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सत्यमेव जयते

LiFE Lifestyle for Environment

Azadi Ka Amrit Mahotsav

G20 भारत 2023 INDIA वसुधैव कुटुम्बकम् ONE EARTH • ONE FAMILY • ONE FUTURE

Celebrating the

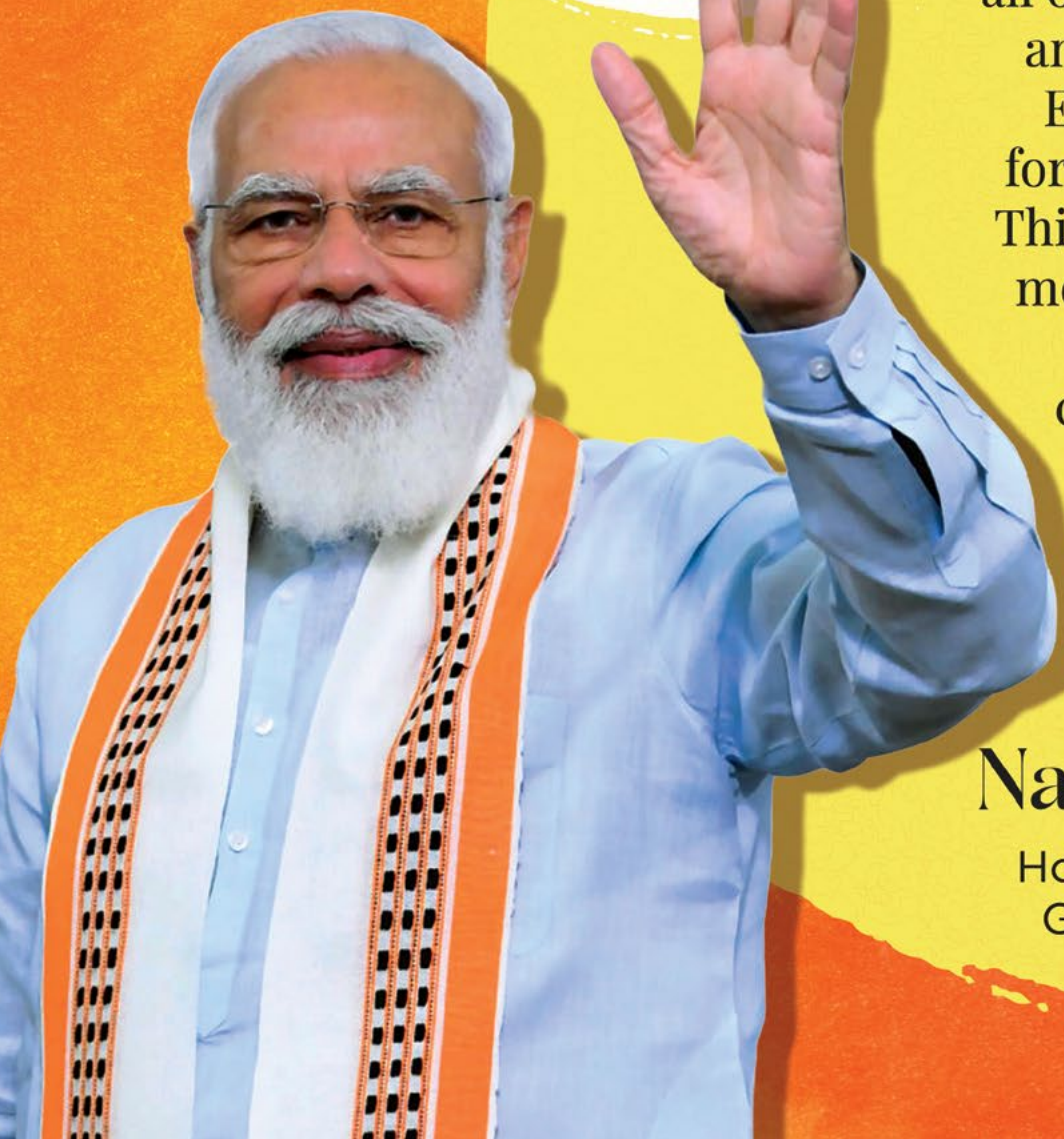
100th

Episode of

Mann Ki Baat

Scheduled to be broadcast on

April 30, 2023



“Today, there is a need for all of us to come together and take Lifestyle For Environment (LiFE) forward as a campaign. This can become a mass movement towards an environmentally conscious lifestyle.”

Shri Narendra Modi

Hon'ble Prime Minister, Government of India

We in India have respected and revered nature for thousands of years. With just 2.4% of the world's land area, we harbour 8% of all recorded species and are recognized as one of the 8 centres of origin of cultivated plants. Several hundred species of wild crop relatives are also distributed all over the country.

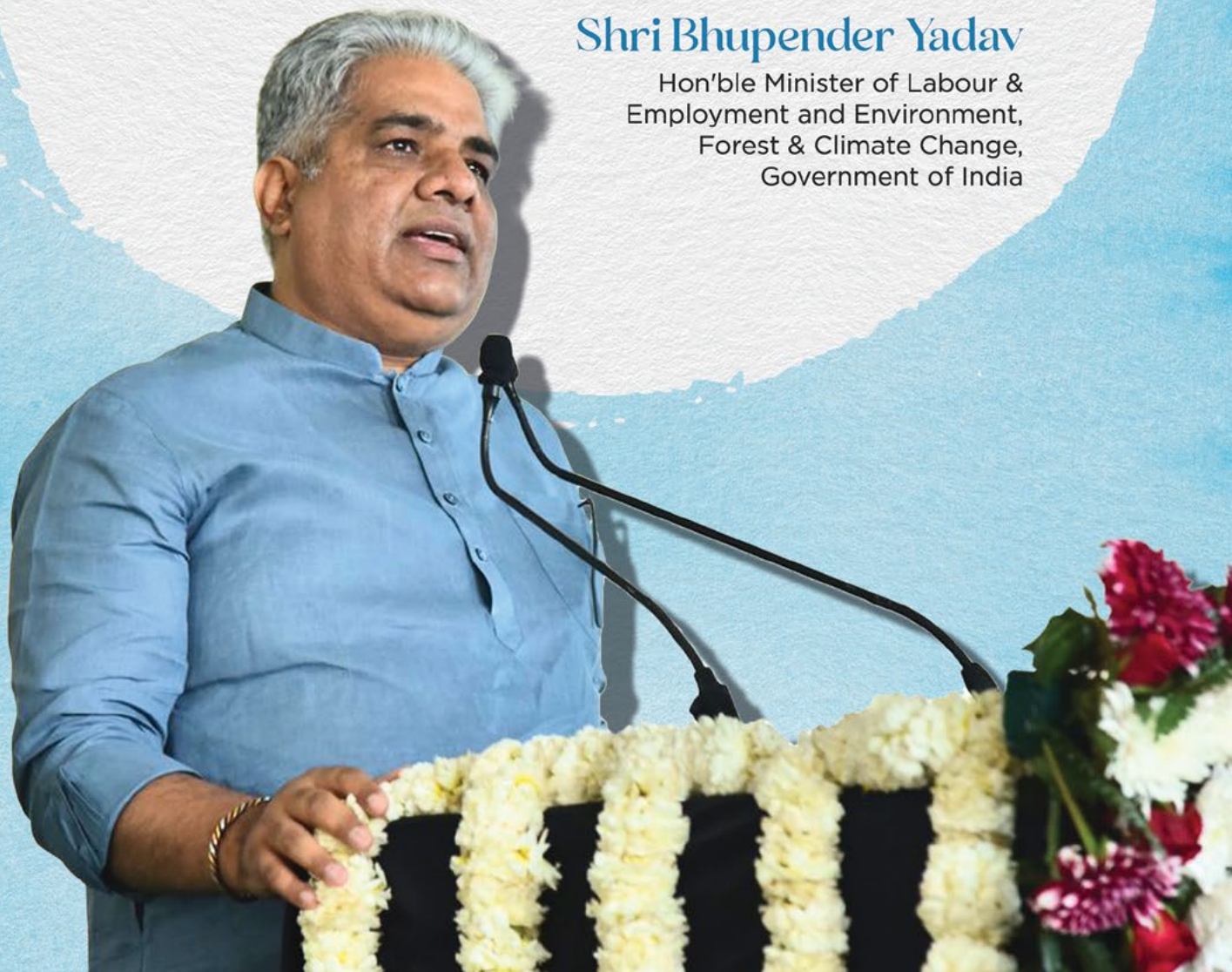
Mainstream biodiversity across all sectors in order to conserve nature, reverse its loss and to secure a healthy planet for our current and future generations.

Ensure that benefits of biodiversity conservation flow to the poor and resource-dependent communities, who are the true custodians of biodiversity and

Put nature, climate and 'One-health approach integrating animal, environmental and human health' into the core of our Post COVID-19 recovery and 'Atma Nirbhar Bharat' strategy.

Shri Bhupender Yadav

Hon'ble Minister of Labour & Employment and Environment, Forest & Climate Change, Government of India



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From the Director's Desk

It is indeed a pleasure for me to bring out the special issue of the Zoological Survey of India E-Newsletter dedicated to 'Biodiversity Conservation and Mann ki Baat' to the wide spectrum of readers, commemorating the 100th episode of Mann ki Baat. Hon'ble Prime Minister of India in several episodes of 'Mann Ki Baat' spoke on the need of being compassionate and kind to all the living beings on this planet and strongly advocated people's participation in conserving India's rich biodiversity. In his speeches, he quoted that India is committed to safeguarding its biodiversity which is native, endemic, threatened as well as migratory in nature and advocated that conserving the environment has been central to our cultural heritage that we have learnt from our ancestors. Being the pioneer taxonomical institution on faunal communities, the Zoological Survey of India (ZSI), under the Ministry of Environment, Forest and Climate Change, the Government of India took the initiative to bring a special issue of ZSI E-Newsletter focussing on some of the important issues related to biodiversity in 'Mann ki Baat'. Overall, it has been observed that there has been a positive trend post every "Mann Ki Baat" speech by the Hon'ble PM on topics involving the conservation of biodiversity.

This special issue includes five generic articles focusing on the following themes: Status, Diversity and Distribution of Migratory Birds in India; Status and Diversity of Waterfowls in Kaziranga National Park, India; Biodiversity assessment of faunal diversity of Sultan ki Baoli applying e-DNA analysis; Prioritizing conservation of transboundary species with cross-cutting network and multilateral dialogues; & the hunting practice of different tribes in Arunachal Pradesh: Impacts and conservation efforts.

This special issue includes five generic articles focusing on the following themes: Status, Diversity and Distribution of Migratory Birds in India; Status and Diversity of Waterfowls in Kaziranga National Park, India; Biodiversity assessment of faunal diversity of Sultan ki Baoli applying e-DNA analysis; Prioritizing conservation of transboundary species with cross-cutting network and multilateral dialogues; & the hunting practice of different tribes in Arunachal Pradesh: Impacts and conservation efforts. I would also like to mention that ZSI also published a special issue of Records of the Zoological Survey of India, including four scientific articles from ZSI (Migration of Birds and their flyways in India, Cavefishes of Meghalaya, Faunal Composition of Ramsar Wetlands from India: An analysis & Increase of Waterfowl Abundance in Kaziranga National Park, India) and two scientific articles from the National Centre for Sustainable Coastal Management, Chennai (Synergetic effects of marine litter and climate change in coastal and marine ecosystems & Removal of marine litter and its impact along the coast of India).

I am grateful to Shri Tammay Kumar, IAS, Additional Secretary, MoEFCC, New Delhi, for all his support and encouragement. I wholeheartedly appreciate the hard work of the entire ZSI Mann ki Baat Team for their dedication and collective team efforts, to bring out the publications on time.

Jai Hind

Dr. Dhriti Banerjee

Director
27th April 2023
Kolkata

Status and Diversity of Waterfowl in Kaziranga National Park, India

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A spectacular view of Kaziranga National Park, Assam, India.
(Photo Credit: Dr. Mayur Bawri)

Introduction

Kaziranga National Park is a wildlife sanctuary located in the northeastern state of Assam in India. The park spans over 1,302 km^2 and is famous for being home to the one-horned rhinoceros, an emblem of conservation in India. The park's landscape is predominantly flat, with a gentle incline from east to west and south to northwest, creating a haven for a vast array of flora and fauna. One of the park's most remarkable features is the recent surge in the waterfowl population, including ducks, geese, and swans. The waterfowl serve as critical indicators of the overall health of the wetlands and are a vital food source for predators such as tigers and leopards. Conservationists attribute the increase in the waterfowl population to habitat restoration, conservation efforts, and changes in weather patterns. The wetland ecosystem of Kaziranga is crucial to the flourishing of the waterfowl population, and conservationists are tirelessly working towards its protection and preservation.

The park is recognized as an Important Bird and Biodiversity Area (IBA) by the Bombay Natural History Society and BirdLife International. Recent studies have identified around 521 species of birds in Kaziranga, including 62 globally threatened and near-threatened species, making it one of the most critical IBAs in India. The park plays a significant role in the conservation of grassland-obligate species, including the critically endangered Bengal Florican, Slender-billed Babbler, Black-breasted Parrotbill, and Marsh Babbler. The park's ever-changing landscape is brought on by the shifting course of the Brahmaputra River and soil erosion, creating a wonder to behold. Every year, the park experiences the incredible force of nature as floods ravage its land for days on end. However, areas along the base of the Karbi Anglong plateau, standing tall and untouched by the floods, create natural highlands. The park's captivating oxbow lakes, also known as 'beels,' are remnants of former river channels, forming the park's defining characteristic, spread throughout its landscape. As some of these lakes have silted up, they have formed swamps and marshes, resulting in the growth of tall grass and a decline in areas of short grass. This change in the park's landscape has created a perfect habitat for a myriad of waterfowl and grassland-obligate species, including the critically endangered Bengal Florican, Slender-billed Babbler, Black-breasted Parrotbill, and Marsh Babbler. Conservationists and wildlife enthusiasts have been working tirelessly to protect and conserve the wetland ecosystem, recognizing that the waterfowl serve as an essential indicator of the overall health of the ecosystem and are crucial prey for predators such as tigers and leopards. The rise in the waterfowl population

is a positive sign, and the continued success of conservation efforts will be crucial for the future of Kaziranga National Park. The park is a must-visit destination for any nature lover, with its breath-taking landscape, oxbow lakes, and wetland ecosystem creating the perfect habitat for a wide range of flora and fauna, including the magnificent waterfowl. As we continue to protect and conserve this unique ecosystem, we can look forward to the continued growth and success of the park's incredible biodiversity.

Waterfowl at Kaziranga National Park

The ethereal realm of waterfowl, where feathered creatures of grace and elegance rule the aquatic landscapes with poise and dexterity, is a testament to the beauty of nature. With webbed feet as their instruments of motion and waterproof plumage as their armour of buoyancy, waterfowl epitomize the perfect fit for their watery habitats. From the majestic swans and cranes to the agile ducks and herons, these avian species are a living examples of adaptation and survival. Waterfowl serve a crucial role in maintaining the ecological balance of wetland ecosystems, where they thrive in their aquatic domains. As they are highly sensitive to changes in the environment, they act as reliable indicators of the overall health of their habitats. These birds are also an essential link in the food chain, serving as vital sustenance for predators such as tigers, leopards, and other carnivorous animals.

Amidst the natural wonders of India, Kaziranga National Park stands out as a prime example of a location where waterfowl reign supreme. The park is a sanctuary for the majestic Bar-headed Geese Anser indicus, with over 20,000 waterbirds residing in the park's waterbodies and riverine areas. Kaziranga National Park boasts a vibrant and diverse avian population, with more than 521 species of birds recorded, including over 200 resident and migratory species. The residents of the park are an exquisite collection of avian species, whose beauty and elegance can only be described as ethereal. Among these are the elegant Spot-billed Pelican *Pelecanus philippensis,* the stately Lesser Adjutant *Leptoptilos javanicus*, the elusive Swamp Francolin *Francolinus gularis*, the rare Bengal Florican *Houbaropsis bengalensis*, the regal Pallas's Fish-eagle *Haliaeetus leucoryphus*, the majestic Greater Grey-headed Fish-eagle *Icthyophaga ichthyaetus*, the striking Black-necked Stork *Ephippiorhynchus asiaticus*, the melodious Bristled Grass-warbler *Chaetornis striatus*, the elusive Marsh Babbler *Pellorneum palustre,* and the exquisite Black-breasted Parrotbill *Paradoxornis flavirostris*.

The avian residents of Kaziranga National Park are not only an integral part of the park's vibrant birdlife but also serve as a testament to the park's ecological health. The Eurasian Coot, with 50,432 individuals, topped the list of the park's most abundant species, followed by the majestic Bar-headed Goose with 7,860 individuals and the enchanting Common Teal with 4,667 individuals. These numbers are a testimony to the abundant and thriving population of waterfowl in Kaziranga National Park. Ultimately, the world of waterfowl is a magical and enchanting realm where grace, elegance, and adaptability combine to create the perfect balance in nature. Kaziranga National Park stands out as a prime example of a location where these feathered creatures thrive, adding to the vibrant tapestry of the park's ecological diversity. With their beauty, elegance, and crucial role in maintaining the ecological balance, waterfowl are indeed a wondrous sight to behold.

Status and Diversity of waterfowl at Kaziranga National Park

Behold, the magnificent Kaziranga National Park and Tiger Reserve - a true haven for waterbirds and a sight to behold! The latest waterfowl census conducted by KNPTR authorities in February 2021 has revealed an unprecedented surge in the number of waterfowls and winter migratory birds visiting the reserve, a clear indication of the park's thriving ecosystem. This astounding census counted a whopping 93,491 birds from 112 different species belonging to 22 families across 52 wetlands in KNPTR, marking an astonishing increase of 175% from the previous year's count of 34,284 birds. The Laokhowa-Burhachapori Wildlife Sanctuary witnessed the most significant surge, with the number of birds increasing from 9,244 to a stunning 71,902.

The family Anatidae, consisting of ducks and geese, accounted for the highest number of species, with a staggering 26 species recorded. The top three species counted by number were the magnificent Eurasian Coot with 50,432 individuals, followed by the resplendent Bar-headed Goose with 7,860 individuals, and the delightful Common Teal with 4,667 individuals. Of the 112 waterfowl species found in Kaziranga, 58 are migratory species visiting the area from different parts of the world, including Europe, Central Asia, and East Asia. Despite the awe-inspiring increase in the number of waterfowls and winter migratory birds visiting KNPTR, the census revealed some concerning issues that need immediate attention to ensure the long-term conservation of the park's ecosystem. The area under wetlands (beels) in KNPTR has declined from 8.5% of the total area to 6.7% between 1967 and 1997, underscoring the need for effective habitat management and conservation measures. In conclusion, the surge in the number of waterfowls and winter migratory birds visiting the KNPTR is a testament to the park's thriving ecosystem and successful conservation efforts. However, the concerning issues highlighted in the census should not be taken lightly, and the KNPTR authorities must continue to implement effective habitat management and conservation measures to maintain the park's biodiversity and ecological balance. With continued efforts, this wondrous reserve will continue to thrive and mesmerize us with its beauty and biodiversity.

Reasons for the increasing population

The upsurge in the population of waterfowls and migratory birds in Kaziranga can be ascribed to the multifaceted conservation initiatives and effective habitat management measures implemented by the Kaziranga National Park and Tiger Reserve (KNPTR) authorities. The park has undertaken several conservation programs aimed at preserving the natural habitat and creating an ecosystem conducive to the survival and proliferation of waterfowl species. The park authorities have paid special attention to the maintenance and restoration of wetlands, which serve as critical breeding and nesting sites for resident waterfowl. Wetlands are essential ecosystems that support a diverse range of flora and fauna, and provide crucial ecological services such as water purification, flood control, and carbon sequestration. Nonetheless, wetlands are under constant threat from anthropogenic activities like land and restore the wetlands in the park. This involves dredging and desilting of the beels to enhance their water retention capacity and improve water quality. The park has also instituted measures to curb the spread of invasive plant species that can outcompete native plants and diminish the biodiversity of the wetlands. Additionally, the park authorities have been stringent in enforcing anti-poaching laws and conducting regular patrols to deter poachers, as hunting and poaching have been identified as major threats to the survival of waterfowl and migratory birds. The park has also implemented awareness and education programs for local communities to sensitize them to the importance of conservation and the need to safeguard wildlife.

Moreover, the park authorities have taken steps to mitigate human-wildlife conflicts in the park. Human activities like grazing, fishing, and farming can cause habitat destruction and displacement of wildlife. Therefore, the park authorities have implemented sustainable livelihood programs and provided compensation for damages caused by wildlife to reduce such conflicts. However, the third waterfowl census discovered siltation, erosion, fragmentation of 'beels,' and the presence of invasive species in the wetlands. These issues could have detrimental effects on the park's ecosystem, and immediate action is imperative to address them. Overall, the increase in the population of waterfowls and migratory birds in Kaziranga can be attributed to the concerted efforts of the park authorities towards conservation and effective habitat management. The remarkable surge in the number of waterfowls and winter migratory birds visiting the park is a positive indication that the conservation initiatives have yielded fruitful results. However, the challenges posed by anthropogenic activities cannot be overlooked, and it is crucial for the park authorities to remain committed to their conservation efforts and implement robust measures to safeguard the park's biodiversity and ecological balance.

Threatened birds of Kaziranga National Park

The Kaziranga National Park is renowned for its remarkable avian diversity, encompassing a significant proportion of India's threatened and near-threatened bird species. The park is home to an impressive 62 out of the 192 threatened and near-threatened bird species present in India. This noteworthy statistic serves to underscore the importance of the park in bird conservation and highlights the vital role it plays in the preservation of regional biodiversity. Of particular note are the seven critically endangered bird species found within the park's boundaries, including the Bengal Florican, Baer's Pochard, and White-rumped Vulture, among others. Kaziranga is a vital refuge for these species, which face immense pressure from habitat loss, poaching, and other anthropogenic threats. Additionally, Kaziranga is home to six endangered bird species, including the Great Knot and the Pallas's Fish Eagle, both of which face significant population declines due to habitat degradation and fragmentation. The presence of these threatened and endangered bird species serves as a poignant reminder of the importance of protected areas such as Kaziranga National Park in safeguarding the future of biodiversity.

Moreover, Kaziranga also provides sanctuary to 19 vulnerable bird species, including the Lesser Adjutant and the Pale-capped Pigeon. The continued presence of these vulnerable species in the park emphasizes the urgent need to maintain and enhance the park's conservation efforts to ensure their long-term survival. The conservation of Kaziranga's threatened bird species is a vital endeavor that requires ongoing and sustained investment in habitat restoration, anti-poaching measures, and community engagement. By safeguarding the park's biodiversity, we can ensure that the generations to come can appreciate the beauty and ecological importance of the region's avifauna.e generations can continue to marvel at the beauty and diversity of the natural world.

The rare and threatened avian species such as White-rumped Vulture *Gyps bengalensis* can also be spotted in the park. It is a medium-sized (about 85 cm in length) vulture with a silvery bill, dark body, greyish shine on the wings, white back, and a distinct white collar around the neck. It is a resident species, found in open areas and near human settlements.
(Photo Credit: Anil Kumar)

Conclusion

Kaziranga National Park, a vital conservation area for a diverse range of bird species, has emerged as a beacon of hope for bird conservation in India. The park's success in protecting and conserving waterfowl, an essential component of the wetland ecosystem, is an encouraging sign and is indicative of the effectiveness of its conservation efforts. The park's designation as an Important Bird and Biodiversity Area underscores its importance as a critical site for avian conservation in the region. Despite facing numerous challenges such as human encroachment, habitat loss, and poaching, the park management has implemented a range of measures to ensure the survival of threatened and near-threatened bird species. The park's success in conserving the Indian one-horned rhinoceros and the Asian elephant is also a testament to the effectiveness of its conservation efforts.

The importance of Kaziranga National Park as a critical site for bird conservation in India cannot be overstated. The park's rich avian diversity and its vital role in maintaining the balance of the ecosystem make it an essential area for bird conservation. Continued support for conservation efforts in the park is crucial to the survival of many threatened and near-threatened bird species and other wildlife. With ongoing conservation efforts, Kaziranga National Park will remain a beacon of hope for bird conservation in India and a vital contributor to the overall health of the region's ecosystem.

A panoramic view of Brahmaputra River, Assam. It is the backbone of the ecosystem of Kaziranga National Park and its rich flora and fauna. This National Park is the major digestion of winter migratory birds in North-east India.
(Photo Credit: Anil Kumar)

A mixed species flock of Ruddy Shelduck *Tadorna ferruginea* and Northern Shoveler *Spatula clypeata.* Both species can be observed in large flocks in the park during winter.
(Photo Credit: Anil Kumar)

A mixed winter migratory species flock. Species such as Common Pochard *Aythya ferina*, Tufted Duck *Aythya fuligula*, and Eurasian Wigeon *Mareca Penelope* are frequent winter migrants of the Kaziranga National Park.
(Photo Credit: Anil Kumar)

Northern Pintail *Anas acuta* is a common winter migratory bird that can easily be spotted in the park and adjoining localities. It breeds in the northern areas of Europe and across the Palearctic and North America, and winters in many parts of the southern hemisphere and equator.
(Photo Credit: Anil Kumar)

Large wintering flocks of Bar-headed Geese *Anser indicus* can be easily spotted in the Kaziranga National Park.
(Photo Credit: Anil Kumar)

Lesser Adjutant *Leptoptilos javanicus* is often seen in the park and adjoining grasslands. It is a widespread species found from India through Southeast Asia to Java and belongs to the family Ciconiidae, having a bare neck and head. It is closely associated with wetland habitats.
(Photo Credit: Anil Kumar)

Bronze-winged Jacana *Metopidius indicus* is a resident species often seen in the park area.
(Photo Credit: Anil Kumar)

Striated Grassbird *Megalurus palustris* is a resident species often seen on the tall grasses in the park.
(Photo Credit: Anil Kumar)

Ferruginous Duck *Aythya nyroca* is a common migratory bird, while Baer's Pochard *Aythya baeri* is rarely seen. Both species have quite a similar appearance in large flocks. However, on the basis of the colouration of head, both can be identified.
(Photo Credit: Anil Kumar)

Status, Diversity and Distribution of Migratory Birds in India

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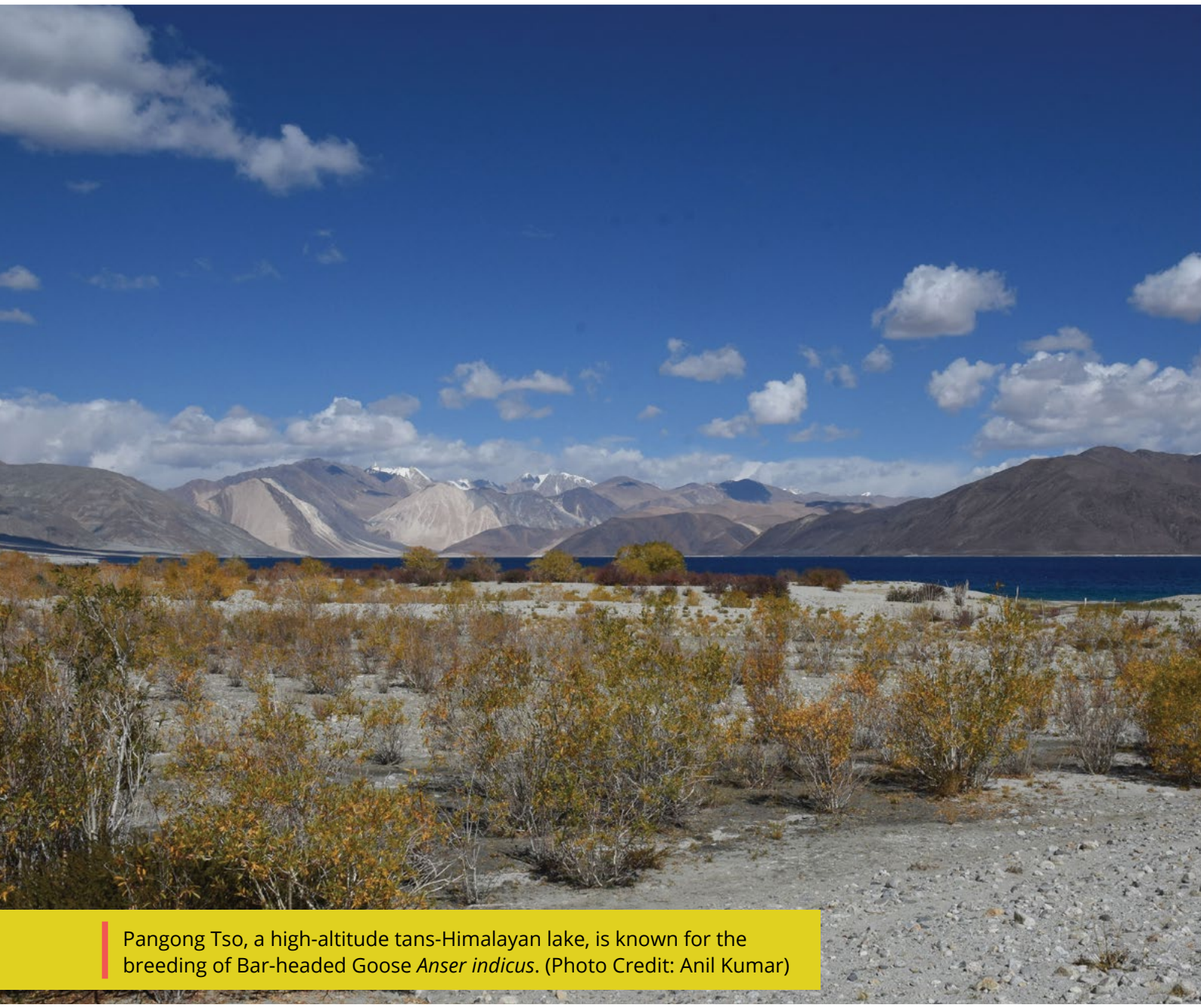


Pangong Tso, a high-altitude tans-Himalayan lake, is known for the breeding of Bar-headed Goose *Anser indicus*. (Photo Credit: Anil Kumar)

Introduction

Migration is a very interesting, spectacular and intriguing behaviour, exhibited by a sizable number of birds. Over the decades, it remains one of the fundamental aspects of the life of migratory birds, which attracted the attention of ornithologists to understand the secret of this phenomenon. Studies conducted so far revealed that every year, after the onset of the winters in most parts of the Northern Hemisphere, most of the avian species move towards the Southto gain the benefits of favourable conditions in terms of food and shelter. After spending the winter season at their respective destinations they return back in the spring seasonusing the same migratory routes.This regular two-way seasonal movement is termed as bird migration and over 2000 species of birds are known to participate in this worldwide phenomenon.The mechanisms of bird migration vary and are not completely understood. It can be triggered by a combination of factors such aschange in day length, lower temperatures, scarcity of food, and genetic predisposition. It was noticed that the migratory species kept as pet in cages, show a restlessness in each spring and fall. German behavioral scientists termed it'zugunruhe', meaning migratory restlessness.

Due to various reasons, most migratory birds face a number of challenges (namely habitat destruction and degradation, pollution and climate change, illegal and unsustainable hunting, infrastructure development, and disease) and their species diversity and populations are declining worldwide. United Nations implementedsome multi-lateral treaties (such as Convention onMigratory Species, Ramsar Convention, Convention for the Protection of Migratory Birds, and State of the World's Bird)to ensure the conservation and sustainability of migratory birds a number of measures have been enforced. India is a party to the Convention on Migratory Species and is playing a crucial role in the conservation of migratory birds in India. A total of 128 avian species are listed in the appendices of the convention. A total of 7 species are covered in appendix-I and 103 species in appendix-II, while 18 species are covered by both appendices.The Central Asian Flyway encompasses several important bird migration routes between Eurasia and the Indian Ocean including India. Over 180 migratory birds including some globally threatened species are known to use this flyway. Studies carried out in India, provide rich information on migratory birds and their habitats.It is worth mentioning that all species of birds do not migrate, however most species are subject to seasonal movements of varying extents, resulting into several types of migration mostly based on the season and distance of migration.

Types of migration

The birds of the northern hemisphere are mostly migratory and cover long distances during migration, which is known as'Latitudinal migration'. It refers to the movement from north to south, and vice versa. The birds native to the northern temperate and subarctic zones where they breed during summer, move towards the south during winter. Some notable examples are Northern Pintail *Anas acuta*, Eurasian Teal *Anas crecca*, Eurasian Wigeon *Mareca penelope*, Bar-tailed Godwit *Limosa lapponica*, Pallid Harrier *Circus macrourus*, Marsh Sandpiper *Tringa stagnatilis*, Common Greenshank *Tringa nebularia,* Ruddy Turnstone *Arenaria interpres*, Eurasian Whimbrel *Numenius phaeopus*, and Pallas's Gull *Ichthyaetus ichthyaetus*, are known to cover a long distance.However, some species migrate over short latitudinal distances, such as Himalaya to peninsular India and vice versa. Some interesting examples of this type of migration are Indian Blue Robin *Larvivora brunnea,* Rusty-tailed Flycatcher *Ficedula ruficauda*, and Blue-throated Blue Flycatcher *Cyornis rubeculoides.*

Some species move from the Himalaya to the plains of India, such as Verditer Flycatcher *Eumyias thalassinus,* Blue-capped Rock Thrush *Monticola cinclorhyncha* and Scaly Thrush *Zoothera dauma.* Some species cover a very short distance, such as Himalayan Black Bulbul *Hypsipetes leucocephalus,* where some individuals move southwards less than 100 km, while larger populations remain in the breeding areas as residents. The same trend can be seen in Blue Whistling Thrush *Myophonus caeruleus*. When some of the birds travel a short distance for safety and food without any specific direction, it is called vagrant or irregular migration. Herons may be the example of vagrant or irregular migration, including a few more examples such as Black Stork *Ciconia nigra*, Glossy

A panoramic view of Asan Conservation Reserve, Uttarkhand, known to host a sizable number of migratory birds in the winter season. (Photo Credit: Anil Kumar)

Ibis *Plegadisf alcinellus*, Spotted Eagle *Aquila clanga*, and European Bee-eater *Merops apiaster*.

A less frequent opposite movement also occurs in the southern hemisphere. For example, cuckoos breed in India and spend the summer at South-east Africa. Some tropical birds are known to migrate during the rainy season to the outer tropics to breed and return to the central tropics after breeding. Many marine avian species also make considerable migrations. The Arctic Tern *Sterna paradisaea* breeds in the northern temperate region and migrates to the Antarctic zone along the Atlantic, covering a distance of 22,500 km. The Bar-headed Goose *Anser indicus* is one of the world's highest-flying birds, and winters in many wetlands of India. Some species (such as Hooded Pitta *Pitta sordida*)are known to possess longitudinal migration,occurring when they migrate from east to west and vice-versa.

Large congregations of migratory birds and residents at Patna Bird Sanctuary, Uttar Pradesh. (Photo Credit: Anil Kumar)

Diversity and distribution of migratory species in India

India is a major destination for the long-distance winter migratory birds, owing to the availability of rich natural resources in terms of a large number of water bodies, such as inland and coastal wetlands, marsh areas and ponds, which attract a sizable number of migratory birds in India. These wetlands ranging from high altitude trans-Himalaya lakes such as Tso Moriri, Pangong Tso, Tso Kar and Chandra Taal) to costal wetland comprised of salt marshes, lagoons, bottomland hardwood swamps, fresh marshes, mangrove swamps, and shrubby depressions. Most of these wetlands are very rich in primary production and thus attract a large number of birds. Some of these wetlands are designated as 'Wetlands of International Importance' due to an incomparable ecosystem with immense conservation values and ecosystem services. At present in India, we have a total of 1243 wetlands further comprised of 75 Ramsar wetlands, 115 significant wetlands and 1053 other wetlands. India became a party to the 'Convention on Wetlands', also known as the Ramsar Convention on 1st February 1982. Ramsar sites in India cover an area of 13266.77 km^2.

A mixed species flock of winter migratory birds at Patna Bird Sanctuary, Uttar Pradesh. (Photo Credit: Anil Kumar)

A flock of Greater Flamingo *Phoenicopterus roseus* at Soor Sarover Bird Sanctuary, Uttar Pradesh. (Photo Credit: Anil Kumar)

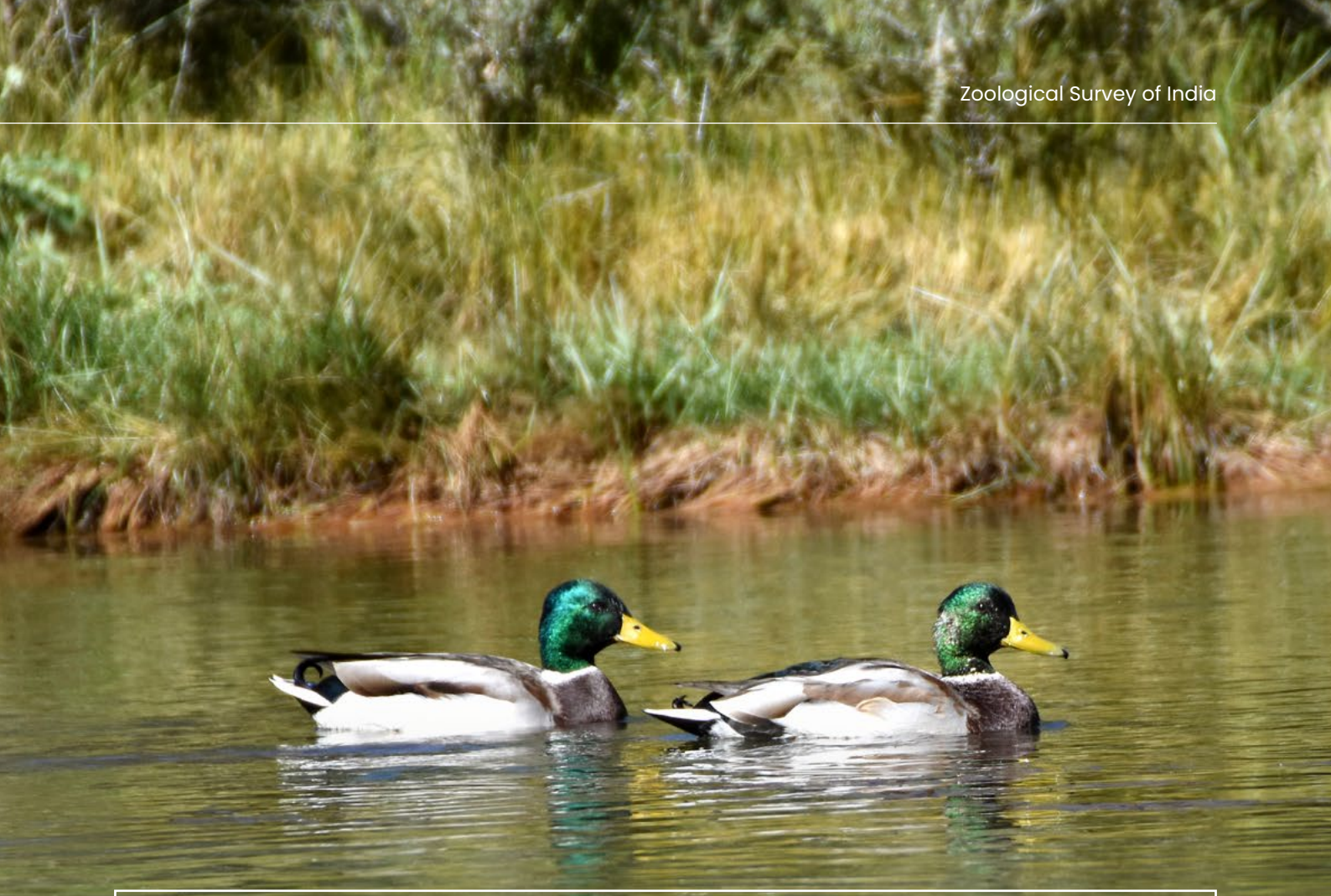
Some of the notable wetlands that attract a large number of winter migratory birds are Pong Dam in Himachal Pradesh, Asan Conservation Reservein Uttarakhand, Wular Lake in Jammu & Kashmir, Tso Kar Wetland Complex in Ladakh, Harike Lake in Punjab, Bhindawas Wildlife Sanctuary and Sultanpur National Park in Haryana, Sur Sarovar Bird Sanctuary in Uttar Pradesh, Keoladeo National Park and Sambhar Lake in Rajasthan, Bhoj Wetland in Madhya Pradesh, Kabartal Wetland in Bihar, DeeporBeel in Assam, Loktak Lake in Manipur, Bhitarkanika Mangroves and Hirakud Reservoir in Odisha, East Kolkata Wetlands and Sunderbans Wetland in West Bengal, Kolleru Lake in Andhra Pradesh, Point Calimere Bird Sanctuary and Pichavaram Mangrove in Tamil Nadu, Ashtamudi Wetland and Sasthamkotta Lake in Kerala, Nanda Lake in Goa, Thane Creek in Maharashtra, Nalsarovar Bird Sanctuary, Khijadia Wildlife Sanctuary and Wadhvana Wetland in Gujarat. Apart from this, a number of bird sanctuaries have wetland habitats, known to host a sizable number of migratory birds such as Patna Bird Sanctuary, Nawabganj Bird Sanctuary, Lakh Bahosi Sanctuary and Sandi Bird Sanctuary in Uttar Pradesh, Kanwar Lake Bird Sanctuary in Bihar, Khichan Bird Sanctuary, Pulicat Lake at the border of Tamil Nadu and Andhra Pradesh, D'Ering Wildlife Sanctuary in Arunachal Pradesh, Rann of Kutch in Gujarat, Kumarakom Bird Sanctuary in Kerala, and Ranganathittu Bird Sanctuary in Karnataka.

Over 370 avian species are migratory in India. It includes both long-distance winter migrants and local migrants. Over 180 migratory bird including some globally threatened and near-threatened species are known to use the 'Central Asian Flyway'. These include the critically endangered White-bellied Heron *Ardeai nsignis* and Northern Bald Ibis *Geronticus eremita*, the endangered Greater Adjutant Stork *Leptoptilosd ubius*, the vulnerable Lesser Adjutant Stork *Leptoptilos javanicus* and Black-necked Crane *Grus nigricollis*, and the near-threatened Lesser Flamingo *Phoeniconaias minor*.

Role of the Indian Government

India is a signatory to the conventions of IUCN pertaining to environment and biodiversity conservation, and plays a major role in nature conservation. For the conservation of migratory birds and their wetland habitats, the remarkable steps and measures adopted by the Government of Indiaare highly appreciable. Ministry of Environment, Forest and Climate Change (MoEFCC) has adopted a wide framework and implemented a large number of programmes. India is a Party to the Convention on Biological Diversity (CBD). The MoEFCC is the nodal Ministry for the implementation of CBD in India. India is recognized as a leader in biodiversity conservation in developing and implementing relevant legal and policy regimes. Two Protocols have been adopted so far under the aegis of CBD, namely the Cartagena Protocol on Biosafety (2000) and the Nagoya Protocol on Access and Benefit Sharing (2010). India became a party to the 'Convention on Wetlands', also known as the Ramsar Convention on 1st February 1982 and has since then designated 75 wetlands under the List of Wetlands of International Importance. India has successfully implemented the National Action Plan for Conservation of Migratory Birds and their Habitats along the Central Asian Flyway (2018-2023). The overall goal of the plan is to reduce the population decline of migratory birds and to secure their habitats.

An spectacular view of wetlands located near Hunder in Nubra valley, Ladakh, is known as a breeding ground for a number of migrotaryducks and waders.(Photo Credit: Anil Kumar)



Conclusion

India is one of the most important destinations for migratory birds in South Asia, owing to the occurrence ofa large number of wetlands ranging from coastal wetlands to inland lakes and dames. Strategic locations of some major wetlands such as Pong Dam, Asan Barrage, Harike Barrage and some marshyareas in northern India, host a large number of migratory birds and also act as a stop-over for passage migrants proceeding further to the south. A number of treaties have been enforced by United Nations for the conservation of water birds and India is a majorpartner,is working for the conservation of migratory birds and their habitats in India mediated through the country-wide implementation of a number of programmesunder the umbrella of Ministry of Environment Forest and Climate Change.Shri NarendraModi, Honourable Prime Minister of India, in 'Mann Ki Baat' in Feb. 2020, highlighted the bird migration and migratory species in India. It was a great motivationfor ornithologists and conservationists of the country. With the support and encouragement of Shri Tammay Kumar, Additional Secretary, Govt. of India,MoEFCC, and Dr.Dhriti Banerjee, Director, Zoological Survey of India, Kolkata, it has been transformed and resulted in a number of new initiatives and studies on the migratory birds and their habitats in India.

A pair of Mallard *Anas platyrhynchos*, in a wetland area located in Nubra Valley, Ladakh. It is known to breed in trans-Himalayan wetlands of Ladakh and winters wetlands located in India.(Photo Credit: Anil Kumar)

A mixed species flock of the aquatic bird in the marshy area located near Hanle, Ladakh. They breed in Ladakh, and are winter migratory in India.
(Photo Credit: Anil Kumar)

Black-necked Crane *Grus nigricollis*:
It is a grayish-white coloured, medium-sized, crane in Asia that breeds on the Tibetan Plateau and winters mainly in some remote, high altitude localities in Himalaya. A study conducted by the Zoological Survey of India revealed the in Ladakh mostly they occur in small groups comprised of 2 to 4 individuals. Total 23 individuals were sighted directly. While, interview-based estimated population was 51 individuals. There may be 10 to 15 more individuals in the wetlands that could not be counted or overlooked. It is a shy bird, and usually dislike the presence of human in its habitats. Feral dogs, habitat encroachment/ disturbance by locals for cattle grazing and increasing tourists are the mainly accountable for decreasing population.
(Photo Credit: Anil Kumar)

Common Cuckoo *Cuculus canorus*:
It is a widespread species of cuckoo, a summer migrant to Europe and Asia, and winters in Africa. Every year, cuckoos arrive in European countries in April and return back in September. It is seen as vagrant in some countries such as United States, Greenland, Iceland, Indonesia, Seychelles, Taiwan and China. In Europe, the soft melodious 'Ku- ku....' calls of the Common Cuckoo are regarded as an indication of the onset of spring. It is an obligate brood parasite bird that lays its eggs in the nests of other birds such as warblers, babblers, thrushes, flycatchers and bulbuls.
(Photo Credit: Anil Kumar)

Hooded Pitta *Pitta sordida*:
It is a skulking, strongly territorial, shy and beautiful green-coloured bird having a black head and chestnut crown, common and widespread in Eastern and Southeast Asia, where it lives in various types of habitats. During the summer months, it migrates to the Himalayan foothills. It is known to breed between February and August and build the nest on the ground.
(Photo Credit: Anil Kumar)

Yellow-bellied Fantail ***chelidorhynx hypoxanthus*:**
It is a small-sized (about 8 cm in length), local migratory bird, having yellow underparts with a black eye stripe, white wing bar and broad white-tipped black tail. It is widespread in Himalaya, further extended to Southeast Asia including Thailand, Vietnam, and Myanmar. During winter the birds move to southwards in lower Himalayan hills and adjoining plains for wintering.
(Photo Credit: Anil Kumar)

Rufous-bellied Niltava ***niltava sundara*:**
It is widespread in Himalaya and South and Southeast Asia along with China. It breeds in the middle Himalaya and winters in lower Himalaya.
(Photo Credit: Anil Kumar)

Verditer Flycatcher *Eumyias thalassinus*:
It is known for its distinctive plumage colour having a shade of copper-sulphate blue and possessing a dark patch between the eyes and above the bill base. It breeds in Himalaya and migrates to the plains of India in winter, except arid and semi-arid areas.
(Photo Credit: Anil Kumar)

Bluethroat *Luscinia svecica*:
It is a migratory species breeding in wet birch wood or bushy swamp in Europe and across the Palearctic region. It winters in North Africa and the Indian subcontinent.
(Photo Credit: Anil Kumar)

Sulphur-bellied Warbler *Phylloscopus griseolus*:
It is a leaf-warbler found in the Palearctic region. It is summer migrant in trans-Himalayan area, passage migrant in northern India and winter migrant in central India.
(Photo Credit: Anil Kumar)

Black-hooded Oriole ***oriolus xanthornus*:**
It is resident species having a widespread distribution in India. In search of food, it often migrates locally without any apparent pattern of migration.
(Photo Credit: Anil Kumar)

Black-rumped Flameback *Dinopium benghalense*:
It is resident species having a widespread distribution in India. In search of food, it often migrates locally without any apparent pattern of migration.
(Photo Credit: Anil Kumar)

Blue-throated Barbet *Psilopogon asiaticus*:
It is a beautiful multi-coloured frugivorous species native to the foothills of the Himalaya and Southeast Asia. It inhabits lowland and montane forests distributed up to 2,000 asl. It migrates locally in search of food without following any apparent pattern.
(Photo Credit: Anil Kumar)

BIODIVERSITY ASSESSMENT OF FAUNAL DIVERSITY OF SULTAN KI BAOLI APPLYING E-DNA ANALYSIS

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Sultan Ke Baoli is a historical stepwell located in the city of Udaipur, Rajasthan. The stepwell was constructed in the 17th century during the reign of Maharana Sangram Singh II of the Mewar Dynasty. The stepwell was built to provide a reliable source of water to the local community during the dry season. The baoli has been an important part of the city's cultural heritage and history for centuries. However, over time, the baoli fell into disrepair and neglect. The water became stagnant, the walls were crumbling, and garbage had accumulated inside the baoli. The once magnificent structure had become an eyesore and was of no use to the local community. In June 2022, the Prime Minister of India, Narendra Modi, shared an inspiring story on his show 'Mann ke Baat' about a group of Charted Accountants who had taken it upon themselves to rejuvenate Sultan ke Baoli. The initiative was called 'Sultan se Sur-Tan,' and it aimed to restore the baoli to its former glory. The baoli after rejuvenation is now a place of beauty and tranquility, and it serves as a reminder of the city's rich cultural heritage. The rejuvenation of Sultan ke Baoli has significant ecological and cultural significance. The baoli is an important part of the city's ecosystem as it provides a source of water for the local flora and fauna. The rejuvenation has also helped to improve the water quality and prevent the spread of water-borne diseases. The initiative has shown that with proper planning and execution, we can restore historical sites and revitalize ecosystems. It has also highlighted the role that local communities and individuals can play in preserving their cultural heritage and protecting their environment. The group of Charted Accountants used their professional skills to manage the funds, plan the restoration work, and execute the project. They removed the garbage and debris, repaired the walls and the roof, and cleaned the water. They also installed a system to filter the water and prevent it from becoming stagnant. The transformation of Sultan ke Baoli has been appreciated by the nation, and it has become a popular tourist spot. The rapid biodiversity survey of Sultan ke Baoli may be proposed using the eDNA metabarcoding approach, which involves analyzing small samples of water to determine the biodiversity of the water ecosystem. This method is considered a cost-effective and time-efficient way to determine the diversity of aquatic life forms. The samples may be collected from different sites within the baoli, and the physico-chemical parameters may also be measured to assess the community structure. Before the 'Sultan se Sur-Tan' initiative, Sultan ke Baoli was in a dilapidated state, and its biodiversity was under threat. However, after the rejuvenation, it has become a popular tourist spot, and the assessment of its biodiversity has become an essential scientific research area. The rapid biodiversity survey using the eDNA metabarcoding approach may provide important insights into the diversity of aquatic life forms in the baoli. The rapid biodiversity survey using the eDNA metabarcoding approach may reveal the presence of several species of aquatic life forms in Sultan ke Baoli, including fish, crustaceans, and other invertebrates. The physico-chemical parameters measured in the water samples may also be correlated with the community structure of aquatic life forms. The findings of the survey will provide important insights into the taxonomic significance of Sultan ke Baoli and its potential as a hotspot for aquatic biodiversity. The rejuvenation of Sultan ke Baoli has not only provided a significant boost to the tourism industry but has also opened up new scientific research areas. The scientific community can continue to conduct more extensive studies on the aquatic life forms in Sultan ke Baoli to understand their ecological roles and the potential benefits they can offer. The conservation efforts of Sultan ke Baoli should be continued to preserve the aquatic biodiversity of this unique water ecosystem.

Keywords: Ecotourism, Aquatic biodiversity, e-DNA, Assessment.
Mann ki Baat Reference: 90th Episode of 'Mann Ki Baat' on 26.06.2022.

PRIORITIZING CONSERVATION OF TRANSBOUNDARY SPECIES WITH CROSS-CUTTING NETWORK AND MULTILATERAL DIALOGUES

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Conservation of biodiversity is of utmost importance at regional as well as global levels. India is a breeding ground for several migratory species, and the Thirteenth Meeting of the Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS COP13) concluded in Gandhinagar, India with the adoption of significant resolutions and decisions to address the conservation needs and threats facing migratory species worldwide. The Prime Minister emphasized the importance of being compassionate and kind towards all living beings and helping them when they are helpless or in need. India's efforts towards conservation of migratory species were praised worldwide in the CoP 13 meeting. India will be chairing the COP Convention on migratory species for the next three years. Zoological Survey of India (ZSI) is undertaking on-ground studies to some of the species listed under CMS or having transboundary distribution with neighbouring countries, such as Himalayan ibex, Blue sheep, snow leopard, red panda, primates, and white-bellied heron. ZSI believes that studying the large-ranging behavior with the seasonal migratory pattern of CMS-listed species is crucial to better propose conservation action plans. Before the Prime Minister's Mann ke Baat episode, conservation of transboundary species was not in the limelight in India. However, the episode brought the issue into the public sphere, and now there is a growing awareness and commitment towards the conservation of migratory species in the country. India's efforts towards the conservation of migratory species are being recognized globally, and India's chairmanship of the COP Convention on migratory species is an acknowledgment of India's commitment towards the conservation of biodiversity. ZSI's on-ground studies have found that migratory species have complex migration patterns and require different types of habitats and resources in their various ranges. Understanding the behavior and movement of migratory species is crucial for proposing effective conservation action plans. ZSI has also found that conservation efforts need to be collaborative and involve cross-cutting networks and multi-lateral dialogues among range countries to address the threats faced by migratory species. Conservation of transboundary species is crucial for the long-term sustenance of biodiversity. India's commitment towards the conservation of migratory species is a step in the right direction. Effective conservation action plans require understanding the behavior and movement of migratory species, and collaborative efforts involving cross-cutting networks and multi-lateral dialogues among range countries. By prioritizing the conservation of transboundary species, India can set an example for other countries to follow and contribute towards global biodiversity conservation efforts.

Keywords: Migratory Species Conservation, Trans Boundary, India.
Mann ki Baat Reference: 9th Episode of Mann ki Baat aired on 23rd February, 2020

Transboudary landscape in Arunachal Pradesh

Transboudary landscape in Arunachal Pradesh

Arunachal Macaque

ibex

Red Panda

ibex

THE HUNTING PRACTICE OF DIFFERENT TRIBES IN ARUNACHAL PRADESH: IMPACTS AND CONSERVATION EFFORTS

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Indiscriminate hunting in Arunachal Pradesh, a state in northeastern India, is a major threat to the region's rich biodiversity. For a long time, hunting has been a community practice steeped in history and culture. However, the situation has become alarming, with many bird species on the verge of extinction. In response, the State Environment and Forests Minister Mama Natung launched the 'Air gun Surrender Abhiyan', a voluntary campaign aimed at gradually easing people into the concept of conservation. Over 1600 weapons have been surrendered so far. Arunachal Pradesh is recognized as one of the 200 globally important ecoregions and shares its borders with China, Myanmar, and Bhutan. It is a transition zone between the Himalaya and Indo-Burmese regions, containing about 50% of the country's total flowering plants and supporting about 21 types of vegetation and land cover classes. The state also supports approximately 18% of the terrestrial faunal diversity of the Indian Himalayan Region. ZSI has been undertaking research to understand the local dependencies of forest and wildlife resources, and the impact of hunting on the region's species extinction. The episode of Mann ke Baat, where the Prime Minister emphasized the need for conservation and congratulated the residents of Arunachal Pradesh on their success in the Airgun Surrender Campaign, has raised awareness of the issue. However, the impact of the campaign is yet to be fully realized. Hunting is deeply ingrained in the culture and traditions of the local tribes, and it will take time to change people's attitudes. Hunting of animals is prevalent in the region and is a major driver of species extinction. Research by Jyrwa et al. (2020) in the Global Ecology and Conservation journal highlights the impact of hunting on the region's biodiversity. The study found that hunting pressure is high in areas where communities depend on forest and wildlife resources for their livelihoods. Indiscriminate hunting in Arunachal Pradesh is a threat to the region's biodiversity. The Airgun Surrender Campaign is a positive step towards conservation, but more needs to be done to change people's attitudes towards hunting. Education and awareness programs aimed at local communities could be an effective way to tackle the issue. Scientific research can provide evidence-based solutions to conservation challenges, and collaborations between scientists, policymakers, and local communities are crucial for long-term sustainability. Ultimately, the goal should be to ensure the survival of the region's unique flora and fauna for future generations to enjoy.

Keywords: Northeastern India, Conservation, Airgun, Arunachal Pradesh.
Mann ki Baat Reference: 84th Episode of Mann ki Baat on 26th December 2021

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