mahul b) Sewri Mudflats c) Alibaug d) Thane Creek e) Uran
Gujarat	13. Nalsarovar Wildlife Sanctuary	4. a) Khijadia Bird Sanctuary b) Marine National Park & Wildlife Sanctuary
Madhya Pradesh	14. Karera (Dihaila Jheel and adjoining wetlands)	5. a) Halali Reservoir b) Bhoj (Upper Lake) Wetland
West Bengal	15. Sundarbans Biosphere Reserve 16. Farakka Barrage and adjoininig areas	-----
Rajasthan	17. Keoladeo National Park 18. Sambhar Lake	6. a) Alniya Dam b) Bardha Dam Reservoir c) Ramsagar Lake (Hindoli)
Punjab	19. Harike Wetland	----
Himachal Pradesh	20. Pong Dam Wildlife Sanctuary	-----
Assam	-----	7. a) Majuli Island b) Pani-Dihing Bird Sanctuary c) Sibsagar (Sivasagar) Tanks
Uttar Pradesh	-----	8. a) Kurra Jheel b) Saman Bird Sanctuary
Jammu & Kashmir	-----	9. a) Haigam Rakh Wetland Conservation Reserve b) Hokarsar Wetland Conservation Reserve c) Mirgund Jheel & Reserve

to identify, document, and protect important wetlands and a network of internationally important avian sites in India, for the conservation of migratory waterbirds along the CAF.

As a first step to achieving India's commitment in the Conservation of Migratory Species (CMS) and implementing the CAF Action Plan to Conserve Migratory Waterbirds and their Habitats, 29 sites including 20 major wetlands and nine wetland clusters have been identified as critical, crucial and bottleneck sites for migratory waterbirds (see Table). These sites have been selected based on the Ramsar and IBA criteria, and experiences gained from the IBA programme and the 90 year-long bird migration studies.

Site-based long-term monitoring and migratory studies will be helpful for the effective management of critical sites, with coordinated planning and holistic management along migration flyways, which are vital to many migratory birds in the CAF. Moreover, this initiative will be helpful in achieving the CAF Action Plan Actions 3 to 5 and India's commitment to international agreements and conventions like the Ramsar Convention, Convention on Biological Diversity (CBD), Bonn or CMS Convention, and sister agreements under CMS, particularly in CAF, and Sustainable Development Goals (SDGs).

The Ministry of Environment, Forest and Climate Change (MoEFCC), various state governments, government organizations and institutions, and NGOs need to work out strategies for executing the long-term monitoring and conservation of the ornithologically important critical and bottleneck sites as part of implementing the CAF Action Plan. BNHS would play a central role as the

ACTIVITIES ENVISAGED IN THE CAF ACTION PLAN UNDER ACTIONS 3 TO 5 FOR THE CONSERVATION OF WATERBIRDS AND THEIR HABITATS

Action 3: **Habitat Conservation and Management:** Habitat inventories, conservation and management of habitats, Establishment of CAF Site Network, Rehabilitation and restoration of feasible and appropriate sites, and Monitoring of the impacts of climate change on migratory waterbirds and their habitats.

Action 4 : **Management of Human Activities**: Protection of bird species from harvesting/hunting, Development of sensitive and appropriate livelihood support activities for communities depending on the wetlands, Assessing impacts of development and human activities, Research and monitoring, and training, education and awareness for the stakeholders.

Action 5: **Implementation strategies**: of activities planned under Actions 2 to 4

nodal agency on behalf of MoEFCC, considering its long-term contributions on bird migration and conservation of ornithologically important wetlands. The BNHS Wetlands Division will extend all possible technical expertise to the MoEFCC in this regard. As a second step, BNHS would prepare the template of model management actions to be undertaken in the flyway context to address the threats (if any) faced by selected wetlands, and restoration of degraded wetlands. The site-specific threats, required legal frameworks, restoration measures, stakeholder engagements, and short and long-term action plans for conservation of these wetlands would be formulated after discussion with MoEFCC, various state governments, government organizations, and NGOs. All these activities will be carried out in accordance with the actions envisaged in the CAF Action Plan for the conservation of waterbirds and their habitats.

Thousands of Lesser Flamingos and other waders congregate at Sewri Mudflats, in Mumbai, for nearly six months of the year

Migratory Birds of the Tibetan Plateau & Conservation Issues

TSEWANG NAMGAIL

TSEWANG NAMGAIL

Tsewang Namgail is currently Director, Snow Leopard Conservancy India Trust.

Migration is one of the most spectacular natural events of our planet. Thousands of birds can be seen on the move every autumn and spring during their journey from and to their breeding and wintering grounds. Some birds have an easy journey across lowland meadows replete with wetlands, while others cross some of the harshest environments on earth. Birds breeding in Siberia and wintering in India – in the Central Asian Flyway – are challenged throughout their journey by mountain ranges like the Great Himalaya, Pir Panjal, Hindukush, Karakoram, Pamir, Altai, Tian Shan, and Kunlun, and desolate areas like the Taklamakan Desert, Gobi Desert, and the Tibetan Plateau, depending on the migratory routes taken. Nowhere else on the planet do migratory birds face such diverse barriers and monumental obstacles as the birds using the Central Asian Flyway (CAF).

CENTRAL ASIAN FLYWAY

This flyway is unique due to its geography, landscape, cultural diversity, and of course, to the diversity of its migratory birds. CAF hosts one of the greatest assemblages of migratory raptors, perhaps because it encompasses the border of four zoogeographical realms, including two of the most raptor-diverse realms in the world: Palaearctic and the Indo-Malayan. Some unique birds like the Bar-headed Goose *Anser indicus* have evolved in this flyway, constantly adapting to the topography of the Himalaya, which has been changing ever since it formed as a result of the collision between the Indian and the Eurasian plates *c.* 45 million years ago. This mountain range, the youngest in the world, is continuously rising, modifying the habitats and constantly challenging the migratory birds that traverse it. The Bar-headed Goose is one of the highest-flying birds on the planet, crossing peaks over 7,000 m above msl in the Himalaya.

The Central Asian Flyway has relatively fewer birds compared to the numbers in other flyways. This could be because of the smaller size of the Indian subcontinent, the main wintering area for birds in this flyway, compared to the wintering areas in other flyways. The other probable reason is the geographical features of this flyway, characterized by numerous high mountains and deserts, which are uninhabitable for most birds. In recent years, increasing anthropogenic threats in the form of illegal hunting, destruction of wetlands for agricultural purposes, and climate change are also important contributing factors. Despite the increasing threats to migratory birds and the declining populations of several species both in the breeding and wintering areas, the Central Asian Flyway remains the least studied among all the flyways in the world.

◀ Black-necked Crane is one of the few migratory birds that breed on the Tibetan Plateau

TIBETAN PLATEAU

The Tibetan Plateau is one of the most desolate places in the Central Asian Flyway. It covers most of the Tibet Autonomous Region, Qinghai Province of western China, and the Changthang region of Ladakh, northern India. Stretching about 1,000 km north-south and about 2,500 km west-east, it is a vast plateau, encompassing about 2.5 million sq. km. It is the largest and the highest plateau on the planet, with an average altitude of about 4,500 m above msl, and is sometimes referred to as the Roof of the World. The plateau came into being as a result of the collision between the Indian plate and the Eurasian plate. The Tibetan Plateau plays a very important role in the climate of Asia as it influences the Indian monsoon.

The vegetation of the Tibetan Plateau is characterized by dwarf alpine plants due to the high altitude and aridity, as the high Himalaya blocks all the moisture laden clouds from the Indian Ocean. Trees are rare, except juniper and willow stands in valleys. The Tibetan Plateau is both a boon and a bane to the migratory birds in the Central Asian Flyway. On the one hand, it has vast expanses of desolate, barren land, while on the other, it has innumerable lakes, the remnants of the Tethys Sea, with stretches of meadows and marshlands along their shores. These wetlands are breeding and staging sites for birds that migrate between Siberia and the Indian subcontinent.

The characteristic migratory birds of the Tibetan Plateau are the

Tourists feeding migratory birds like the Brown-headed Gull with biscuits and cookies is a recent problem

Bar-headed Goose, Ruddy Shelduck *Tadorna ferruginea,* Black-necked Crane *Grus nigricollis,* Northern Pintail *Anas acuta,* Garganey *Querquedula querquedula,* Common Rosefinch *Carpodacus erythrinus,* Citrine Wagtail *Motacilla citreola,* Desert Wheatear *Oenanthe deserti,* Little Ringed Plover *Charadrius dubius,* and Common Redshank *Tringa totanus* among others. Some of these such as the Black-necked Crane breed on the Tibetan Plateau, while others are passage migrants, stopping temporarily at the wetlands to refuel.

The tortuous route of migrating birds over the Tibetan Plateau is further endangered by threats both natural and anthropogenic. Natural threats include blizzards, wind-storms, mammalian predators, and raptors. Some of the foremost manmade threats are habitat modification due to land reclamation for agriculture, diversion of water from wetlands to irrigate agricultural fields, wide use of pesticides and herbicides, illegal hunting of waterfowl, and the construction of dams to supply power to India and China.

India and China are both rapidly growing countries, which are pushing migratory bird habitats to the brink. Hundreds of dams being built over rivers originating in the Tibetan Plateau and the Himalayan region adversely affect migratory birds. The fallout can be seen in bird habitats upstream of the dams getting inundated, with birds losing nests, eggs, and food resources. Furthermore, clear felling of natural forests is permanently altering the habitat of many migratory birds. The most affected are populations of migratory birds, especially passerines such as the Great Rosefinch *Carpodacus rubicilla.*

The other prominent threats to migratory birds in the Tibetan Plateau are land reclamation for agriculture, as mentioned earlier, and extraction of fuel wood, fodder, and other resources from the wetlands. The indiscriminate use of highly subsidized artificial fertilizers, insecticides, and herbicides pollutes the wetlands and reduces the abundance of insects and aquatic invertebrates that the migratory birds feed on. India and China, two of the most important countries for migratory birds in the Central Asian Flyway, are the largest producers of pesticides in Asia. Deaths of migratory birds after ingesting pesticide-laced crops are increasingly being reported.

Infrastructural development by India and China to secure their border areas is also causing damage to bird habitats. Construction workers on infrastructure development projects collect eggs from the nests of ground-nesting birds, and they disturb the breeding birds at wetlands. The increase in road network also makes the remotest areas in the plateau more accessible, which leads to a greater flow of insensitive tourists towards migratory bird habitats. These tourists disturb and scare the birds away, and also litter the edges of lakes at camping sites.

In Ladakh, a new problem has arisen from tourists feeding migratory birds such as the Brown-headed Gull *Chroicocephalus brunnicephalus*. Although no study has hitherto been conducted on the larger implications of this, it is obvious that human food like cookies may make these birds obese and sick. Increasing numbers of feral dogs, escalated by increasing tourism and military camps, are also taking a toll on migratory birds such as the Black-necked Crane, the eggs of which are predated by these dogs.

Climate change is also jeopardizing the long-term survival of migratory birds in the Central Asian Flyway. Rapid melting of glaciers in the mountains on the Tibetan Plateau is leading to inundation of breeding areas of migratory birds. Also with the rapid rise in temperature, many people in pastoral areas of the Tibetan Plateau resort to agriculture, because they can now cultivate high altitude areas where crops did not mature earlier due to frost. Farmers divert water from lakes and streams to irrigate their agricultural fields. Moreover, nomadic pastoralists are settling near lakes, largely to educate their children in centralized schools, exerting further pressure on the wetlands and their birds.

In order to protect the migratory birds in the Central Asian Flyway, it is of paramount importance to identify wetlands and protect them throughout the flyway. The wetlands on the Tibetan Plateau are especially important because birds need to refuel at these points to cross the Himalaya located immediately south of the plateau. Although there are numerous protected wetlands on the Tibetan Plateau, they often do not cater to the needs of migratory birds. For instance, many lakes on the plateau have been declared as Ramsar Sites or other protected wetlands according to the conservation norms in China, but these lakes are of very little use for certain types of birds. For instance, dabbling ducks, or for that matter

any duck, cannot use very deep lakes, unless they have shallow stretches. So only a small fraction, if at all, of such lakes can be used by migratory birds. Therefore, it is crucial to identify and protect wetlands of different types for particular groups of birds. For instance, it is important to identify and protect shallow wetlands with mudflats for dabbling ducks and shorebirds.

Given the mountainous terrain in the Tibetan Plateau, individually most of its wetlands are too small to be declared as protected areas or

TSEWANG NAMGAIL

Brandt's Mountainfinch is an altidudinal migrant and can be sighted at dumps and roadside eateries

Individually, most wetlands of the Tibetan Plateau are too small to be declared as protected areas or Ramsar Sites, but collectively they play a very important role in sustaining the populations of migratory birds in the Central Asian Flyway

Ramsar Sites, but collectively they play a very important role in sustaining the populations of migratory birds in the Central Asian Flyway. So they need to be collectively declared as Ramsar Sites. For instance, many migratory birds such as the Oriental Skylark *Alauda gulgula* stop and feed at very small grassy strips along water channels in Ladakh in northern India. If they do not feed on these, many would succumb to the high altitude and fail to cross the Himalayan crest, which is located immediately south of Ladakh.

Clear felling of natural forests permanently alters the habitats of migratory birds like the Great Rosefinch

In this regard, all the states in the Central Asian Flyway need to take actions at the country level first. The best practices can then be replicated in other countries within the flyway. International treaties and conventions are crucial on the larger scale, but the problem is that they often lack legal teeth, which are imperative for achieving any conservation goal. Therefore, we need to think globally, but act locally, to sustain the migratory wonder of the Himalaya-Tibetan Plateau and the Central Asian Flyway.

Conservation of Waterbirds in three Indian Coastal Wetlands

S. BALACHANDRAN
RANJIT MANAKADAN

GANESH PALLELA

Pacific Golden-Plover

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The Central Asian Flyway (CAF) is centred on one of the three major wintering areas of waterbirds in the Old World, i.e., the Indian subcontinent. Northwards, the CAF ranges through Central Asia, western China and Mongolia till Siberia, and westwards it extends into West Asia. Other than the CAF, the East Asian-Australasian Flyway is used by migrants travelling along eastern India, Bangladesh, and Andaman & Nicobar Islands to Southeast Asia and Australia, e.g., Rufous-necked Stint *Calidris ruficollis* and Spotted Greenshank *Tringa guttifer*. Some species like the Amur Falcon *Falco amurensis* also pass through the West Asian-East African Flyway while flying from north-eastern India to their wintering grounds in southern Africa.

Many species of migratory waterbirds are on the decline, and the identification and protection of the important wetlands along flyways are becoming top conservation priorities. Other than short-listing of important wetlands and protection to birds and the habitat, there is a need to undertake scientific studies to monitor the changes in the populations and habitat, as these will be important sources of information for deciding on conservation action plans. In India, BNHS has the distinction of carrying out long-term ecological studies in a number of wetlands that are crucial for migratory waterbirds, and especially Keoladeo National Park in Rajasthan, Great Vedaranyam Swamp (which falls under the Point Calimere Wildlife and Bird Sanctuary) in Tamil Nadu, Pulicat Lake in Tamil Nadu-Andhra Pradesh, and Chilika Lake in Odisha.

ORNITHOLOGICAL SIGNIFICANCE OF GREAT VEDARANYAM SWAMP, PULICAT, AND CHILIKA

The Great Vedaranyam Swamp (GVS), and Chilika on southeastern coast and Pulicat on the eastern coast are three major wetlands important for migratory waterbirds in India. These wetlands are sand-built lagoons connected to the sea through one or more openings, with freshwater inflow from rivers, especially during the monsoon season.

BNHS bird migration studies have shown that these three wetlands are interconnected in terms of bird movements of some species, with the same migratory populations using the wetlands during different periods. For example, a GVS-ringed Curlew Sandpiper *Calidris ferruginea* was later caught in Chilika, revealing that the species migrates to Chilika prior to undertaking its spring journey to its breeding grounds in Siberia. In another case, a Greater Flamingo *Phoenicopterus roseus* satellite-tagged in GVS was recorded to fly to Pulicat and back to GVS within a day! Further on, we provide more insights into the three wetlands and their waterbirds.

GREAT VEDARANYAM SWAMP

The Great Vedaranyam Swamp (349 sq. km) is situated in Nagapattinam and Thiruvarur districts of Tamil Nadu. It is the extensive mudflats spread over 200 sq. km around the lagoon (known as Seruthalaikkadu Creek) that provide feeding and roosting grounds for thousands of migratory and resident waterbirds. The western part of GVS has mangrove forests (120.2 sq. km), and the Mullipalam Lagoon (17 sq. km). During the dry season, water is generally present only in the two lagoons and adjoining areas. GVS is the only wetland in India that has been intermittently monitored for almost four decades, through bird banding and census. Studies have continued with the establishment of the BNHS's Bird Migration Study Centre at Point Calimere in 2007.

The GVS is a Ramsar Site an extremely important wintering and staging area for waterbirds of the CAF in India, supporting more than 150,000 waders during each season. Seven individuals of the Critically Endangered Spoon-billed Sandpiper *Calidris pygmaea* have been ringed between 1981 and 1990, and there are also records of another extremely rare waterbird Asian Dowitcher *Limnodromus semipalmatus* in GVS. Besides waders and resident waterbirds like egrets and herons, GVS

offers habitats for a diverse group of migratory waterbirds, especially ducks, flamingos, and terns, either on passage or wintering. Waders ringed in their breeding grounds in the Arctic tundra of Russia and in Kazakhstan and Uzbekistan have been recovered from GVS. Species ringed in GVS recovered from other countries/regions are Common Tern *Sterna hirundo* from Poland, Lesser Crested Tern *Thalasseus bengalensis* from Saudi Arabia, Caspian Tern *Hydroprogne caspia* from the Caspian Sea, Greater Flamingo *Phoenicopterus roseus* from Iran and Caspian Sea, and Curlew Sandpiper from Australia. Within India, birds ringed in Point Calimere were recovered from wetlands in northern India and vice versa, besides from Pulicat and Chilika.

PULICAT

Pulicat (720 sq. km) lies about 400 km north of the Great Vedaranyam Swamp, and is the second largest brackish-water lagoon in India after Chilika. It sprawls across the states of Andhra Pradesh and Tamil Nadu, with its portions in both the states declared as bird sanctuaries. Pulicat has 20 islands, the largest being

Top: Lime-shell mining in Pulicat Lake

Centre: Over 30,000 fishermen, spread over 50 settlements, depend on Pulicat Lake for their sustenance. Around 1,200 tonnes of fish is harvested each year. Sustainable fishing is vital if fishermen and fish-eating birds are to survive into the future

Bottom: The presence of salt works is a problem in the Great Vedaranyam Swamp, as it impacts the ecology of the wetland as a whole. However, reservoirs and low-salinity condensers of industrial salt works do benefit some species, especially flamingos and fish-eating birds

Sriharikota (181 sq. km), which serves as the base for India's spaceport, the Satish Dhawan Space Centre. During the dry season, water is generally present only in the southern lagoon part of Pulicat Lake and near the two openings into the Bay of Bengal in the northern areas. The waterbirds of Pulicat Lake have been documented by the BNHS through a number of projects from the 1990s till 2007.

A total of 60 species of waterbirds have been recorded from Pulicat, with another 23 species reported from the adjoining wetlands and heronries. Pulicat also supports six heronries, comprising 12 species, at its borders. Six species of Vulnerable or Near Threatened species occur in the Pulicat area. The Greater and Lesser Flamingo *Phoeniconaias minor* both occur in Pulicat. As for bird populations, it is difficult to arrive at estimates of waterbird species that Pulicat supports due to the vastness of the area, difficult logistics involved in reaching most areas, and due to the movements of birds that are influenced by changing water regimes. AWC counts of Pulicat Lake have ranged from a high of 83,806 in 1988 to lows of 10,000 in 1991 and 1992, but due to the reasons mentioned above, it is likely that the higher of the two figures is more correct.

CHILIKA

Chilika (1,165 sq. km) is the northernmost of the three major coastal wetlands, which is situated in Odisha state. It lies about 900 km north of Pulicat. It is a Ramsar Site and is the world's second largest brackish-water lagoon. Chilika is made up of a variety of habitats including marshes, mudflats, freshwater pools, and areas of open water of varying depths and salinity. Chilika has and important island, Nalabana, with extensive mudflats (15.53 sq. km), exposed only during the dry season (December to May), which is a magnet for waterbirds and especially waders. The waterbirds of Chilika have been documented almost without a break by the BNHS from the 1990s through a number of projects, the last of which ended in March 2017.

Chilika is known for its large waterbird congregations, mainly for the massive numbers of migratory ducks. Chilika harbours the largest congregation of both dabbling and diving ducks in India. It annually supports around 10,00,000 waterbirds, comprising more than 150 species of migratory and resident/locally migratory species. Nine threatened species are reported from the area. The extensive mudflats of Nalabana Island, when exposed, attract more than 300,000 waterbirds, and the largest concentrations of waders in the lake, besides a few thousand flamingos.

Power lines run from the mainland to the islands in Pulicat Lake, and are a threat to especially large species of waterbirds and flocking species

CONSERVATION ISSUES

Although of vital importance to waterbirds, and to the economy of local communities mainly in term of fisheries, all the three coastal wetlands are plagued by a multitude of conservation issues. This is despite most of their area (GVS and Pulicat) or a part (Chilika) being declared as bird sanctuaries, and despite the killing of birds being totally banned by various Indian wildlife protection acts. The problems faced by these wetlands range from poaching of birds, over-fishing, human disturbances, impact of salt works (GVS), pollution, siltation, decrease in freshwater inflow, choking of the lagoon mouths due to silt deposition or for other reasons, changes in aquatic vegetation, encroachments, construction of fishing jetties, building of earthen bunds and embankments for various reasons, electrocution of birds by power lines (Pulicat, since there are a number of inhabited islands within the lake), and also the likely impacts from the growth and development of bordering towns. Many of these problems are complex, some of which extend much beyond the confines of the wetlands, e.g., the issue of decreased freshwater inflow. All the changes may have resulted in diminishing or altered food resources, for example, a drastic decline has been observed, during the four decades of observations in GVS, in the highly preferred prey Chironomid larvae. The tsunami of 2004 also devastated

(Above) A Greater Flamingo marked with satellite transmitter in Point Calimere by BNHS was recorded to spend two consecutive summers in Pulicat lake, and one marked in Kanyakumari, spent one summer season in Pulicat;
(Below) Curlew Sandpiper ringed in Point Calimere was recovered from Pulicat. This indicates the importance of wetland linkage for migratory birds

large tracts of mudflats along the southeastern coast of India.

A decline in waterbird populations over the decades is clearly evident in GVS. More than 75% decline in several waders and other waterbird species has been recorded. For example, counts of around 40,000 to 50,000 Greater Flamingos in the reservoirs and low-salinity condensers of salt works in GVS were not uncommon during the early 1980s, but nowadays, sightings of more than 5,000 are rare. Similarly, more than 500,000 waders were estimated to winter in the GVS during the 1980s, but counts in the present century are less, around 150,000. The decline is especially evident in the two Arctic breeding birds, Curlew Sandpiper and Little Stint *Calidris minuta*. Similarly, the 20-year study in Chilika has revealed a clear decline in the population of all the major diving ducks. The cloud-like formations of waders and ducks in flight, noticed in the early years of our studies in GVS and Chilika, where BNHS has had a long presence, are now things of the past.

REFLECTIONS

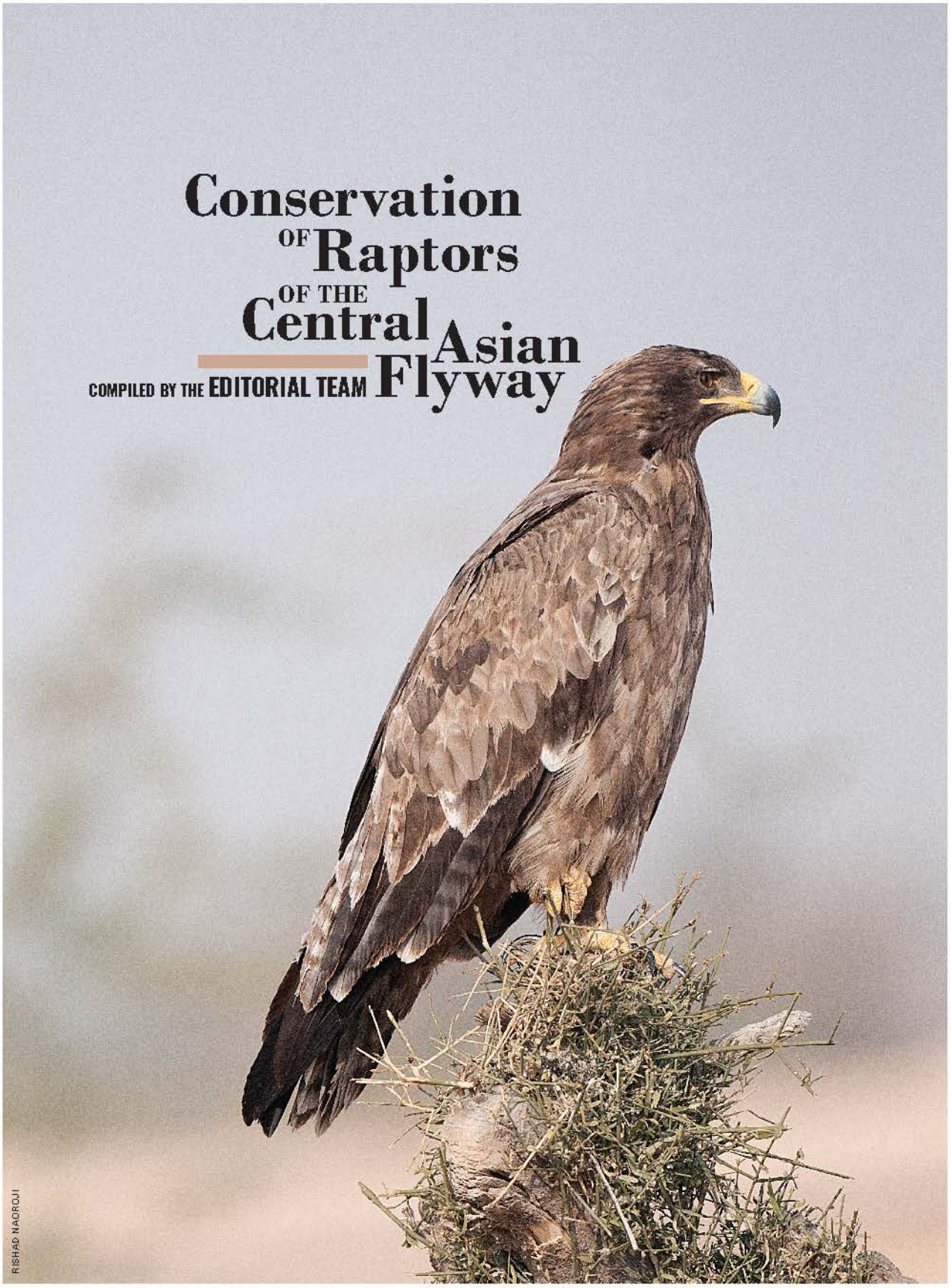
The CAF has a high representation of globally threatened species, but it has received relatively less attention from international conservation organizations with only scattered information available on the waterbirds and wetlands important for them. To add to this lacuna, many of the wetland habitats for birds in the CAF have been lost or are facing serious threats. According to a report, 50,000 small and large Indian wetlands are polluted to the point of being dead.

Hence, protecting and trying to obtain science-based databases on the majority of wetlands and waterbirds of the CAF would be difficult and a waste of effort. Instead, protection and data collection of this flyway should primarily focus on ensuring the protection of major migratory waterbird habitats. Such a conservation strategy is felt to be all the more necessary since BNHS studies have shown that despite GVS, Pulicat, and Chilika being legally protected and extremely important sites for migratory birds, they are plagued by a multitude of conservation issues, compounded with clear indications of sharp declines in many waterbird populations. These conditions can only be expected to further deteriorate with India's rapid human population increase and development, as they put severe pressures on the natural resources, even in protected areas.

The grave issues affecting migratory birds of the CAF in these three important coastal wetlands of India should also be true for many other countries of the CAF, and need to be addressed in future conferences of the CAF and Ramsar. Unless urgent action is taken to protect and improve the conditions in the major wetlands in India – leave alone the smaller ones – the day is not far when the situation of migratory birds in India will end up like that of our vultures, Siberian Crane, and Great Indian Bustard.

Conservation of Raptors of the Central Asian Flyway

COMPILED BY THE EDITORIAL TEAM



RISHAD NADIROJI

Raptors, or birds of prey, can serve as good bio-indicators of ecosystems since they form the apex of the food-chains among birds. Some among them, the vultures, are one of the most efficient scavengers of the animal world. There are around 572 species of raptors in the world, with the Indian subcontinent supporting 106 species (18%). Among these, 45 are winter visitors from lands across the Himalaya that comprise the northern part of the Central Asian Flyway.

One of the most remarkable examples of raptor migration occurring across the Indian subcontinent is in Nagaland, a stopover site for at least a million Amur Falcons *Falco amurensis* arriving from their breeding grounds in Mongolia, northern China and south-eastern Siberia, before they proceed across India to their wintering grounds in southern Africa. This is the largest concentration of a raptor species anywhere in the world. Till recently hunted in thousands in the Doyang lake area of Nagaland, a campaign in 2012 involving the local people with support of conservation organisations have been successful in stopping the illegal hunting of birds. As part of this programme, satellite transmitters were fitted on a few birds, which has helped track their movements from the breeding to wintering grounds and back.

BNHS has carried out significant studies on raptors, starting with a pioneering decade long study on raptors in the 1980s in Bharatpur through two projects, the *Avifauna* project and *Keoladeo National Park Ecology*. Subsequently, BNHS undertook another major project, *Ecology and behaviour of resident raptors with special reference to endangered species* (1990–1994) to obtain information on the distribution and status of raptors in India. Under this project, surveys of raptors were carried out in 34 protected areas in different biogeographic zones of the country to get information on status and distribution of raptors. This was followed by the following projects: *Wintering ecology of raptors in areas of*

◀ Steppe Eagle is a migratory raptor which has undergone extreme population declines within its distribution range in Europe and other parts

MEMORANDUM OF AGREEMENT FOR RAPTORS

Vultures utilize vast home ranges, frequently crossing geo-political boundaries and so international cooperation is essential to their conservation.

In November 2014, CMS Parties gathered at COP11 in Ecuador adopted CMS Resolution 11.14 - *Programme of Work on Migratory Birds and Flyways*, which established the mandate to develop a Multi-species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP), under the auspices of the CMS Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia (Raptors MoU). The mission being to bring together representatives of Range States, partners and interested parties, to develop a coordinated Action Plan for submission to CMS COP12, scheduled to be held in October 2017.

The overall aim was to develop a comprehensive strategic Action Plan covering the whole geographic ranges (at least 124 countries) of 15 species of Old World Vultures to promote concerted and collaborative international conservation actions. The species covered are: Bearded Vulture *Gypaetus barbatus*, Egyptian Vulture *Neophron percnopterus*, Red-headed Vulture *Sarcogyps calvus*, White-headed Vulture *Trigonoceps occipitalis*, Hooded Vulture *Necrosyrtes monachus*, Himalayan Griffon *Gyps himalayensis*, White-rumped Vulture *Gyps bengalensis*, Whitebacked Vulture *Gyps africanus*, Indian Vulture *Gyps indicus*, Slender-billed Vulture *Gyps tenuirostris*, Cape Vulture *Gyps coprotheres*, Rüppell's Vulture *Gyps rueppelli*, Cinereous Vulture *Aegypius monachus*, Lappet-faced Vulture *Torgos tracheliotos*, and Griffon Vulture *Gyps fulvus*.

The objectives of the Vulture MsAP are to:

- Rapidly halt current population declines in all species covered by the Vulture MsAP;
- Reverse recent population trends to bring the conservation status of each species back to a favourable level; and,
- Provide conservation management guidelines applicable to all Range States covered by the Vulture MsAP.

BNHS has extended technical support to the MoEFCC for inclusion of three Indian Gyps vultures and Steppe Eagle into Appendix – I of the CMS, which will be discussed in the CMS COP 12.

VULTURE PROGRAMME

BNHS VULTURE PROJECT

Indian Vulture

BNHS has been and is at the forefront of saving vultures in India in collaboration with MoEFCC, various State Forest Departments, Central Zoo Authority (CZA), and Royal Society for Bird Preservation (RSPB) among others. BNHS vulture conservation work involved the pioneering work in identifying the incidence and cause of their decline, highlighting the issue of their decline, carrying out research and monitoring of vulture populations, undertaking relentless advocacy work with multiple stakeholders for vulture conservation and policy intervention, and the establishment of Vulture Conservation Breeding Centres (VCBCs) at four locations (Haryana, Assam, West Bengal, and Madhya Pradesh) in India.

It has been more than a decade since the Indian Government banned the use of veterinary drug diclofenac that was responsible for catastrophic decline in vulture populations. The last census in 2015 indicates that the vulture population is not declining – it is either stable or slightly increasing. BNHS has now over 400 vultures housed in the four VCBCs, and the population continues to grow, and the time has come to release some of the captive stocks bred at the BNHS centres into the wild as was envisaged in the overall conservation breeding programme. Three in-situ sites in India for the release programme have been identified: Bunder, Madhya Pradesh, Dimow and Shivsagar, Assam, and Terai region, Uttar Pradesh (a trans-boundary project implemented in collaboration with UP Forest Department, RSPB and in co-ordination with Bird Conservation Nepal). BNHS is hopeful of starting the release of some birds into these 'vulture safe zones' sometime this year, and hope the Indian skies will again be dotted with the sight of soaring vultures.

unusual concentration (1996–1999), *Ecology of rare raptors* (1997–2001), and *Studies on the effect of environmental contamination on raptors with special reference to Shaheen* Falcon *Falco peregrinus peregrinator* (1997–1999).

A major ongoing project of the BNHS is on the resident *Gyps* species of vultures, which were till the 1980s, the most abundant large birds of prey in the Indian subcontinent. However, by the 1990s, these vultures underwent a drastic (99.9%) decline to the point of near extinction. Studies revealed that the deaths were due to birds feeding on the carcasses of diclofenac-treated cattle. To save the three resident *Gyps* populations of vultures, BNHS started a project in 2001, under which four Vulture Conservation Breeding Centres were established in India for the ex-situ conservation of vultures. It is planned to reintroduce birds bred in these facilities into 'safe zones' in the wild in the future. The mission of the programme is to save Indian vultures from extinction through an integrated approach of conservation breeding, research, monitoring, public awareness and advocacy for policy interventions. A further landmark contribution by the BNHS to the conservation of vultures was its role convincing the MoEFCC to ban diclofenac for veterinary use in 2006, which has helped to arrest decline of Gyps vulture and recovery in some areas. This should also be benefitting other raptor species, including the migratory ones that are scavengers or those that partially feed on carrion.

As with Indian species of vultures and other resident raptors, the populations of migrant raptors of the Central Asian Flyway are also on the decline since they face a multitude of threats, primarily habitat loss and degradation, illegal hunting and poisoning, collisions with aerial structures and electrocution by power lines. Migrant raptors may also be affected by the drug diclofenac, as recent studies on other species of vultures and some partially scavenging eagle species such as the migratory Steppe Eagle *Aquila nipalensis* suggest. As a step towards conservation of raptors, the Ministry of Environment, Forest and Climate Change has signed a memorandum of understanding (MoU) on March 07, 2016, for the 'Conservation of Migratory Birds of Prey in Africa and Eurasia'. This MoU, better known as the Raptor MoU, covers 76 species of birds of prey, of which

Greater Spotted Eagle (juvenile) is one of the threatened species included in the CMS Appendix I

◀ Slender-billed Vulture *Gyps tenuirostris* is one of the Critically Endangered species that has been included in the Multi-species Action Plan for conserving African and Eurasian Vultures

over 50 occur in India. There are 27 species of Indian raptors that are globally threatened (Critically Endangered, Endangered, and Vulnerable), Near Threatened and Data Deficient as per IUCN Redlist-2017. Of these, four species are included in CMS Appendix I and 14 species are included in CMS Appendix II. Out of 27 raptor species, 14 species are listed in the Action Plan for the Conservation of Migratory Birds of Prey in Africa and Eurasia amended in October 2015 (Raptor MoU). This MoU will push for conservation in collaboration with other countries which come in the migratory routes of these species.

AMUR FALCON – A SUCCESS STORY


ASAD R. RAHMANI

The Amur Falcon is a small, handsome raptor, well-known for making the arduous journey from Siberia to South Africa every year. Having one of the longest migration routes of all birds, up to 22,000 km a year, these falcons cross the Himalayan peaks, and the entire expanse of the Indian Ocean, often flying through the night. Nagaland witnesses what is probably the largest congregation of Amur Falcons recorded anywhere in the world. Almost the entire global population of Amur Falcons goes through this area in Nagaland.

In 2012, Conservation India (CI), an NGO, approached BNHS with a video showing masses of Amur Falcons, 12,000–14,000 birds every day during the peak season, being illegally trapped on the roost, plucked, and smoked for sale as food in Nagaland's Doyang reservoir area. BNHS wanted this unsustainable illegal hunting to become a national issue. The challenge was to make this an issue that the government would notice and care about.

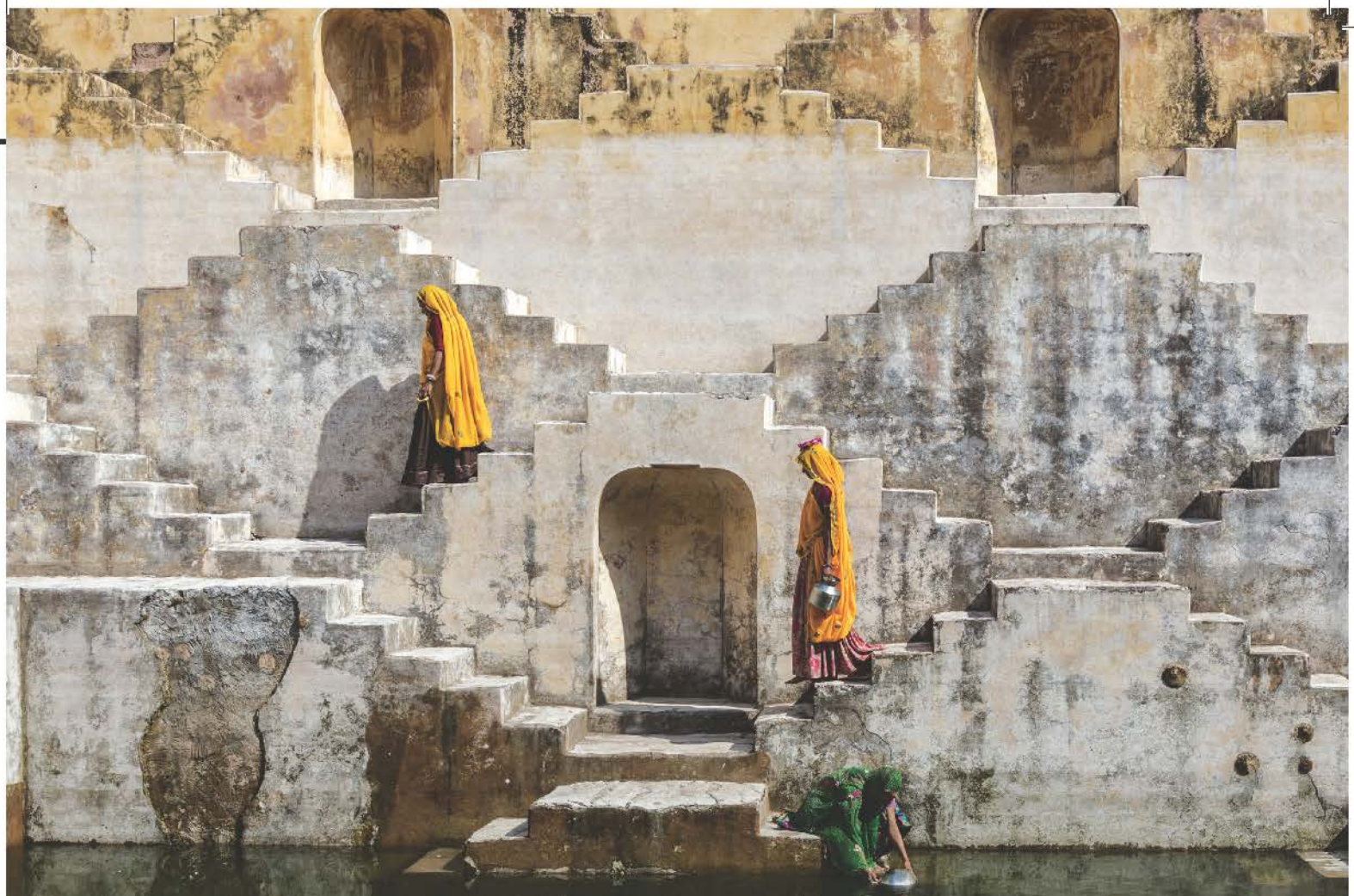
From the outset, BNHS along with other NGOs took action and coordinated a widespread campaign, primarily implemented locally by Nagaland Wildlife and Biodiversity Conservation Trust. BNHS created an advocacy policy as well as a subsequent education programme, stressing India's role in the Convention on Migratory Species and CBD. In response to the range of voices that took up this issue, the Central Government ordered fact-finding and action-taken reports.

Interviews with hunters in the region revealed that 60–70 hunting groups were organized, each setting up about 10 nets over the transmission lines, attaining an average catch of 18 birds per net, worth just about Rs. 16–25 per bird. Taking into consideration that migration periods may be longer, and hunting by other methods (shooting, catapults) had not been estimated, it became clear that the rate of decimation of the species in India was terrifying. Indiscriminate illegal hunting was being carried out of a species that was neither well-known nor on the conservation radar.

As a result of the rigorous campaign and immediate steps taken by BNHS towards conservation of Amur Falcon, active involvement of the Government was sought and secured. As a result of the rapid enforcement of law by the Government, and timely issuing of an anti-hunting order by the local government, zero trapping of Amur Falcon during the 2013 autumn migration was achieved in the very same area where massacres were happening with impunity. Amur Falcons are now treated, in the words of Nagaland's Chief Minister, as "esteemed guests". BNHS has furthered its conservation efforts for the bird with an ongoing conservation programme. We run ten eco-clubs in Nagaland and support Amur Falcon advocacy activities in Nagaland. We also support low-impact eco-tourism in Nagaland. Several trainings for teachers and community leaders have been held both for hospitality, as well as for completely stopping wild bird hunting.

The A4 iv criterion for IBAs includes sites known or thought to exceed thresholds set for migratory species at bottleneck sites. Using this criterion, BNHS has identified Dailong Rongku Forest in Manipur, and Doyang Reservoir and Pangti Forest in Nagaland as IBAs. These sites in north-east India are designated as stopover and bottleneck sites for thousands of Amur Falcons during their passage migration from their north-east Asian breeding grounds to the wintering grounds in Africa.

with inputs from Neha Sinha, Advocacy Officer, BNHS



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Importance of BIRD Ringing & Tagging

ASAD R. RAHMANI

S. BALACHANDRAN

Asad R. Rahmani, a renowned ornithologist, is currently Senior Scientific Advisor in BNHS.

It is perhaps only in India that bird ringing, marking, and tagging exercises are questioned by bureaucrats and misguided animal lovers. Getting permission to conduct these studies is a nightmare and sometimes takes months, even for an organization like BNHS which is recognized worldwide as a nodal agency in India for bird ringing. The importance of bird ringing, termed bird banding in some countries, must be understood and emphasized. Information on the new tools that have come up to study bird migration also needs to be disseminated.

The ability of birds to fly and move long distances has always fascinated humankind, almost arousing envy that we were able to somewhat overcome when the Wright brothers flew their first putative plane in 1903. Bird tagging has an interesting history. The Romans knew that some bird species fly long distances to reach home, so they used them as messengers, an older version of the telegram, email or tweet!

◀ Bird ringing and tagging help to understand the network of sites required for migratory birds like Bar-headed Geese to complete their annual cycle. Such information is required for conservation and management of migratory waterbirds and their habitats

During wars, besieged Romans used to send pigeons with letters tied to their legs asking for help or to communicate with other garrisons. In more peaceful times, the results of chariot races were relayed to various cities by colour-coded leg tags on homing pigeons. Falconers in the Middle Ages were known to mark their birds with rings and names. In the United Kingdom, the Mute Swan species was (and is still) considered a royal bird, and was marked with leg rings (or nicked), and nowadays with neck collars.

It is said that scientific ringing started in 1899 by a Dutchman, Hans Christian Cornelius Mortensen, who used aluminium rings on the European Starling *Sturnus vulgaris*. Since then, millions of birds have been ringed in the world, giving valuable data. For example, from 1909 to 2001, 30,295,091 birds have been ringed in U.K. alone. In recent years, nearly 800,000 birds are being ringed each year in UK. The British Trust for Ornithology published the findings based on the ringing data on 30 million birds in *The Migration Atlas* in 2002.

In India, the first attempt at bird migration studies was undertaken in 1927 through a small-scale bird banding programme (200 birds) by the BNHS with the Maharaja of the former Dhar State to band migrant ducks to establish their origins (he got three recoveries, as duck shooting was then a royal sport). Bird banding continued till 1934 through the financial support of a few other rulers of Indian States, and the zamindars of Sind. Though the total number of birds ringed and recoveries made were meagre, the recoveries from these exercises furnished the first positive evidence for migration of the Siberian Crane, and central and north-east Asian provenance of ducks that wintered in the Indian region.

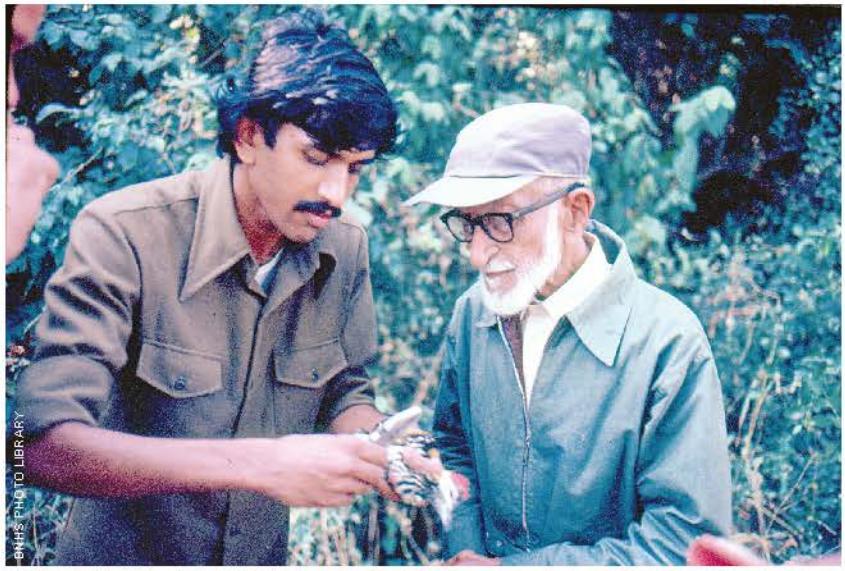
The year 1959 was significant for Indian ornithology and the study of bird migration, when the first ever organized scheme for bird banding and migration study in the Subcontinent was taken up by BNHS. During this ringing programme from 1959 to 1973 and later, from 1980 to 1992 by the BNHS with funding by the World Health Organization (WHO) and US Research and Development Group, Smithsonian Institution, US Fish & Wildlife Service and Ministry of Environment and Forests, Government of India, over 700,000 birds were ringed in India. More than 3,000 recoveries were obtained from 29 countries spanning five continents (Asia, Europe, Africa, Australia, and Antarctica). Based on these recoveries, the breeding zones, migratory routes, and stopover sites of more than 40 species were well documented. The information obtained through these intensive studies was pivotal in delineating the boundaries of East-Asian, Australasian, Central Asian, and African Eurasian flyways.

Though the recoveries obtained through the ringing programmes provided a profile of the migrations in and out of the Subcontinent for some species, especially for ducks and some waders, we are still unable to pinpoint the migratory routes and pattern of many waders, terns, cranes, and passerines. A limitation with bird ringing is that the ringed birds need to be recaptured in order to obtain data on their movements. This becomes a tremendous strain on finances, and is difficult to implement due to the need to have long-term bird banding field stations and trained personnel to handle birds.

Catching a bird and tagging it with a numbered aluminium ring is not enough – it is the recovery or recapture that is important. Technically speaking, by recovery/recapture, we mean that the bird is killed or found dead (recovery) or caught again (recapture) and released. From this data, we may get to know how far the bird has travelled, the routes it has taken, how many years it has survived, besides a host of other information.

Bird ringing, to me, is one of the most absorbing and satisfying ornithological studies. I still remember my first bird, a male Oriental Magpie-Robin *Copsychus saularis*, that I ringed in 1980 in Point Calimere under the supervision of the late Mr. S.A. Hussain. To see the ringed bird flying away from your hand gives you the satisfaction that you have added a drop of data/information into the ocean of ornithological knowledge. Besides telling us about bird movement and migration, ringing gives us a host of information that is not possible without having a bird 'in hand'. Under the able guidance of Mr. Hussain in Point Calimere, we were taught how to take measurements of beak, tarsus, wings, and tail, how to weigh the bird, how to record data on moult and brood patch stages, and how to age the bird. Every such nugget of information adds to our knowledge of a species. For example, if we have a large sample size of ringed birds of a particular species, we can know from it the adult-juvenile ratio, and the annual recruitment rate. The presence of a brood patch gives us information on its breeding status.

Scientific ringing studies were started by the BNHS in 1959



S. Subramanya with Dr. Sálim Ali examining a ringed bird in Keoladeo National Park in 1980

The weight of the bird varies from season to season and from area to area. It is also a useful indicator of the health of an environment. How? It has been shown by many studies that in a healthy environment, birds are heavier than those living in suboptimal habitats. In small birds, this difference can be just a few grams, but this can determine whether the bird will survive or not. In migratory birds, weight difference can be remarkable, sometimes up to 20% in different seasons. When they arrive in October/November in India, after covering thousands of kilometres, they are thin and lean as they have used up the stored fat for flying. They must feed sufficiently to regain weight to survive, and for this, need prime habitats with plenty of food resources. Imagine the fate of a Northern Pintail *Anas acuta* arriving in an Indian wetland choked with water hyacinth or heavily polluted. Will it find its favourite submerged vegetation to regain its normal weight? Or, of a Lesser Whitethroat *Sylvia curruca* reaching a village forest that has felt the impact of pesticide spraying from nearby crop fields. Will it find insects to satiate its hunger after flying 5,000 km non-stop?

While some birds fly non-stop from their breeding areas to wintering areas, most birds have stop-over sites where they rest and eat. For small birds, such as stints, plovers, and curlews, these stop-over sites are crucial for their

Dr. Rahmani ringing a Bar-headed Goose in Ladakh

Intesar Suhail, Wildlife Warden of Ladakh, with staff releasing a Bar-headed Goose after putting a neck collar

survival. Even if one critical stop-over site is destroyed, they may not be able to complete the journey and may die of hunger and exhaustion. That is why a string of protected areas is necessary along major flyways or pathways. To know which areas are important for migratory birds and need protection, we need to carry out indepth and systematic migration studies using the latest techniques/technologies – good science results in good conservation.

Not many decision makers appreciate the importance of bird migration studies, as data reveals. In 50 years of bird ringing in India, BNHS has ringed over 700,000 birds only, while this number is ringed each year in UK. Besides permission requirement to catch birds, there are a few other reasons for our low total output, but let us stick to the permission issue. Some chief wildlife wardens are extremely helpful and know the value of bird ringing or tagging, so getting permission is easy. However, others create hurdles, sometimes in the name of animal welfare. There is no institutional mechanism that allows serious researchers and organizations to take up bird ringing/tagging/ marking on a long-term basis. Ringing permission depends on the authority of the person at the top. A chief wildlife warden once told me that BNHS has done enough ringing, so there was no need to carry out more ringing exercises. Another agreed to give permission with a rider to catch only five pairs of each species! Ringing, marking and tagging of wild animals are now well-established methods in wildlife research, and their necessity and importance can hardly be questioned.

Let us assess the information we could get from bird ringing. BNHS has published a simple INDIAN BIRD BANDING MANUAL by Dr. S. Balachandran, one of the finest bird ringers in the world and among India's leading ornithologists, a standard book for any ringer in India. During ringing, we use the BNHS ringing proforma sheet to note down various parameters, such as the ring number and size used; scientific name of bird; place, district and coordinates of the ringing site; date and time of ringing; sex (if there is sexual dimorphism); age (juvenile, first year, second year, adult); weight; beak, tarsus, wing and tail measurements; moult pattern; brood patch – present or absent; and any abnormality if present. Utmost care is taken to ensure that the birds are not harmed during the trapping, ringing, and data recording processes. Once done, the bird is released. More information is gathered on its recovery or recapture. Once the bird is recaptured from the same site or recovered live from other sites in India or in other countries (by BNHS or other organizations ringing birds), all the parameters are recorded again to know if there are any changes. If the bird is recovered dead (shot/killed

A Black-necked Crane with colour-rings and PTT in Ladakh

by a hunter/trapper or due to other reasons), it is the end of the game for that individual, but even a dead ringed bird provides data on its survival rate, longevity, and some indications of its migration. For example, if a Curlew Sandpiper *Calidris ferruginea* ringed by BNHS is found dead in South Korea, we know that it moves between these two countries. A Lesser Flamingo *Phoeniconaias minor* chick, rescued and ringed in Lake Magadi, Kenya in 1962, was found dead in Lake Bogoria, Kenya on February 13, 2013 after 50 years! Can we get such information without ringing birds?

If we carry out systematic and long-term bird ringing at a site, it has the potential to provide us with data on site fidelity, survival and population dynamics of species. There are also statistical packages that help in estimating the population size of a species by the mark-recapture method, provided there are sufficient sample sizes for the species. To put it in a nutshell, a whole new window of scientific discovery is opened up by long-term and large-scale ringing. Here it will not be out of place to mention Wytham Woods, a 375 hectare forest belonging to Oxford University, UK, where studies on Great Tit *Parus major* and Blue Tit *Cyanistes caerulelus* have been going on since 1947. Every individual had/has been marked with numbered and coloured rings, as a result of which the life history of each tit can be traced to several generations. Many theories on behavioural ecology, social ecology, population dynamics, and survival rates of birds have originated from these long-term studies.

Additionally, when a bird is caught for ringing, we can also do a health check, take blood samples for genetic and disease surveillance studies, and study its parasite load. Many countries have such multi-pronged approaches to bird ringing, to study migration, health, and disease surveillance, among others.

Bird migration can also serve as a great tool for environmental education, involving local communities, decision makers, researchers, and school children in bird ringing operation. The data generated result in heightened environmental awareness. The gleeful expression of a child after releasing a ringed bird makes a good cover story. Even the worst sceptic becomes convinced once she/he has seen professionally done bird ringing, for which BNHS is so famous all over the world.

Bird ringing has to be large-scale to get any meaningful results, because the recovery/recapture rate is very low, i.e. less than 1 percent. This is even lower in smaller birds which occur in larger numbers or/and have short life spans. For instance, if we have to get 100 recoveries of migratory Eastern Orphean Warbler *Sylvia crassirostris* that winters in India (wintering areas not clearly known) or Common Teal *Anas crecca,* we have to ring at least 10,000 individuals of each species. Moreover, the recovery rate decreases each year as the ringed birds die a natural death. That is why long-term regular ringing is required in India, as is being done in many countries such as UK, Germany, USA, Japan, Taiwan, and Spain. Small-scale irregular bird ringing does not give good results. Another important aspect of bird ringing is to have multi-country bird ringing programmes on major flyways. A bird ringed in India caught by a Mongolian scientist provides migration data to both countries. This way, bit by bit, we can interlace the strands in the puzzle of bird migration.

Although there is no good substitute for bird ringing, many scientists now use markers such as neck collars or wing tags. However, neck collars and wing tags can be deployed only on large birds. Neck collars are particularly unsuitable for birds with small neck, such as raptors. Wing tags or patagial tags with numbers are generally used in larger raptors, vultures, storks, and bustards. Colour-coded neck collars with numbers have been very successfully used by Mongolian and Russian scientists on Bar-headed Goose *Anser indicus.*

The use of leg tags or flags is another methods to track the movement of

long-legged waders, and are used in addition to metal rings. Colour code and numbers can be easily read by observers, and reported to the researchers who had deployed these tags.

Geolocators are miniature archival light-level loggers (also known as GLS tracking or Geologgers) for tracking birds. Geolocators record ambient sunlight over a very long period. From this recorded information, the areas that the animal visited can be determined. This low-cost technology is being used successfully to aid conservation efforts by tracking annual migration. Seabirds, waders, wildfowl, passerines, land birds, and seals have all been successfully tracked using geolocators.

New methods are constantly being developed to study bird movement. In the latest issue of *Bird Conservation International*, a prestigious journal published by BirdLife International, I was amazed to read about the rare Slender-billed Curlew *Numenius tenuirostris* that no one has seen since the last bird was sighted in Morocco in 1995. The Slender-billed Curlew is very similar to the more common Eurasian Curlew *Numenius arquata* and Whimbrel *Numenius phaeopus*. So, there are chances that a few remaining Slender-billed Curlews may be moving about with their common cousins. In order to find out where they nest or originate from in the vast northern latitude, scientists used stable isotopes from the feathers of 35 Slender-billed Curlew museum specimens. "These atoms are tiny traces of the environment (such as food or water) that are transferred into body tissues when the bird consumes them, and subsequently become a part of the bird's feathers as they are formed. By studying the isotopes from juvenile specimens – that is to say, young birds at the breeding site preparing to embark on their first migration – staff at Iso-Analytical, a laboratory specializing in isotope analysis, were able to calibrate their findings with existing large-scale isotope ratio maps from across the world, allowing the team to discover where these young birds first grew their feathers," writes Alex Dale (BirdLife International webpage: April 18, 2017). The study concludes that scientists were looking for Slender-billed Curlew in the wrong places (breeding areas) all these years, and instead, they should have searched in the vast steppes of Kazakhstan and southern Russia to find this mysterious bird.

Leg tags or flags are another method to track the movement of long-legged waders like the Great Knot

However, the best way to study the actual movement of long-distance migrants is through satellite tracking, also called PTT (Platform Transmitter Terminal). Through satellite tracking, we can get hourly, daily, twice a day, or weekly data of the location of the bird (data delivery depends on how the devise has been programmed). The only problems are that it can be used only on larger birds (the smallest PTT is 3.5 gm), and it is expensive. There is another article (see pp. 80–86) on satellite tracking in this issue so I will not go into detail.

Climate change and habitat destruction are changing the migration patterns of birds. Ringing, colour marking, satellite tagging, geolocators, GPS locators, and now isotope studies have given scientists new tools to study bird movements. India with its talented and committed wildlife scientists should be the leader of groundbreaking new technology. Precise information of bird movements will not only help us design better networks of Protected Areas and Important Bird and Biodiversity Areas (IBAs), but will also help us to be better prepared for the uncertainties of climate change. This will also aid in the control of avian diseases that threaten the multi-billion rupee poultry industry. For all this to happen, we have to catch and tag millions of wild birds – unless some of the new technologies/devices discussed or those that may be made available in the future are adopted. As to how? This is a multi-billion question for which I have no answer!

REPORTING BIRDS WITH RINGS AND COLOUR BANDS

In India, in addition to the traditional methods of marking birds with metal rings, BNHS has adopted the method of colour banding. As more people are becoming aware of the significance of reporting information on colour-banded birds, interesting information is being reported from all over the migration routes in the past two years. The observation data are the key to mapping the migration routes between breeding grounds, stopover points, and wintering grounds, as well as behaviour like mate pairings and family structure.

For colour marking, different coloured plastic bands with alpha-numeric inscriptions are used. Neck-collars, leg bands, leg flags, wing tags, and nasal saddles are used for ducks and geese. Coloured plastic leg bands inscribed with letters are used for the larger birds, like storks, cranes, egrets, and flamingos. Coloured leg flags are used for waders. A different colour or fixing position of the colour flag on the leg indicate different countries/regions and specific sites.

A Bar-headed Goose fitted with a neck collar and ready for release in Chilika

BNHS has already created sighting databases for colour banded birds. Besides scientists and researchers, many birdwatchers, BNHS-Indian Bird Conservation Network (BNHS-IBCN) members, wildlife photographers, students, and interested public are also reporting sightings of colour banded birds to BNHS. An individual each of Bar-headed Goose and Greylag Goose neck-collared in Pong Dam, Himachal Pradesh by the BNHS were sighted in Vadhavana wetland, Gujarat in subsequent years. Three colour-tagged Curlew Sandpipers, one from Point Calimere and two from Chilika, were sighted in Bohai Bay in Shanghai, China during return migration. In the case of birds tagged outside the Indian region, Great Knots tagged with leg flag in Sakhalin Island, Russia and Chongming Island, China were sighted in Kakinada, Andhra Pradesh. Another from Chongming Island was sighted near Palghar, Maharashtra. Bar-headed Geese fitted with neck collars in China and Mongolia were sighted in the wetlands of the Indian peninsula and south to Koonthankulam in southern Tamil Nadu. These sighting records reported by ornithologists, photographers, and interested citizens have yielded very important and interesting results on waterbird movement, and have established links between migratory birds wintering in India and breeding/refueling areas.

Through this platform, everyone is invited to contribute sightings of colour-banded birds to BNHS. If you see any birds with colour markings, please report your observations to BNHS at bands@bnhs.org. The format to be followed for reporting banded birds is given on the facing page. BNHS will be setting up a dedicated web page on the BNHS website to report sighting records of banded birds shortly, to maintain a coordinated common database for sighting records. All observers who report sightings of banded birds to BNHS will receive available information, like where and when the bird was banded, within a period of one month.

MOBILE APPLICATION (APP) FOR REPORTING COLOUR-BANDED BIRDS

BNHS in collaboration with the Mangrove Cell, State Forest Department, Government of Maharashtra, is developing a mobile application to report sightings of banded birds. This App will have a one-time registration page; once registered, the pages that follow will provide options to report sightings of birds with metal rings, colour leg flags, colour leg bands, neck collars, and wing tags. It will support uploading of photographs and video clips of the colour-marked birds observed. The App will be available for download from the BNHS website shortly.

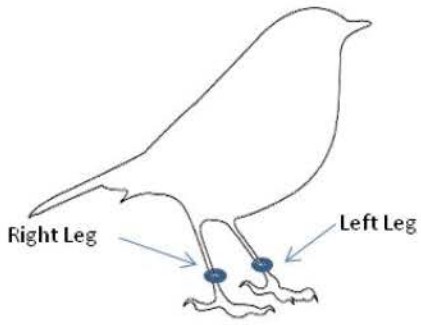
BAND DETAILS FORM

Bird Name / Species _____

Bird Record Location Name _____

Latitude _____ Longitude _____ Landmark _____ District _____

State _____ Date of Observation _____



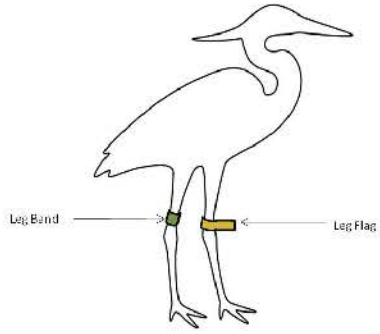
Metal Ring on: ☐ Right Leg ☐ Left Leg

Number/Letter Inscribed _____

Ring Location: ☐ Above knee (Tibia) ☐ Below knee (Tarsus)

Bird Status (Alive/Dead/Injured/Trapped) _____

Further Information on Bird Condition _____



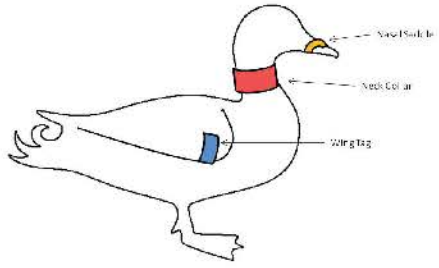
ANY ADDITIONAL TAGS

☐ Leg flag ☐ Neck collar

☐ Wing tag ☐ Leg band

☐ Nasal saddle ☐ Satellite transmitter

☐ Geolocator



Tag Colour _____

Tag Inscription _____

Leg tag on Right/Left Leg _____

Further Information on tag _____

Additional Information on Bird sighting (Species composition, habitat, weather) _____

OBSERVER'S CONTACT DETAILS

Name/s of Observer _____

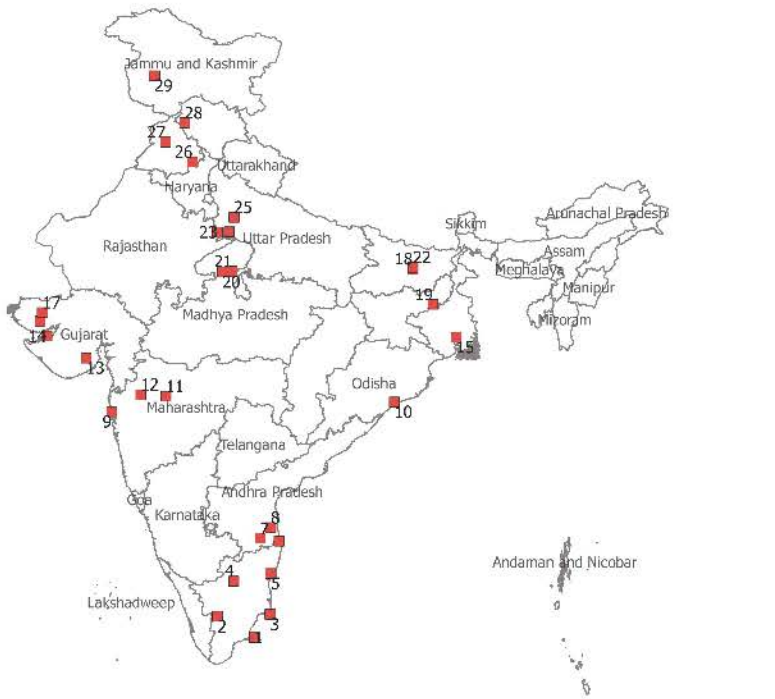
Contact Number/s _____ E-mail Address _____

coming soon

INDIAN BIRD MIGRATION ATLAS

BNHS has a long history of undertaking bird migration studies in India, and is still the only organization carrying out long-term and intensive bird banding and associated studies in the Indian subcontinent. The bird banding exercises of BNHS over the years (since 1927) have resulted in the ringing/banding of more than 700,000 birds, comprising both waterbirds and terrestrial birds. Around 3,000 ringed birds were recovered from sites other than the ringing site, located in 29 countries spanning five continents (Asia, Europe, Africa, Australia, and Antarctica). These recoveries have helped to delineate the boundaries of the Central Asian Flyway.

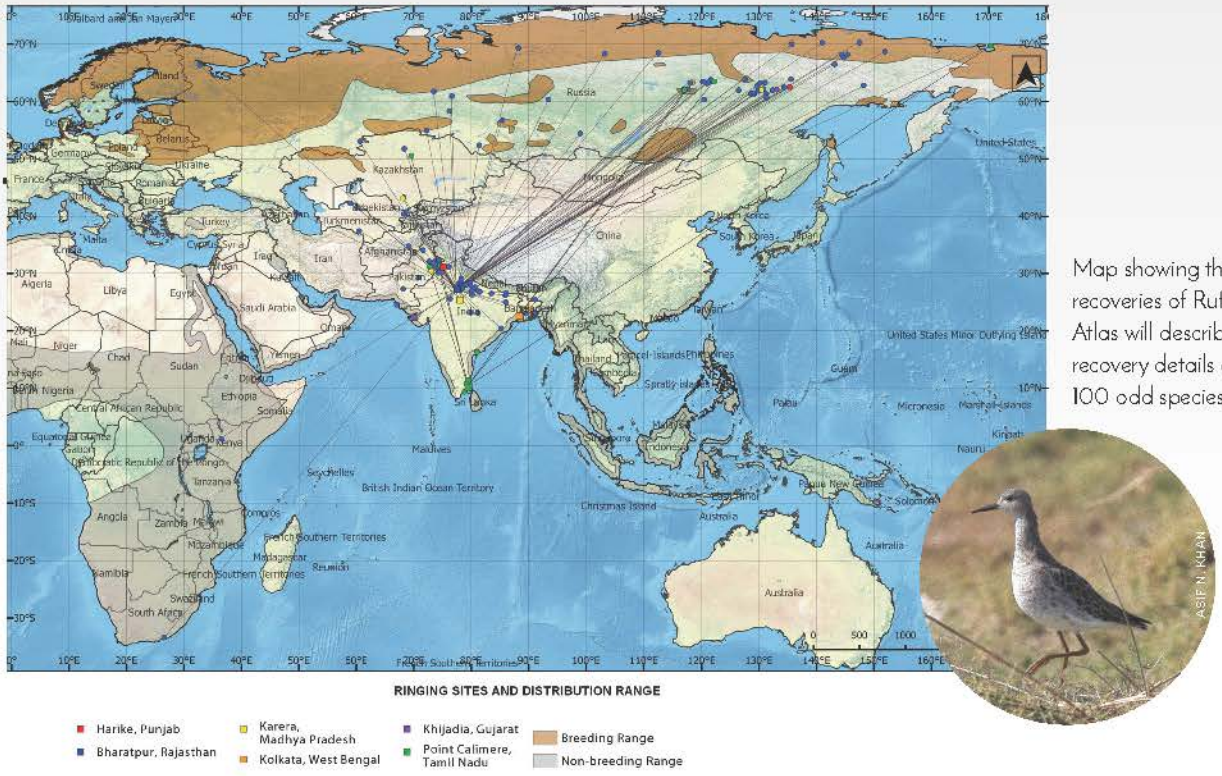
In addition to the traditional methods of marking birds with metal rings, BNHS has in recent years, adopted the more recent methods of tagging birds with colour-flags and neck-collars. In more recent years, BNHS has started undertaking satellite-tracking projects of migratory species, viz., ducks, geese and flamingos. Unlike bird ringing, satellite telemetry can track species throughout their journey, and provided comprehensive information on the routes taken, stopover sites, duration of stay at stopover sites, the pathways for northward and southward passage migration, and most importantly, provide on the connectivity between the networks of habitats used in the migratory pathway for each species, which are of conservation importance.



Sr No	Ringing Location	State
1	Mandapam	Tamil Nadu
2	Palni Hills	Tamil Nadu
3	Point Calimere	Tamil Nadu
4	Yercaud	Tamil Nadu
5	Kaliveli Tank	Pondicherry
6	Pulicat Lake	Andhra Pradesh
7	Tirupati Hills	Andhra Pradesh
8	Gudur	Andhra Pradesh
9	Borivali	Maharashtra
10	Chilika Lake	Odisha
11	Daulatabad	Maharashtra
12	Nandur Madhmeshwar	Maharashtra
13	Khijadiya	Gujarat
14	Pirotan Island	Gujarat
15	Kolkata	West Bengal
16	Bhuj	Gujarat
17	Chhari Dhand	Gujarat
18	Manjhaul	Bihar
19	Manihari Jheel	Jharkhand
20	Madhav National Park	Madhya Pradesh
21	Karera	Madhya Pradesh
22	Khabra Tal	Bihar
23	Bharatpur	Rajasthan
24	Agra	Uttar Pradesh
25	Shekha Aligarh	Uttar Pradesh
26	Patiala	Punjab
27	Harike	Punjab
28	Pong Dam	Himachal Pradesh
29	Hokarsar	Jammu & Kashmir

To give special focus on migration studies, in 2009, BNHS established the Bird Migration Study Centre at Point Calimere in Tamil Nadu to serve as the headquarters for the Society's bird migration studies. One of the missions of the Centre since its establishment was to bring out an atlas of migration of Indian birds based on all the ringing recoveries of the various projects undertaken, which has seen fruit with this publication INDIAN BIRD MIGRATION ATLAS. The publication also includes discussions on the findings of satellite-tracking studies on 'Indian birds' undertaken by BNHS and other organizations.

A publication of this nature, besides its contribution to Indian Ornithology, would provide, in a nutshell, ornithologists and amateur birders information on their breeding origins, migration routes, stop-over sites and wintering sites of some of the



Map showing the recoveries of Ruff. The Atlas will describe recovery details of 100 odd species

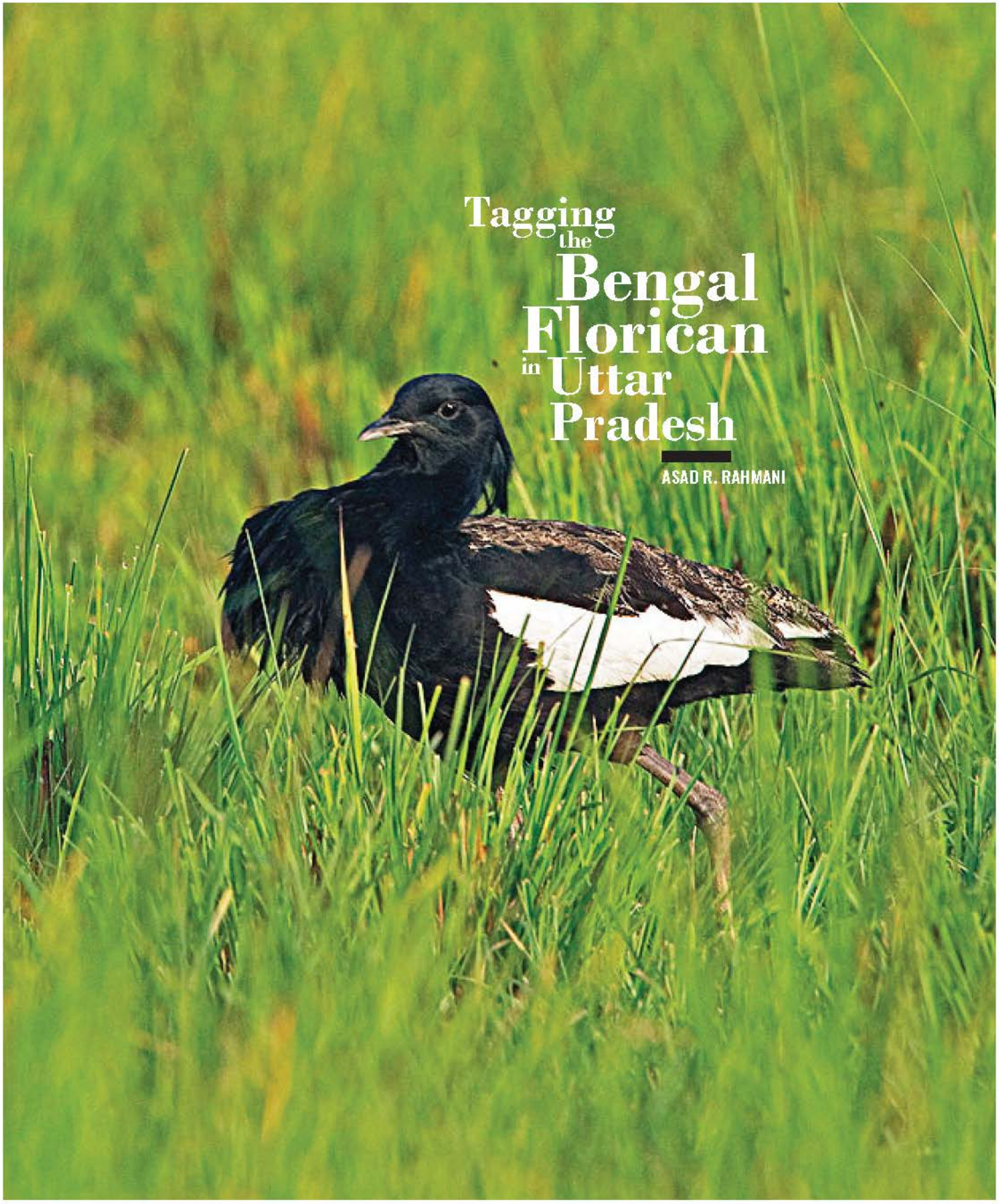
bird species migrating into the Indian subcontinent. The publication will also be of immense value for aiding conservation of migratory birds and their habitats within and outside the boundaries of the Indian subcontinent.

IMPORTANT FINDINGS

- The recovery zones for some species such as Common Teal *Anas crecca* and Common Pochard *Aythya ferina* indicate that there are several breeding populations wintering in India.
- Recoveries, neck collar, and satellite tracking studies of Bar-headed Goose *Anser indicus* confirmed its leap-frog migration, with the southernmost wintering population summering in the northernmost breeding ground.
- Individuals of duck species ringed together were recovered either from the same site or nearby sites within a few days, which showed the existence of flock fidelity (same flock migrating together).
- The presence of migratory population was identified in House Sparrow *Passer domesticus*, a species which was perceived to be sedentary. Similarly, the presence of migratory population in Grey Heron *Ardea cinerea*, Eurasian Spoonbill *Platalea leucorodia*, and Large Egret *Ardea alba*, was established through recoveries.
- East-West migration was established by two recoveries made for Black-headed Bunting *Emberiza melanocephala*. One was recovered to the east of Black Sea and other in Cyprus, Greece. A Rosy Starling *Sturnus roseus* ringed in Hungary was recovered from Lahore, Pakistan.
- Ruff *Calidris pugnax* has an extensive range above as well as below the equator. This species was recovered from the former USSR (Russia, Kazakhstan, Tajikistan, Uzbekistan, and Turkmenistan), Indian subcontinent, and one bird each in Kenya and South Africa. (see Map).
- Satellite tracking studies showed that a Ruddy Shelduck *Tadorna ferruginea* fitted with a satellite transmitter at Pong Dam had taken a circuitous route of 12,000 km, going northward and crossing the Taklamakan Desert from and to the breeding ground, though a straight route could have easily taken just 560 km.

DHRITIMAN MUKHERJEE

A male Bengal Florican



Tagging the Bengal Florican in Uttar Pradesh

ASAD R. RAHMANI

Asad R. Rahmani, a renowned ornithologist, is currently Senior Scientific Advisor in BNHS.

Ever since I read about the findings of a satellite tracking study on a Wandering Albatross *Diomedea exulans*, in *Nature* in 1990, I was keen that BNHS tag a few Great Indian Bustards *Ardeotis nigriceps* and Bengal Floricans *Houbaropsis bengalensis* to know where they wander in the non-breeding season. The results from satellite tracking become available as soon as the bird is released after tagging – unlike bird ringing/banding.

Studying the movements of birds by placing numbered rings on their tarsus is a method that is now more than 100 years old. For ringing, called banding in some countries, we have to recapture/recover the bird to know how far it has travelled and how long it has lived. Ringing does not provide data on the exact movement patterns of a bird, which is important in birds, which may travel hundreds or even thousands of kilometres in a year. Conventional radio telemetry using very high-frequency (VHF) tags, popularly called radio collars, deployed on large mammals overcame this problem, but had limited use in birds. Firstly, radio collars are heavy, and secondly, they have limited range. They can be used on species with limited movements. Moreover, there are other constraints such as hilly terrain or dense vegetation, where receiving signals and following animals is often difficult. Satellite tracking, popularly known as PTT (Platform Transmitter Terminals), turned out to be the answer.

Satellite tracking offers greater details about animal migration routes, wintering ground, home range, behaviour, and habitat selection. Initially, PTTs were quite heavy, weighing up to 60 gm, so obviously, they could be deployed only on large birds such as albatross, cranes, pelicans, storks, and geese, because the weight of a satellite tag should be less than 3% of the weight of the bird so as to not burden it. But now, the smallest PTT weighs 3.5 gm, vastly increasing the scope of studying the movement of smaller birds.

The Bengal Florican is one of the most threatened bustard species of the world. Since 2008, BirdLife International and IUCN have listed it as Critically Endangered, due to its very small and declining population. It is listed under Schedule I of the Indian Wildlife (Protection) Act 1972. A hundred years ago, the Bengal Florican was common in the alluvial grasslands (*terai*) of many parts of north India, Nepal, and the Brahmaputra valley of Assam. Presently it is found only in well-protected areas such as Kaziranga, Manas, and Orang in Assam, Dudhwa, Kishanpur, and Pilibhit in Uttar Pradesh, D'Ering Wildlife Sanctuary

in Arunachal Pradesh, and Sukla-Phanta, Royal Bardia, and Chitwan in Nepal. Occasional birds are reported from Laokhowa-Burachapori, Dibru-Saikhowa National Park, and river islands in Assam, and some private grasslands in Arunachal Pradesh. Earlier it was found in grasslands in Meghalaya, but we do not have any recent record, as is the case of Jaldapara in West Bengal. The Bengal Florican is probably extinct in West Bengal. Besides the Indian region, it is also found in Nepal, while a different subspecies survives in Cambodia.

During the 1980s, detailed studies were conducted by BNHS scientists in Uttar Pradesh and Assam on the biology and behaviour of the Bengal Florican. However, its movement outside the breeding area was not known because sightings of birds could not be obtained once they left the area or stopped displaying. Therefore, there was an urgent need to understand the movement pattern and dispersal of the species for devising better conservation strategies.

The Bengal Florican is normally solitary in the breeding season, but up to six males may come together for short periods, and often two females may visit the same patch of grassland. Most of the adult males become territorial in the breeding season, while a few remain non-territorial, probably due to lack of suitable grasslands. Good territories are at a premium and adult male floricans fight for them. This bird appears to favour relatively open short grasslands (0.5–1 m tall), sometimes with patches of tall grass and scattered bushes. The major grass species are *Imperata cylindrica*, *Saccharum bengalense*, *Phragmites karka*, *Vetiveria zizanioides*, and *Desmostachya bipinnata*, with or without scattered small trees. Shorter grassland appears to be favoured for foraging and displaying. However, seek shelter in tall grass during the heat of the day. Females, which are difficult to see, probably spend much of their time in tall grass, together with males outside the breeding season.

In India, BNHS scientist Dr. S. Balachandran, with an international team, has deployed PTTs on nearly 160 individuals of 12 species of ducks and Bar-headed Goose from 2008. In Uttar Pradesh, under avian surveillance programme, four Bar-headed Goose were trapped and deployed with PTTs in Sur Sarovar Bird Sanctuary near Agra. More recently, two Bar-headed Goose and two Black-necked Crane


NIKHIL SHINDE


NIKHIL SHINDE

DHRITIMAN MUKHERJEE

Left Top : The late Carl D'Silva (with hat) with his dummy

Left Bottom: Asad Rahmani putting PTT on a Bengal Florican

Right Top: Asad Rahmani holding the Bengal Florican before release (L-R): Carl D' Silva, Sikander (back), Ali Hussain, and Mohit Kalra

Right Bottom: Releasing the Florican after tagging
Inset: The tagged Bengal Florican flying away

THE BENGAL FLORICAN

SMAR AJIT OJAH

A female Bengal Florican

The male Bengal Florican has a spectacular flight display that, usually takes place in an open patch in its territory. Once aroused, it fluffs up the head, neck, and breast feathers. Just before taking the jump, it inflates the breast pouch even further, draws the head further back, and lowers the body by bending the legs partly. The bird springs forward at an angle of about 45°. A loud and rapid wing-flapping sound is made while ascending and on reaching its apogee 3–4 m high, and this is where the flapping stops and the wings are opened, displaying the glistening white wing feathers vividly against the jet black body. Then it delivers its sharp, whistle-like *chip-chip* call. It glides down a metre or two, moving forward on open wings, with the pouch drooping under the breast and the head thrown back. Just 1–2 m above ground, it begins to flap its wings again and moves forward, regaining the lost height. During the display flight, it covers anything between 20–40 metres ground and takes 6–8.5 seconds from take-off to landing. It calls four to seven times while in the air.

The female Bengal Florican is far more shy and secretive, and is known to visit a male territory only briefly to mate and forage. Females usually lay one to two eggs directly on the ground, among thick grass. The eggs are glossy, olive-green flecked with purple-brown, and are incubated for 25 to 28 days by the female. The males provide no care for the chicks. Chicks are capable of walking, running, and feeding by themselves shortly after hatching, and they leave the nesting site within two days with their mother.

The Bengal Florican is a large bird, the size of a domestic hen, of 66–68 cm height with longish legs. The male has mostly black head, neck, breast, and underparts, with back dark brown, heavily mottled and vermiculated, and with bold black arrowhead marking. Elongated plumes overhang the breast, more visible before and during display. Wings are largely white with black primaries. Female and juvenile male have overall rufous-buff, sandy buff, and brown back mottled with bold black arrowhead marks. No glistening white on wings, instead buffish-white wing coverts. The female also has two brown bars on the wings, visible in flight.

The Bengal Florican lives in short wet grasslands and is essentially a cursorial bird, but it is capable of long flight. Its food consists of insects, grasshoppers, beetles, ants, occasionally lizards and small snakes, grasses, flowers, shoots, berries, and seeds, depending on availability.

were studied through satellite tracking in Ladakh, J&K. As I was involved in the last two projects, I was confident that we would be able to successfully tag the Critically Endangered Bengal Florican *Houbaropsis bengalensis*. And, in 2013, we were sanctioned a major project titled 'Studying movement pattern and dispersal of the Bengal Florican: A Satellite Telemetry Pilot Project', funded by the Ministry of Environment, Forest and Climate Change. BNHS was also part of another project on the same species funded by Darwin Initiative for the Survival of Species, UK. This project covered India and Nepal, and was initiated by Royal Society for the Protection of Birds (RSPB), a BNHS partner in various projects on threatened bird species. BNHS and RSPB are both partners of BirdLife International, and work together to save species.

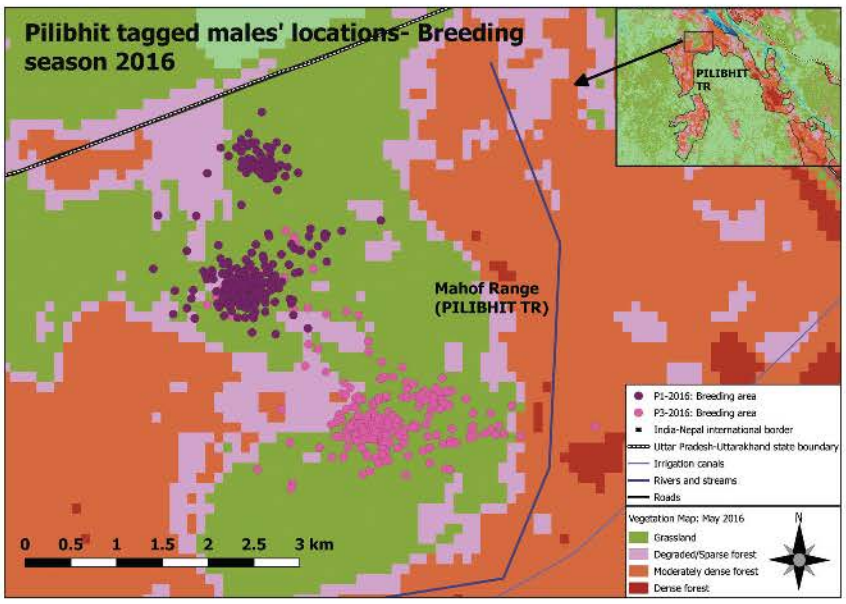
When I explained the importance of studying the post-breeding movements of Bengal Florican to Dr. Rupak De, Chief Wildlife Warden of UP, he at once gave us permission to tag four birds. Dr. De has a doctoral degree in forestry science, and was Field Director of Dudhwa National Park, when I had the privilege to work with him in the early 1990s. I must put on record that the UP Forest Department has been extremely supportive of wildlife research, and I never had any problems in getting permission. I wish this positive attitude is replicated in all other states. We need more research work on threatened species and neglected habitats for taking better conservation decisions.

Before attempting to catch such a rare species, I had to train a few researchers to study the local movements of the species. Fortunately, we got a dedicated researcher, Nikhil Shinde, who soon picked up field

craft. We studied the florican for many months in Pilibhit Reserve Forest, now a Tiger Reserve. Nikhil located five adult territorial males in Pilibhit, but by the time we could assess the birds' local movement sufficiently, the monsoon started and the 'florican season' was soon over, as the grass became too tall. We had to wait for one year. Meanwhile, I asked the late Carl D'Silva to prepare life-size models of male and female Bengal Florican, which he did with tremendous skill. In April 2014, Carl and I went to Lucknow to show the models to Dr. De and other officers. The models impressed them, but alas, we could not replicate the aerial display of a live florican!. Meanwhile, the legendary BNHS bird trapper Ali Hussain, and his apprentice son, Sikander, were already in the field.

When I reached Pilibhit, Nikhil showed me four male territories and the exact areas where the males spent most of their time, advertising to passing females. Reaching the site at 2:00 p.m. on a hot afternoon in mid April, Ali Hussain spread his noose traps around the decoy male florican. As soon as the territorial male of that area saw the 'intruder' in its kingdom, it came flying/running for a fight, only to get caught in strategically placed nooses. Deploying the PTTs took less than ten minutes. Interestingly, the decoy was not as effective for the next two birds that we caught in ten days. Why was one bird attracted and fooled by the dummy so easily, while the other two were not? I have no answer. The three tagged birds gave us valuable data on their post-breeding movements outside the protected area, which is given in the final report of the project that we published in 2017, which is available in the BNHS library.

Unfortunately, in 2014 Nikhil left the project, but we got a got replacement



Breeding season movement of tagged male Bengal Florican

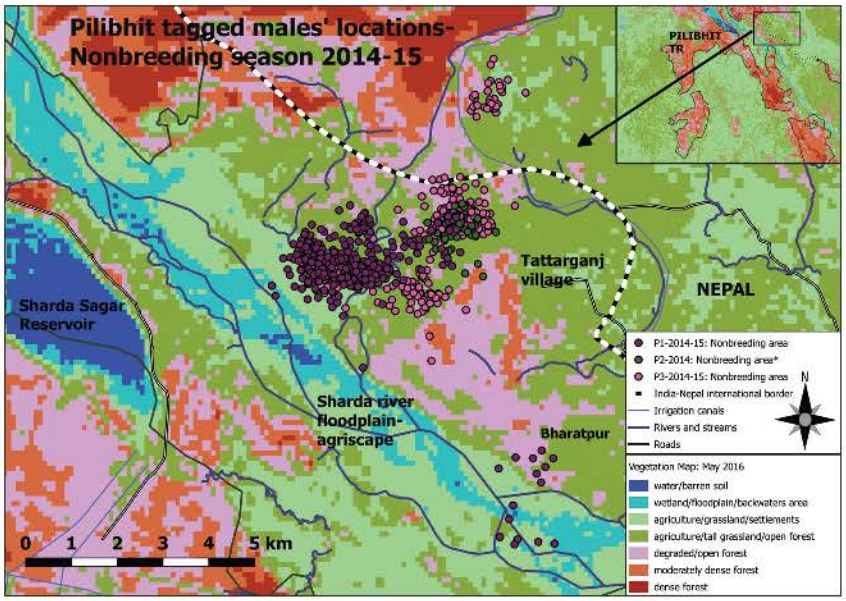


Illustration showing the movement of tagged male Bengal Floricans outside the breeding season

in the form of Rohit Jha. For the next three years, Rohit diligently followed the two tagged birds – the transmitter of one bird stopped working after three months while it was outside the protected area. Rohit tagged one more bird in Dudhwa in 2015, so we collected breeding and post-breeding movement data of three Bengal Florican males for three years. At the same time, our colleagues in Nepal tagged seven birds, so collectively, we have data on ten PTT tagged Bengal Florican. In Nepal, Ali Hussain showed his dexterity in catching the birds in Sukla Phanta, a protected area close to the Indian border.

Some of the highlights of the results are: Bengal Floricans show high site fidelity, i.e. they come back to the same

breeding and wintering areas year after year; they spend almost six to seven months outside protected areas; they are always on the lookout for short-grass or low crop habitat, suggesting the need for habitat management interventions they are safe in protected areas, but probably not when they are in a mosaic of crops and fallow fields outside the breeding season; they have a high adult survival rate (so we have to study why their numbers are going down – perhaps there is a problem in the breeding areas); if the problem is in the breeding areas, we must re-examine the current management practice of grassland burning.

We were not able to tag any females in India, so there is still lack of information on them. Do the females also winter in the same area as the males, or go elsewhere with the fledged chicks? Is nesting impacted by late grass burning? Has local extinction and/or decrease of wild herbivores changed the grass structure and composition, affecting nesting success? Is the chick survival rate sufficient to maintain the population?

Like any other good science, our studies on tagged Bengal Floricans threw up as many questions as they gave answers! Ours was practically a pilot study. There is a need to tag at least 10 more Bengal Floricans, male and female, in UP, and perhaps the same numbers each in Assam and Arunachal Pradesh, to solve the mysteries of the Bengal Florican's lifecycle. If we know why they have decreased despite good habitat protection in PAs, appropriate conservation interventions can be initiated.

IN A NUTSHELL

- The Central Asian Flyway (CAF) covers a large continental area of Eurasia between the Arctic and Indian Oceans and the associated island chains.
- Central Asian Flyway (CAF) area is spread over 34,089,399 sq. km over 30 Range states
- Over 300 migratory species use the CAF
- CAF covers at least 279 migratory waterbird populations of 182 species, of which 29 species are globally threatened and Near Threatened
- Sixteen out of the 30 countries encompassed by the CAF are located in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)
- Besides geographical overlap there is also a substantial overlap in species between CAF and AEWA. Out of the 279 migratory waterbird populations in the CAF, over 50% (145) are covered by AEWA
- 17 species are included in Appendix I and 103 species in Appendix 2 of Convention on Conservation of Migratory Species (CMS)
- For details read: www.cms.int/en/legalinstrument/central-asian-flyway and the links therein

Central Asian Flyway Action Plan for the Conservation of Migratory Waterbirds and their Habitats

The Central Asian Flyway Action Plan sets the agenda for enhanced regional environmental cooperation among the Range States to promote the conservation of migratory waterbirds and their habitats. It builds on and complements actions that are being undertaken by national governments to promote conservation. In addition, it builds on and complements programmes and actions that are being undertaken by various international conventions (including CMS, AEWA, Ramsar and CBD), development agencies (including UNEP, UNDP, World Bank and Asian Development Bank), and international NGOs [including BirdLife International, International Crane Foundation (ICF), World Conservation Union (IUCN), World Wide Fund for Nature (WWF), and Wetlands International] to promote regional and national cooperation and conservation action.

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MANGROVE FOUNDATION

Established in September 2015, the Mangrove and Marine Biodiversity Conservation Foundation works towards conservation of coastal and marine biodiversity and improving the livelihoods of the coastal communities through conservation-linked and ecofriendly interventions. The Primary objectives of Mangrove Foundation are: To promote sustainable livelihood opportunities, cultural heritage and community resilience of local communities particularly fisher folk in the coastal areas of Maharashtra through awareness generation and capacity building programmes.