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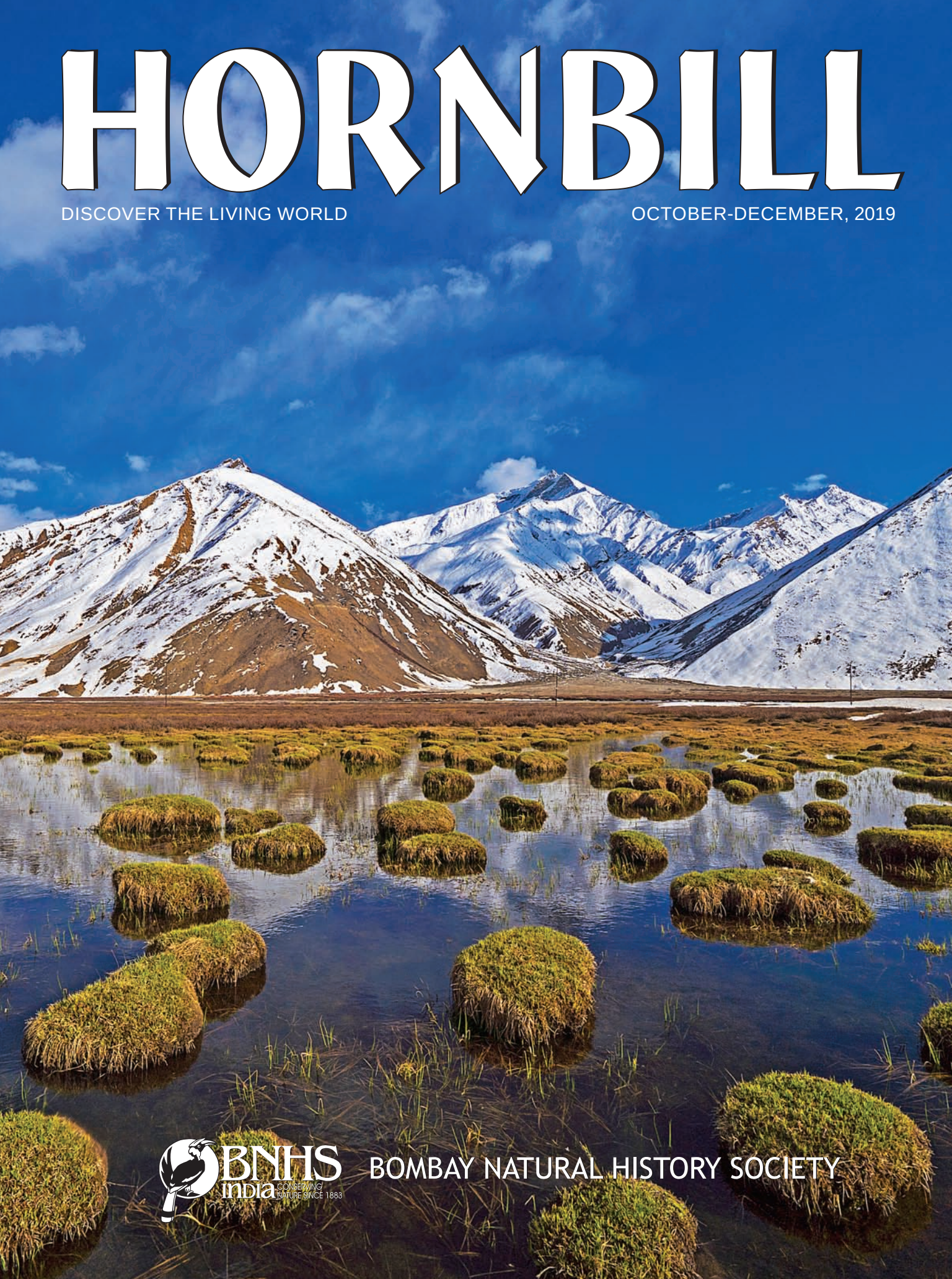

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Wetlands are amazing places

Many of you may have childhood memories of time spent at a pond, a tank, a stream, a river, or by the sea. Some may have learned to swim or paddle around in these waters; others may have simply dipped their feet in to explore the life in the waters, to feed the fish, or to watch migratory birds.

Wetlands are amazing places. When calm, they mirror the sky. In winter, even a small wetland in India may host migratory birds, which come from faraway places in Europe, Africa and Central Asia. There is perhaps no other ecosystem that changes so visibly as a wetland does in the migratory season. India provides critical stopover and wintering sites for over 90% of birds of the Central Asian Flyway. Tens of thousands of wetland birds like black-tailed godwit, bar-headed goose, and ruff visit India in winter. Wetlands are also a source of water, play an important role in flood control, and provide much needed open spaces.

According to the National Wetlands Atlas published by Indian Space Research Organisation (ISRO) in 2011, the total estimated wetland area in India is 15,260,572 hectares. Of these, 43% are natural inland wetlands. Despite the fact that India still has about 5% of its land area under wetlands, very little of this is actually protected or even identified.

On February 1, 1983, India became a party to the Ramsar Convention. The Ramsar Convention identifies globally significant wetlands, which are to be governed by the principles of wise use. But despite the vast expanse of our country and a large number of wetlands, India has identified only 27 Ramsar sites. These sites comprise less than 5% of the total wetland area in India. The situation is not much better for other wetlands either. Wetland Rules were notified in India in 2010. They called on states to notify and identify wetlands within state jurisdiction. A decade later, no state had completed the exercise. The Supreme Court of India took cognizance of this and ruled that states need to inventorize the 201,503 wetlands listed in the Wetlands Atlas that have an area of more than 2.25 hectares.

In 2017, the Wetland Rules were amended. According to the new rules, some categories of wetlands like saltpans are no longer recognized as wetlands. States are given greater jurisdiction in identifying wetlands. It must be noted, though, that we still have a long way to go in identifying and notifying wetlands, and completing 'brief documents' (detailed descriptions) on these wetlands.

Wetlands have been acknowledged as the backbone for ecological services that sustain life, but they are also among the most threatened ecosystems on earth. Recently, a report on the status of biodiversity and ecosystems was completed by the UN-led Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES). This 2019 report states that between 1700 – 2000, more than 85% of wetlands have disappeared. The rate of loss of wetlands is three times faster than that of forests.

Coastal wetlands, which often harbour endemic life, and are so important for overwintering bird populations, are severely threatened by a range of activities like ports, thermal power plants, jetties, and badly-planned infrastructure. As India is on a growth trajectory, we also have our commitments to sustainable development. The courts of India have repeatedly emphasized the importance of preserving wetlands. In the Hinch Lal Tiwari vs Kamala Devi & Others (2001) 6 SCC 496, the Honourable Supreme Court had observed (on the issue of a degraded pond):

"It is important to notice that the material resources of the community like forests, tanks, ponds, hillock, mountain, etc. are nature's bounty. They maintain delicate ecological balance. They need to be protected for a proper and healthy environment which enables people to enjoy a quality life which is the essence of the guaranteed right under Article 21 of the Constitution."

At the moment, we have an opportunity at hand. While many wetlands have been lost, we also have the right policy framework to identify and conserve wetlands. In a time of changing climate, nature-based solutions are the way ahead. Wetlands provide livelihoods, ecosystem services, and habitats for wildlife. They deserve to be protected not just for these values but for their own sake as well. We need to step up efforts to identify and conserve all types of wetlands, including the small and unremarkable ones. The task is not so difficult, as wildlife has already chosen these sites, and there are databases like the Important Bird and Biodiversity Area (IBA) programme that list the hotspots of wetland life. We may not always be able to see what is beneath the water, but life is always blooming there.

Deepak Apte & Neha Sinha

CONSERVING CENTRAL ASIAN FLYWAY WETLANDS IN INDIA

Text and Photographs: **Neha Sinha**

Greater flamingos walk gracefully through the waters of Chilika lagoon

Wetlands are magical places and defy easy definition. The word refers to an area which can be saturated with water, or temporarily dry. It can be brackish or fresh, and it can be land-locked or near the sea. There are many names for wetlands in Indian languages – *pukur* refers to a small pool in Bangla, *beel* in Assamese, and in Hindi *talaab* refers usually to a freshwater lake, while *pokhur* and *jheel* denote a pond or marsh, usually with a lot of aquatic vegetation.

But whatever the name and whichever the state, wetlands face threats from human activities: filled up for need of land, drained for agriculture, turned into aquaculture ponds, water storage reservoirs, salt pans, or even end up as dumpsites. In cities like Delhi, Mumbai, and Kolkata, wetlands are the first natural ecosystem to be filled for urban "planning"; this kind of urbanization does not pay heed to the ecosystem it is losing. One hardly hears of a wetland being made to compensate for a wetland being filled up. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which published a report on the world's biodiversity and ecosystems in 2019, found that wetland ecosystems are the most affected by human-led change. The report finds that 75% of land area is altered, 66% of the ocean is facing human-led impacts, and 85% of wetland areas are gone.

India has a wealth of wetland ecosystems distributed in different geographical regions. The Indian Space Research Organisation (ISRO) prepared a National Wetland Atlas in 2011, and listed more than 200,000 wetlands in India. Yet most of these wetlands are not recorded as waterbodies or wetlands by state governments; not long ago, the term 'wasteland' was used in congruence with wetlands.

National Action Plan for CAF Wetlands

BNHS Wetlands Programme has been working towards documenting wetland biodiversity in different regions of India, and is working towards their conservation. A special focus of this programme is the conservation of migratory waterbirds in these wetlands. Under this programme, BNHS is also working with the Ministry of Environment, Forest and Climate Change (MoEF&CC), in tandem with the Convention on Migratory Species, on wetland documentation and conservation.

India is part of the Central Asian Flyway (CAF) – a flyway is a migratory route used by migrating birds. CAF comprises 30 countries linking their northernmost breeding grounds in Russia (Siberia) to the southernmost non-breeding (wintering) grounds in West and South Asia, the Maldives and the British Indian Ocean Territory. Millions of birds make an arduous journey to India along the CAF. While India supports more than one percent of global populations of several migratory bird species and provides critical stopover sites to over 90% of the bird species known to use this migratory route, till recently the Central Asian Flyway did not get the attention it deserved.

On the issue of saving sites critical and crucial to migratory waterbirds, BNHS worked actively with the Convention on Migratory Species and MoEF&CC, in creating a National Action Plan for the Central Asian Flyway. The National Action Plan for CAF is the Indian government's comprehensive attempt to conserve wetlands important for migratory birds. This plan is for the period 2018 to 2023, and has one major, urgent goal – halting the decline of migratory birds and conserving important migratory bird habitats. Since this cannot be done without considering pressures of land-use change, the plan actively seeks to work within the post-2015 development agenda under the Sustainable Development Goals and the Paris Climate Agreement. The activities under the plan include species conservation, habitat conservation and sustainable management, capacity development, communication and outreach, research and knowledge-base development, and international cooperation. Several wetland sites have been prioritized under the CAF National Action Plan (see box, p. 29). As these wetlands experience different kinds of stresses, there are broad-ranging objectives for the Action Plan. They include reducing the pressures on these critical habitats, developing capacity at multiple levels to avoid threats, and improving database and decision-support systems for science-based conservation.

There is also a transboundary component to the plan and there is a need to collaborate better with our neighbouring countries. The importance of transboundary efforts cannot be overstated. For instance, to preserve the black-necked crane which is found only in Asia, India, Bhutan, and China need to work together. And it is not just waterfowl we need to ponder on. The Bengal florican

The Kolleru waterscape in Andhra Pradesh is a wildlife sanctuary, a Ramsar site, a source of livelihood, and a repository of biodiversity

is a grassland bird, which is critically endangered today. Like wetlands, grasslands are also disappearing. The Bengal florican is found in wet grasslands and moves between Nepal and India. However, neither Bhutan nor Nepal is party to the Convention on Migratory Species (CMS). Increasing engagement with the CMS through wetlands as a starting point can help extend cooperation for other migratory species as well.

The CAF National Action Plan also envisages creating Single Species Action Plans for 20 bird species, including greater flamingo, great knot, lesser flamingo, Eurasian curlew, white-headed duck, yellow-breasted bunting, and ferruginous duck. At the launch of the action plan in November 2019, Jacques Trouvilliez, Executive Secretary of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) said: "The initiative of the Government of India to take the lead in the further development of CAF, as reflected in CMS Resolution 12.11 on Flyways, can be the real game changer to allow the still open questions on the institutional and legal framework to be sorted out, and the initiative to fully take off. The development of a CAF National Action Plan is a clear indication of India's leadership, and I would like to warmly congratulate the Government of India for it. I trust that other range states of the flyway will follow India's example."

From Global to National: An Overview

India has recently changed its legislation for wetlands and the wetland definition is now different from the 2010 Wetland Rules. As per the 2017 Wetland Rules, wetlands now refer to "an area of marsh, fen, peatland or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river

Wetland sites prioritized under the CAF National Action Plan

For decades, BNHS has been studying wetlands and birds that depend on them, and has tagged and tracked birds for nearly a hundred years under its bird migration projects. Based on the findings gained over the years, the following sites have been prioritized under the CAF National Action Plan.

Tamil Nadu: Point Calimere and Great Vedaranyam Swamp, Gulf of Mannar Marine National Park and Adam's Bridge, Karaivetti Bird Sanctuary, Pallikaranai, and the wetland clusters of Suchindram, Theroor, Vembanoor, Manakudi Estuary, and saltpans of Puthalam and Kovalam.

Puducherry: Ousteri Lake, Bahour Lake, and Kaliveli Tank.

Andhra Pradesh: Kolleru, Pulicat, and Coringa.

Odisha: The lagoon of Chilika and the mangrove wetlands of Bhitarkanika.

Maharashtra: A combination of urban and coastal habitats, Jayakwadi, Gangapur Dam and Grassland, Nandur Madhmeshwar and wetland clusters of Mahul, Sewri mudflats, Alibaug, Thane Creek, and Uran.

Gujarat: Nal Sarovar with wetland clusters of Khijadia Marine National Park and Wildlife Sanctuary.

Madhya Pradesh: Karera (which once held great Indian bustards) and wetland clusters of Halali Reservoir and Bhoj (Upper Lake).

West Bengal: Sundarbans and the Farakka Barrage.

Rajasthan: Keoladeo and Sambhar lakes, along with the wetland clusters of Alniya Dam, Bardha Dam, and Ram Sagar (Hindoli).

Punjab: Harike.

Himachal Pradesh: Pong Dam.

Assam: The wetland clusters of Majuli Island, Pani-Dihing and Sibsagar Tanks.

Uttar Pradesh: The wetland cluster of Kurra Jheel and Saman.

Jammu and Kashmir: The wetland cluster of Haigam Rakh, Hokarsar, and Mirgund Jheel.

channels, paddy fields, human-made water bodies/tanks specifically constructed for drinking water purposes and structures specifically constructed for aquaculture, salt production, recreation and irrigation purposes."

A migratory grey-headed lapwing in Mangalajodi wetland, Odisha

A pheasant-tailed jacana in Kolleru

Two things are to be noted here of specific concern for migratory birds. Man-made tanks are often important stops for birds and other biodiversity. Over time, tanks made for storing water can become ecosystems in their own right. The exclusion of man-made tanks (for potable water and irrigation) from the Wetland Rules is of concern. Similarly, salt pans are also excluded from the new Wetland Rules. This is bound to negatively impact bird populations. Along the coastline, many areas close to the sea have been converted into salt pans with the primary aim of salt production. However, these vast

areas also host several waders and waterfowl, especially in the states of Tamil Nadu and Gujarat in southern and western India, respectively. As the coastline gets lost to ports, thermal power plants, and coastal highways, coastal wetlands become degraded and are ultimately destroyed.

What could be the ramifications of excluding salt pans and man-made wetlands from the new rules? In short, the exclusion could mean that these areas would not be identified as wetlands and thus they would remain 'land' even with water. Further, the wetland could be drained and converted to any other land use. Finally, it could also mean that the wetland could be polluted or contaminated without any attention paid to conservation needs.

The new Wetland Rules are more decentralized than the previous ones. States have been given more powers to identify wetlands, because the new Wetland Rules mandate the setting up of State Wetland Authorities. The Wetland Rules will apply only to wetlands that the state notifies as such. This may, in effect, leave out many areas that are naturally wetlands. For such places, other regimes such as seasonal protection and conservation-oriented management will need to be worked out.

Kolleru: A case study

Several natural wetlands face a threat that is inimical to their ecosystem characteristics. That threat is aquaculture. Parts of wetlands like Kaliveli Tank (Tamil Nadu) and Kolleru (Andhra Pradesh) have been cordoned off for making fish and prawn ponds. A good example of aquaculture becoming extremely undesirable for wetlands is Kolleru.

Kolleru is formed by drainage from both the Krishna and Godavari rivers. Kolleru is a wildlife sanctuary, a Ramsar site, and also a source of livelihood for people. Some villages are actually situated within the sanctuary; people live on dry patches and fish in the waters. Unfortunately, a lot of the fishing is non-traditional. Like any other commercial prawn or aquaculture farm, areas have been cordoned off exclusively for raising fish stock. The fishes are artificially fed, and antibiotics are used to treat them. This is a huge departure from age-old methods of fishing, wherein fish were caught in traditional nets.

Biodiversity conservation should not come without poverty alleviation. Decision X/31 of the Convention on Biological Diversity states that we should:

A pod of spot-billed pelicans in Kolleru

Monsoon clouds gathering over a pelican colony

A fisherman in his boat in Kolleru sanctuary

"Increase awareness of the benefits resulting from the implementation of the programme of work on protected areas to health, water, fisheries, industry, tourism and other sectors, the importance of ecosystem services provided by protected areas, for the achievement of climate change adaptation and mitigation and the Millennium Development Goals including poverty alleviation."

Yet, if Kolleru has to survive as a wetland, the challenge is to support livelihood, but through traditional means. This is easier said than done; it is difficult to persuade people to cut down on commercial aquaculture; it is also difficult to resettle wetland rights. In the case of resettlement of rights from forest areas, people are given lands away from forests, or they are given limited rights to extract resources from the forest. Aquaculture at the scale it is practised in Kolleru is a commercial activity; the best fishing zones are also the ones that are biodiverse and ought not to be commercialized on a high scale. Fish ponds typically have measures to deter birds from eating fish, including nets placed near the surface of the water to catch birds. Conservation has become ridden with conflict.

All bird and wetland conservation has to take these realities into account. The CAF National Action Plan provides a mutli-pronged approach, which is useful for taking into account these multi-pronged realities. At the end of the day, birds, fish and fisherman need to coexist in a wetland; it is up to us whether we see the natural as a resource only for us, or give it value as something precious that ought to exist just for its own self. Wetlands typify this dilemma, and the sustainable use of wetlands can hold lessons for a sustainable development model which can be used in many different scenarios.

Neha Sinha is Advocacy and Policy Officer with the Bombay Natural History Society. She has a special interest in the intersection of politics and conservation.

K. SIVAKUMAR

INDIA'S COASTAL AND MARINE PROTECTED AREAS: CHALLENGES AND THE WAY FORWARD

Text: **K. Sivakumar**

India represents 2.4% of the world's landmass and supports a population of more than one billion people. India is also one of the 17 mega-biodiverse countries of the world, having 7.8% of the recorded species of the world, which include 45,500 recorded species of plants and 91,000 recorded species of animals, according to a Ministry of Environment, Forest and Climate Change (MoEF&CC) 2014 report. India has an extensive coastline of 7,517 km, of which 5,423 km encompass peninsular India and 2,094 km are in the Andaman & Nicobar and Lakshadweep Islands. This coastline supports a large human population, which is dependent on its rich coastal and marine resources. It is estimated that nearly 250 million people live within a 50 km wide swathe along the Indian coastline (UNISDR/ UNDP 2012). Therefore, the ecological services of the marine and coastal ecosystems of India play a vital role in sustaining her economic growth.

Despite their tremendous ecological and economic importance, and the existence of a policy and regulatory framework, India's coastal and marine ecosystems and biodiversity are under threat from direct and indirect pressures arising from economic development and associated activities. These pressures are bound to increase in the coming decades with the increase in human population and associated needs and developments. Mushrooming of ports and harbours all along the coast is also threatening coastal biodiversity. Further, natural

phenomena such as tsunamis, cyclones, hurricanes, and storms alter the coastal habitats.

Studies have shown that declaration of selected sites as Marine Protected Areas (MPAs) is one of the most potent conservation tools for protection of marine habitats and biodiversity. In India, the Environment (Protection) Act, 1986, Coastal Regulation Zone Notification, 1991, and National Biodiversity Act, 2002 have been enacted for conservation of coastal and marine environment, along with the Wildlife (Protection) Act, 1972, which also provides for establishment of protected areas (PAs) by state governments. The Gulf of Kachchh Marine National Park, Gulf of Mannar National Park, Sundarbans National Park, and Wandoor Marine National Park are some of the important MPAs of India. The MPA network in India has been used as a tool to manage natural marine resources for biodiversity conservation and for the well-being of the people dependent on them.

K. SIVAKUMAR

Sea turtle hatchlings at Arguna Nalla, Andaman Island

Coastal and Marine Protected Areas in India

India has created a network of PAs representing all its 10 biogeographic regions. These PAs are designated under four categories: National Park, Wildlife Sanctuary, Conservation Reserve, and Community Reserve. A total of 868 PAs (104 national parks, 550 wildlife sanctuaries, 87 conservation reserves, and 127 community reserves) have been established as on March 1, 2019. Besides these, 27 wetlands have been designated as Ramsar sites.

As for Marine Protected Areas, PAs that fall entirely or partially within a swathe of 500 m from the high tide line and the marine environment are considered to be in the MPA network. There are 24 MPAs in peninsular India (see Table) and more than 100 MPAs in the country's islands. The 24 MPAs of the mainland have a total area of about 8,214 sq. km, which is about 4% of the total area under the entire PA network of India, and less than 0.3% of the total land area of India. Of these, the Gulf of Mannar Marine National Park, Sundarbans National Park, Gulf of Kachchh National Park, Gahirmatha Marine Sanctuary, Coringa Wildlife Sanctuary, and Chilika Wildlife Sanctuary have unique marine biodiversity and provide a range of ecological services to the local communities.

As for the islands, the total area of the Andaman and Nicobar Islands is 4,947 sq. km, of which 1,510 sq. km is protected under the provisions of India's Wildlife (Protection) Act, 1972. There are 105 PAs in the Andaman and Nicobar Islands, and all are part of the MPA network of India. These MPAs cover about 60% of the terrestrial area of the islands and protect more than 40% of the coastal habitat. Mahatma Gandhi Marine NP and Rani Jhansi Marine NP are important MPAs here. In the

Marine Protected Areas of Peninsular India

S. No.	Name of MPA	State	Category	IUCN category	Area (sq. km)	Year of establishment
1.	Coringa	Andhra Pradesh	Sanctuary	IV	235.7	1978
2.	Krishna	Andhra Pradesh	Sanctuary	IV	194.81	1989
3.	Pulicat Lake	Andhra Pradesh	Sanctuary	IV	500	1980
4.	Fudam	Daman & Diu	Sanctuary	IV	2.18	1991
5.	Chorao Island	Goa	Sanctuary	IV	1.78	1988
6.	Marine NP (Gulf of Kachchh)	Gujarat	National Park	II	162.89	1995
7.	Khijadia	Gujarat	Sanctuary	IV	6.05	1981
8.	Marine NP (Gulf of Kachchh)	Gujarat	Sanctuary	IV	295.03	1980
9.	Kadalundi Vallikkunnu	Kerala	Community Reserve	NA	1.50	2007
10.	Malvan Marine	Maharashtra	Sanctuary	IV	29.12	1987
11.	Bhitarkanika	Odisha	National Park	II	145	1998
12.	Bhitarkanika	Odisha	Sanctuary	IV	672	1975
13.	Chilika (Nalabana)	Odisha	Sanctuary	IV	15.53	1987
14.	Balukhand Konark	Odisha	Sanctuary	IV	71.72	1984
15.	Gahirmatha	Odisha	Sanctuary	IV	1435	1997
16.	Gulf of Mannar Marine	Tamil Nadu	National Park	II	6.23	1980
17.	Point Calimere	Tamil Nadu	Sanctuary	IV	172.6	1967
18.	Pulicat Lake	Tamil Nadu	Sanctuary	IV	153.67	1980
19.	Sundarbans	West Bengal	National Park	II	1330.1	1984
20.	Haliday Island	West Bengal	Sanctuary	IV	5.95	1976
21.	Sajnekhali	West Bengal	Sanctuary	IV	2091.12	1976
22.	Lothian Island	West Bengal	Sanctuary	IV	38	1976
23.	West Sundarbans	West Bengal	Sanctuary	IV	556.45	2013
24.	Thane Creek FWLS	Maharashtra	Sanctuary	IV	16.90	2015

K. SIVAKUMAR

Local fishermen are involved in biodiversity monitoring at the Gulf of Mannar

SHARMILA JAYARAM

Crown-of-Thorns starfish is a potential threat to coral reefs on islands, if it is not managed

K. SIVAKUMAR

Marine mammals often fall victim to bycatch

UPPADA PAROMITA

Whale shark – the docile giant

BITAPI C. SINHA

Chilika Wildlife Sanctuary, the largest brackish-water lagoon in India

Lakshadweep group of islands, Pitti Island (0.01 sq. km) is the only island having the status of a MPA.

India has also identified 12 protected areas as trans-boundary protected areas under the framework of the IUCN Trans-boundary Protected Areas Programme. Two of these sites are MPAs (Sundarbans National Park and Gulf of Mannar Biosphere Reserve). India has also designated six UNESCO World Heritage Natural sites, and Sundarbans National Park is one among them.

Along with all these conservation initiatives for MPAs, India has taken several steps towards achieving the Aichi Biodiversity Targets, especially Target 11 (at least 10% of coastal and marine areas are conserved in networks of protected areas) and Target 14 (ecosystems that provide water, health, livelihoods, and well-being are restored and safeguarded). Towards achieving these two targets, 106 coastal and marine sites have been identified and prioritized as Important Coastal and Marine Biodiversity Areas (ICMBAs) by the Wildlife Institute of India. In all, 62 ICMBAs have been identified along the west coast of India, and four along the east coast. These sites have also been proposed as conservation or community reserves to increase participation of the local communities in governance. More efforts are required to secure and strengthen community participation in the management of the MPA network in India.

Ecologically or Biologically Significant Marine Areas (EBSA) of India

Conservation and sustainable use of biodiversity in marine areas beyond national jurisdiction is one of the central issues of the United Nations General Assembly.

K. SIVAKUMAR

Sundarbans Tiger Reserve is home to several species of marine flora and fauna

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Coringa Wildlife Sanctuary, Andhra Pradesh

Therefore, the Convention on Biological Diversity (CBD), in 2008, adopted a resolution to identify, using scientific criteria, Ecologically or Biologically Significant Marine Areas (EBSAs) in need of protection in open-ocean and deep-sea habitats. CBD has identified seven scientific criteria largely focusing on ecological or biological values, as follows: 1) Uniqueness or rarity, 2) Special importance for life-history stages, 3) Importance for threatened, endangered, or declining species and/or habitats, 4) Vulnerability, fragility, sensitivity, or slow recovery, 5) Biological productivity, 6) Biological diversity, and 7) Naturalness of the site. Angria Bank for deep sea coral reefs and Bay of Bengal Turtle Areas for sea turtles have been identified as EBSA sites of India by experts. The Government of India, with support from Maharashtra Government and NGOs, has initiated action to conserve the Angria Bank EBSA.

Important Marine Mammal Areas (IMMAs) of India

The Important Marine Mammal Area (IMMA) initiative that was jointly developed by the IUCN World Commission on Protected Areas (WCPA), is modelled on the successful example of the BirdLife International process for determining Important Bird and Biodiversity Areas (IBAs). The identification of IMMAs through a consistent expert process is intended to provide valuable inputs on marine mammals and their habitats, which will contribute to existing national and international conservation initiatives towards marine mammals. IMMAs are relevant to marine mammal conservation, and to support the consideration of marine mammals in the designation of Convention on Biological Diversity (CBD),

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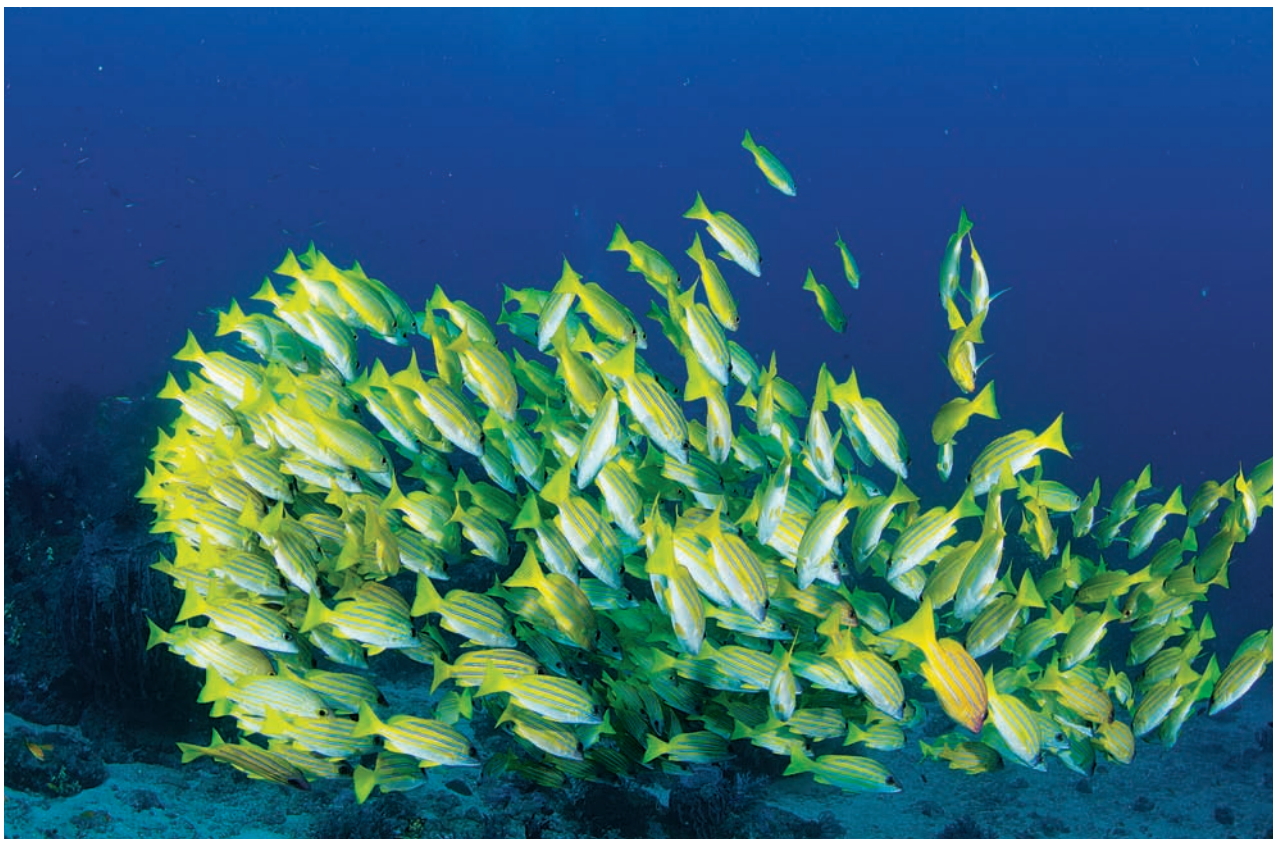
Mangrove patches in Coringa Wildlife Sanctuary

DIGANT DESAI

A coral reef, Andaman and Nicobar Islands



DIGANT DESAI

Reef fish in Havelock Island, Andamans

Ecologically or Biologically Significant Areas (EBSAs), and the new IUCN standard for the identification of Key Biodiversity Areas (KBAs). Scientific criteria largely focusing on ecological or biological value are used to identify IMMAs that are similar to EBSAs, but limited to marine mammals. In India, Chilika Lagoon, Sundarbans, Gulf of Mannar and Palk Bay, and South Andaman Islands have already been identified as IMMAs. Further, Angria Bank, Gulf of Kachchh, off the coast of Kanyakumari, north-east Arabian Sea humpback whale areas, and Sindhudurg-Karwar region have been identified as potential IMMAs. These IMMAs are expected to strengthen our effort to achieve Aichi Biodiversity Target 11.

Challenges and the way forward

Considering the importance of coastal areas in India with respect to the prevailing socio-economic perspectives, it will be difficult to add further habitats of coastal and marine biodiversity to the existing MPA network as national parks or sanctuaries.

So far, there has been no systematic assessment of the conservation status of coastal and marine species of India using the IUCN Regional Red Listing Guidelines. This is largely due to a lack of required data on the status and distribution of most of the marine species in India. Currently, according to expert opinion, 10 species of sharks and rays, including the whale shark, all species of sea horse, the giant grouper, all cetaceans, the dugong, nine species of molluscs, five species of sea turtles, one species of otter, all species of corals, all species of sponges, and all holothurians that occur in the coastal and marine areas of India are considered to be under threat. Therefore, they have been accorded protection under the Wildlife (Protection) Act, 1972 by being listed in Schedule I.

K. SIVAKUMAR

Marine eco-tourism, without harming biodiversity, is an option for sustainable use of MPAs in India

The highly threatened marine s pecies of India need to be conserved on priority basis using special 'Species Recovery Plans'. In this connection, seven threatened marine taxa have been selected for preparation of recovery plans: dugong, whale shark, marine turtles (two species), giant clams, holothurians (sea cucumbers), horseshoe crabs, and sea horses. MoEF&CC has put the threatened dugong, marine turtles, coral reefs, and mangroves under its 'Integrated Development of Wildlife Habitats' programme on a priority basis, and necessary conservation actions in this regard have already been initiated. Recently, MoEF&CC, with support of CAMPA Fund, entrusted WII to implement the 'Species Recovery Programme' for dugong with support from State Governments of Tamil Nadu, Gujarat, and Andaman and Nicobar Islands in collaboration with the Indian Navy, the Indian Coast Guard, and other National/State level institutions. Dugongs and their habitats are being recovered now.

Coastal ecosystems are among the ecosystems most vulnerable to climate change. Therefore, it is of the greatest importance to have a climate change adaptation plan for the coastal and marine protected areas in the country. Coordination is required among all the organizations/ institutions that work for conservation of threatened marine species and the welfare of coastal communities. Moreover, documentation and databases of information obtained through research on threatened marine species are also urgently required. It is also important to develop a specialized field-based programme in marine ecosystem ecology at the higher education level, with emphasis on rigoro us scientific research, hypothesis testing, taxonomy, and conservation, based on the models established by the M.Sc. course in Wildlife Science at the Wildlife Institute of India and at the National Centre for Biological Science. Development of human resources to manage the MPAs of India is also essential.

Fisheries, aquaculture, seaweeds, and mangroves are among the major areas of scientific research into coastal and marine biodiversity in India. Research on the culture of organisms of export value, such as sea cucumbers, sea horses, and ornamental fish, has also been carried out by state and central fisheries departments and academic

DHRITIMAN MUKHERJEE

Dugong at Rani Jhansi Marine National Park, Andaman & Nicobar Islands

K. SIVAKUMAR

A hatchery to conserve marine turtles in Gulf of Kachchh

K. SIVAKUMAR

Ghost nets are a threat to marine animals in Gulf of Kachchh

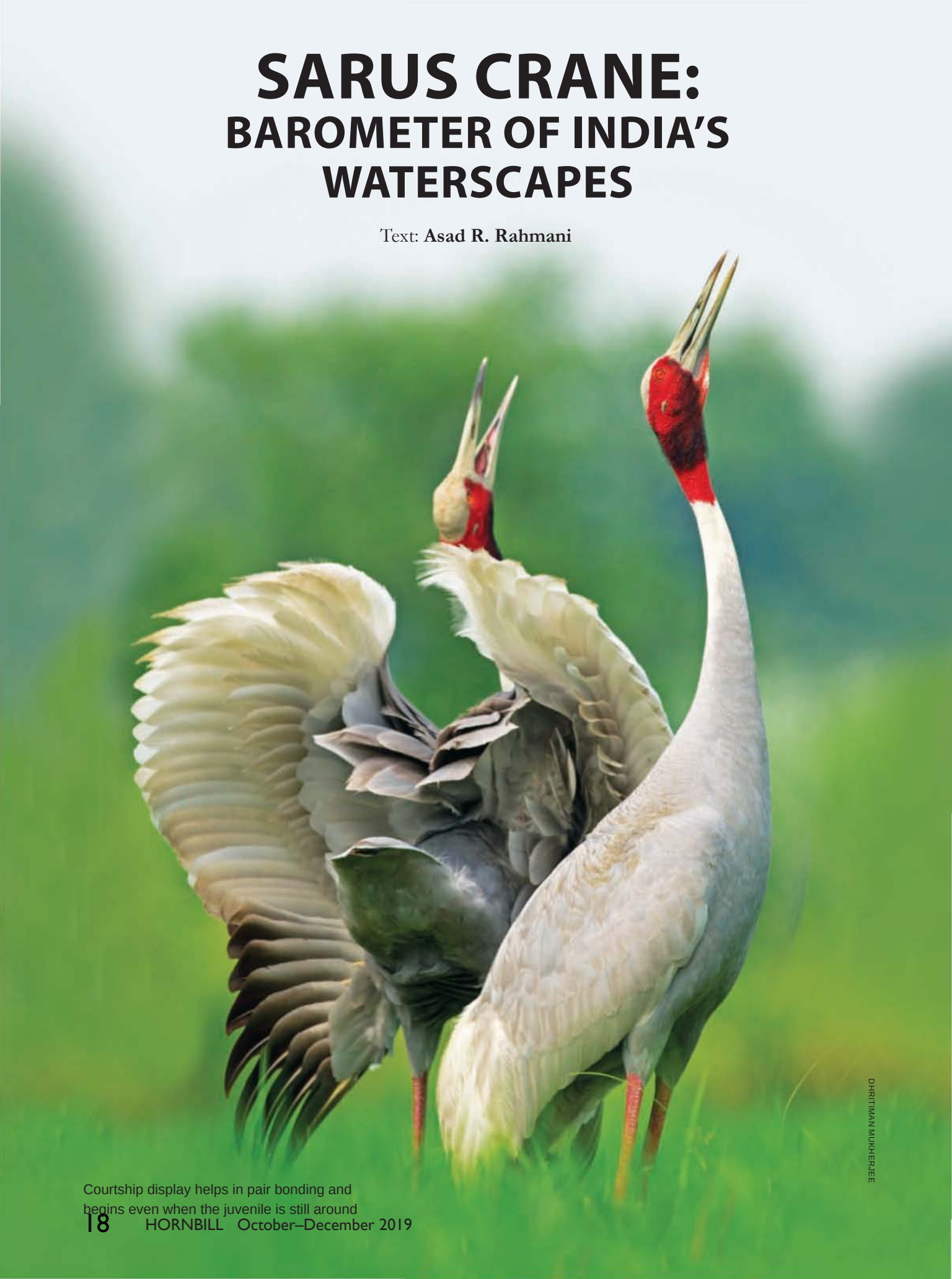
institutions. Research on corals, mangroves, sea grasses, and certain other threatened fauna has also been carried out, but in a sporadic manner and only in selected sites. So far, most of the research carried out in India has treated marine biodiversity as commercial products and largely failed to appreciate their ecological role. Moreover, recent threats such as climate change, invasive species, and rapid economic development are posing major challenges to the conservation of marine biodiversity. Addressing these lacunae urgently through long-term scientific research, and generation of ecological information on the habitat and resource requirements of marine species, are needed for successful management of MPAs in the country.

The Government of India has recently published India's third National Wildlife Action Plan for the period of 2017–2031. The Plan is a road map for wildlife conservation in India, and is unique as this is the first time India has recognized the concerns relating to coastal and marine conservation, and has emphasized the importance of integrated management of coastal and marine ecosystems in India. The Plan also lays special emphasis on integrated management of MPAs in India, so that livelihoods of coastal communities are safeguarded without harming the ecosystem and marine biodiversity.

K. Sivakumar is Scientist 'F' with the Wildlife Institute of India (WII), Dehradun. He leads WII's Marine Biodiversity Programme.

SARUS CRANE:
BAROMETER OF INDIA'S WATERSCAPES

Text: **Asad R. Rahmani**



DHRITIMAN MUKHERJEE

Courtship display helps in pair bonding and begins even when the juvenile is still around

The Indian sarus crane *Grus antigone* is cited as a good example of life-long fidelity, and there is a popular myth that if a sarus dies, its partner pines for days and succumbs to the pain of the loss. There is some truth to this, because the survivor does not leave the area for many days. However, better sense prevails eventually, and with time it finds another mate to start life afresh! Nonetheless, the myth has given a mystical aura to the sarus that has helped in its conservation in large parts of its range. All cranes enjoy such status, but the sarus in particular is considered a sacred bird, not to be killed or molested in anyway. That is why this tallest flying bird of the world is surviving in densely human-dominated landscapes of India and Nepal.

The sarus is mainly found in north, northwest, and central India, and as we go south, its population decreases. It is found in Punjab, Haryana, Uttar Pradesh, western Bihar, Jharkhand, Rajasthan, Gujarat, Madhya Pradesh, Chhattisgarh, and northern Maharashtra. There are occasional records from Andhra, Telangana, and Odisha. The largest numbers of sarus are found in Gujarat, Rajasthan, and Uttar Pradesh. Uttar Pradesh can be called the Sarus Capital of India. Outside India, it is still found in the terai of Nepal, but has become extinct in Pakistan and Bangladesh due to hunting. A subspecies, *Grus antigone sharpii*, is found in Myanmar, Cambodia, Vietnam (where it may now be extinct), and Australia. The total world population is estimated to be anything from 10,000 to 15,000 birds, with about 10,000 to 12,000 birds estimated in India.

Recently, I completed a two-year study on the sarus in seven districts of Uttar Pradesh, funded by the Sarus Protection Society of the Uttar Pradesh Forest Department. In the study, with five volunteers, I was able to collect data on this species from more than a thousand locations. The study revealed many new facets and reinforced earlier information on sarus. Like most crane species, the sarus is dependent on marshes and

DHRITIMAN MUKHERJEE

The mother does not leave the nest until all the chicks have hatched

ASAD R. RAHMANI

During the breeding season, sarus is highly territorial and does not allow other sarus pairs to come near the nest

jheels for its livelihood, but being adaptable, it frequently uses flooded agricultural fields for foraging and nesting. It is not found in large, deep wetlands. Nor is it found in wetlands in forested protected areas such as Dudhwa National Park and Kishanpur Wildlife Sanctuary in Uttar Pradesh, probably due to danger from large predators like tiger and leopard. Typically, it is a bird of shallow seasonal marshes, formed due to flooding of large rivers or by rainwater collection in depressions. Most of these marshes have now been more or less taken over by humans for agricultural or industrial use; and the sarus has no choice but to take refuge in crop fields. It is, therefore, frequently found in paddy and wheat fields, particularly when they are irrigated, and also visits the fields after the harvest to feed on fallen grains.

According to the National Wetland Atlas, Government of India, prepared by Space Application Centre (SAC), Ahmedabad in 2011, there are 745,370 freshwater wetlands in India. Of these, 630,869 wetlands are less than 5 ha (84.64%), 44,007 wetlands are 5–10 ha (5.90%), and 53,710 wetlands are 10–50 ha (7.21%). Thus, almost 98% of the wetlands are less than 50 ha. Despite the fact that wetlands of 100–500 ha form only 0.83% of the total number of wetlands, area-wise they constitute 12.14% of the Indian freshwater landscape. According to the SAC data, there are nearly 14,000 wetlands in Uttar Pradesh that are below 5 ha, and more than 10,000 are from 5 to 50 ha. They constitute nearly 50% of all the wetlands mapped by SAC. Such small wetlands scattered in the countryside are important for sarus breeding and foraging as sarus generally avoids large and deep wetlands. These statistics apart, what is important for sarus is a small, shallow, undisturbed *jheel* of 5–10 ha, where it can nest and raise its chicks, and a normal rainfall pattern for three to four months. It would be an understatement to say that most of the wetlands in which it occurs now are under severe stress and some may not even survive the next few years, leaving this bird with submarginal nesting habitats such as paddy fields, where it faces constant disturbances and toxic pesticides.

Threats to Sarus Crane

The sarus crane lives in human-dominated landscape and waterscape, and earlier may have even benefited from ruralization of the countryside. However, increasing human population, changes in the crop pattern, and

rapid industrialization are exerting subtle stresses on their populations that are sometimes not easy to understand and assess.

Encroachment is the biggest threat to all natural wetlands of Uttar Pradesh, except those which are protected in real terms under the Protected Area Network. Everywhere we found encroachment on wetlands, mostly with the connivance of the Gram Pradhan (village head). In some places, people told us that the Pradhan had given a *patta* (legal record of rights) for cultivation. In almost all the wetlands that we visited, we saw human presence in the form of rice or *singhara* cultivation and fishing. Out of the 380 natural wetlands visited, almost 100% had human intervention in some form or other. Cultivation and draining of wetlands were seen in nearly 80% of the wetlands. Almost 90% of the wetlands had the invasive weed water hyacinth, partially or fully covering the wetland. Only very small wetlands of 2–3 ha, amongst crop fields, were free of this pernicious weed. Sometimes villagers had removed the weed for pisciculture – either way the wetland becomes unsuitable for sarus.

Free-ranging dogs

A new problem that sarus faces is predation and disturbance by free-ranging dogs. This problem is so widespread and contentious that it will require a separate article. We kept records of all sightings of free-ranging dogs near sarus. On 26 occasions we found dogs disturbing the sarus or moving very close to adult birds with chicks/juveniles. Most sightings were of a single dog, but up to eight dogs disturbing sarus were noted. Threats from dogs to sarus can be of three types:

1) *Predation*: A dog may not be able to kill an adult sarus but it is a grave threat to chicks and juveniles. An injured sarus (e.g. after hitting a wire) or a sick sarus (due to eating pesticide laden grains) can easily fall prey to a pack of dogs.

2) *Disturbance*: It can be of two types:

Direct disturbance: Harassment of sarus by free-ranging domestic dogs is a big threat to a sarus. We have often seen sarus leaving the area when dogs appear. Sometimes the cranes chase the dogs but remain distressed for a long time, and leave the area. It is not only direct killing, which may not be common in the case of dog-sarus interaction, but the effects of increased stress and energetically costly behaviour that also need to be considered. It has been shown in other birds that fear-mediated behavioural changes in the presence of predator can decrease breeding success in some species.

Indirect disturbance: Frequent presence of dogs in an area forces the sarus to abandon the area temporarily or permanently. When wild animals perceive dogs as a threat,

CHOTU KHAN

As sarus chicks hatch at an interval of two days, sometimes more, there is a visible difference in their size

they may change their behaviour and habitat use to avoid them. For example, a study near Sydney, Australia found that pet dogs, even when restrained by leash, walking in city parks and national parks reduce the abundance and species richness of birds. It was found that dog-walking in woodland leads to a 35% reduction in bird diversity and 41% reduction in bird abundance.

3) *Multiplier impact*: When two threats join together, we call it a multiplier impact. For example, after harassment by dogs, a sarus is forced to fly away, and during flight it hits a high tension wire and dies or gets injured. As dog numbers increase and power line network spreads, there will be greater chances of electrocution of sarus.

Threat from power lines

This brings us to the serious issue of electrocution of birds, including sarus, by power lines. Transmission (220 kV) and distribution (15 kV–45 kV) lines, and other such infrastructure are now major killers, particularly of large flying birds such as bustards, storks, eagles, and cranes. Cranes and bustards have a "blind spot" in front of the head due to the placement of their eyes on the sides of the head. These large birds are particularly prone to collision due to their low manoeuvrability in flight and/or poor forward-facing vision. In rapid flight, by the time they see a high-tension wire, it is too late. They get injured or electrocuted, or both. Their large bodies touch two wires simultaneously, resulting in electrocution.

There is an increasing scientific literature on the impact of power lines on large flying birds. In Spain, it has been proved that collision from power lines is a major problem for the great bustard *Otis tarda*. A study on whooping crane *Grus americana* found that when the juveniles migrate from Canada to Texas (USA), many die from collisions as they are unfamiliar with the landscape. Reduced visibility in foggy conditions also results in higher rate of collision. In north India, during winter, there are many foggy days when the visibility is less than 50 m. We do not yet have data on sarus collision on foggy and non-foggy days.

K. Gopi Sundar and B.C. Choudhury were the first to highlight the threat of overhead wires to the sarus crane. In a study based in Mainpuri and Etawah districts, they found that 1% of the population dies every year after hitting the wires, non-breeding sarus being most susceptible to such wires. Within territories, mortality was higher for pre-dispersed young ones.

Uttar Pradesh has a huge and complex network of electric, telephone, and high-tension wires in almost all the areas where we found sarus. In many wetlands/crop fields, these wires go right across. At every sighting of sarus, we collected data on presence/absence of wires.

DHRITIMAN MUKHERJEE

A sizeable population of sarus survives in several wetlands outside protected areas


BRIDESH KUMAR


BHALU MONDHE


CHOTU KHAN


B.C.CHOUDHURY

Powerlines, pesticides, dogs, water hyacinth, singhara cultivation, and drainage of wetlands for paddy cultivation are a deadly combination endangering the long-term survival of sarus crane in Uttar Pradesh

We found that 20% of sightings of the sarus were within 100 m of power lines, and 10% sightings were near or under high-tension wires. We found dead sarus in three incidents. We came to know about another eight specific cases that had happened earlier, but the carcasses had decomposed or been eaten by predators. While speaking to local people, we were told by many of them that they had seen or known cases of sarus getting killed by power line wires. When we asked local people about the major threats to sarus, most of them told us that these were from pesticide poisoning and power lines.

Impacts of Climate Change

As our study shows, breeding success of sarus is intricately linked with rainfall. But it is not only the quantum of rainfall that is important, the normal pattern of rainfall for three to four months is perhaps more important. Climate change may change the quantum and pattern of rainfall, impacting the breeding success of sarus. At present, we do not have enough data on this issue.

Recommendations

Based on our studies, we have given recommendations to the Forest Department for the long-term protection of the sarus crane. Protected Area approaches, predominantly used for species protection and conservation, may have limited suitability for sarus crane for two major reasons: a) few sarus have been observed inhabiting PAs, and b) many PAs, particularly forested ones, may be unsuitable for the species due to predation pressure, despite having

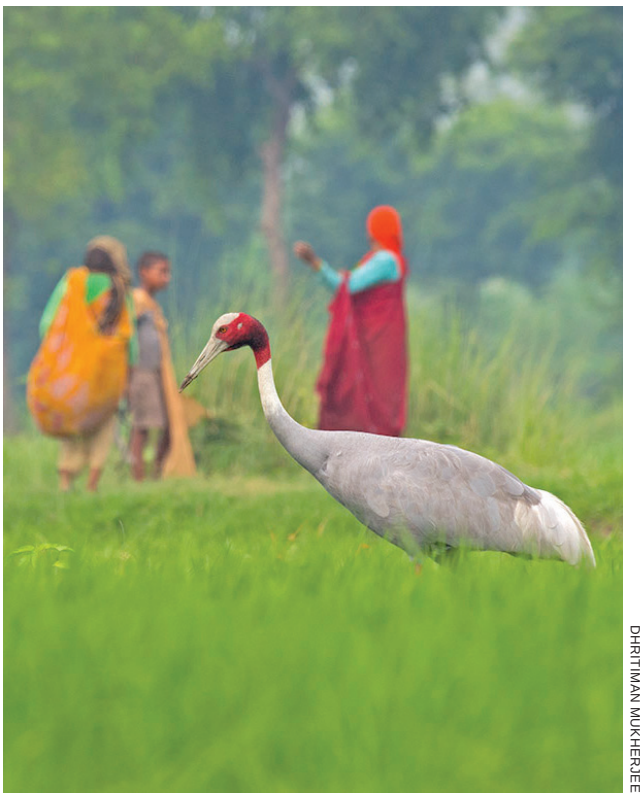
FAZLUR RAHMAN

Author examining a dead sarus after it was electrocuted by a high-tension wire

ASAD R. RAHMANI

Sarus faces constant threat from the dense network of electric wires in its habitat

DHRITIMAN MUKHERJEE



DHRITIMAN MUKHERJEE

Vehicular movement and human presence does not bother sarus much

wetlands within them, as in Dudhwa NP and Kishanpur WLS, mentioned earlier.

As sarus inhabits agrarian landscapes, three factors, namely cropping pattern, pesticide use, and changing attitudes towards farming as an occupation, have significant bearing on the suitability of the habitat for this species. The current cropping pattern appears suitable for sarus in some regions of Uttar Pradesh. However, cropping pattern is subject to change due to various factors such as market forces, India's export/import policy, farmers' distress, new agricultural research, and population pressure further subdividing already small holdings. Even genetic research can lead to change in the cropping pattern, indirectly impacting the sarus crane. For example, new researches show that sugarcane can be genetically enhanced to increase the amount of oil content in its leaves and stems, which can be used for biofuel production. If growing sugarcane becomes much more lucrative in future (sugar, jaggery, bagasse, and biofuel from one crop), many farmers presently growing paddy and wheat may change to sugarcane, hugely impacting sarus habitats.

Pesticides are another issue that can change the species' status. Genetically modified crops and introduction of new chemicals may not appear to have any links with sarus survival, but we should be aware of such indirect links. For example, when the drug diclofenac sodium was introduced for veterinary use in the early 1990s in India, no one thought that it would impact vultures. It led to a catastrophic decline in vulture numbers, from which they have still not recovered, although veterinary use of diclofenac was officially banned in 2006 by the Government of India. Very little work on the impact of pesticides on sarus crane and other farmland birds has been done in India. Lack of data generates complacency – everything is fine, all is well!

Predation by free-ranging stray dogs is becoming a huge conservation problem for landscape species such as cranes. Old methods to eliminate the problem animals are now socially unacceptable and banned by law, so new solutions have to be found before this menace is further aggravated. More disturbances by dogs to sarus may lead to more electrocution deaths as the bird flies more. Devices are available that can minimize bird collision with power lines. We also need research on the flight patterns of sarus cranes to find out which types of power lines are less or more destructive to these large, low-flying birds. Presently not much is known about this in Uttar Pradesh.

Monitoring sarus is not easy as it lives in a highly complex rural landscape, so standard line transect method may not be very suitable for field data. Randomly selected block count using ground staff/ researchers and drones may give better results. However, this has to be statistically robust to interpret the data for the whole area/region.

CHOTU KHAN

Although sarus can fly very well, it prefers walking most of the time, even while crossing roads

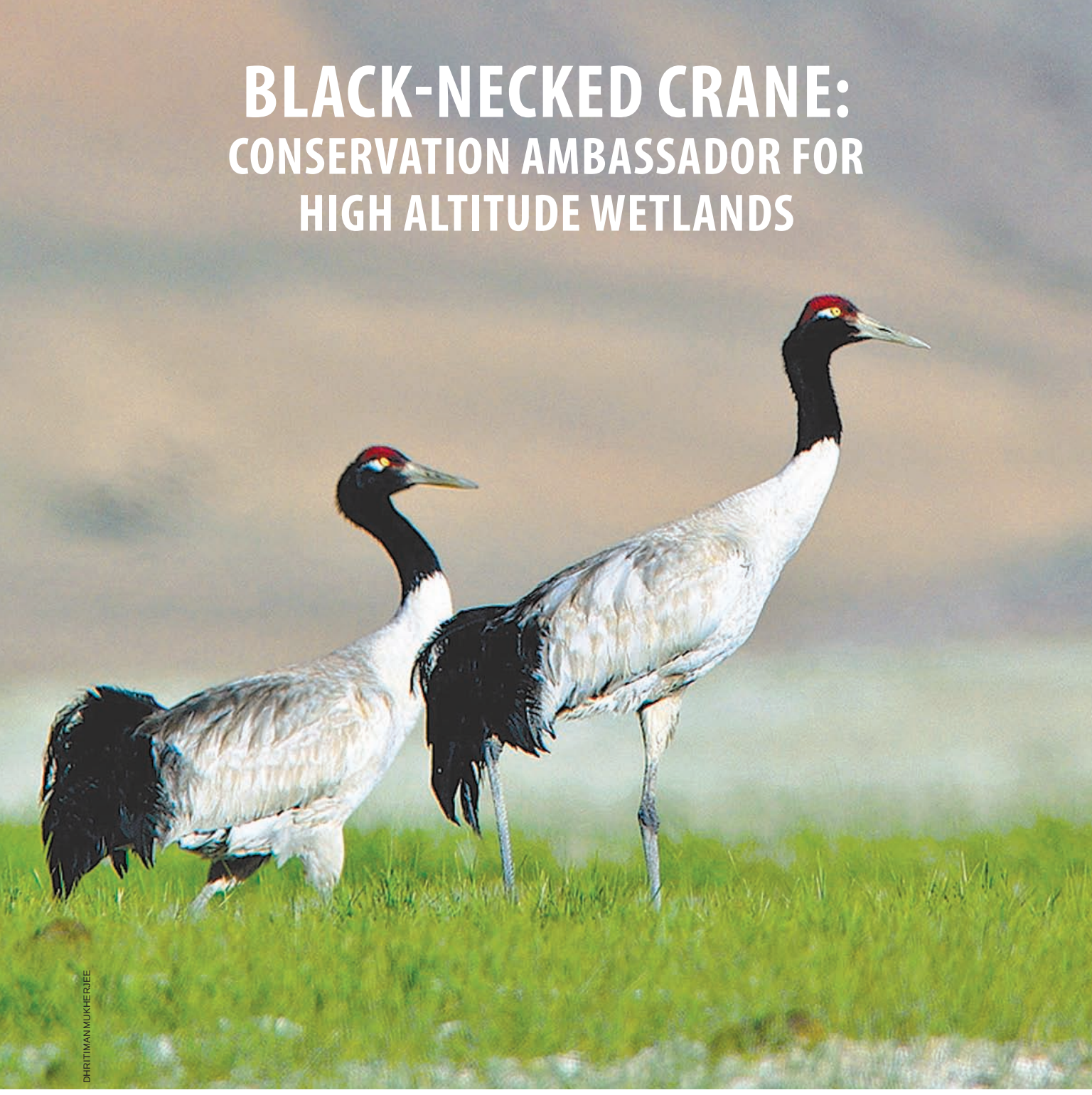
At present, local people are positively inclined towards sarus, but this attitude can change quickly as the new generations of farmers come up. They have a lesser connect with their landscape and the species therein. We are witnessing increasing farmers' distress and increasing aspirations of the new generation to make money. In such a situation any activity that even slightly decreases crop productivity (e.g. sarus breeding in paddy fields) will not be looked at positively. Sarus protection cannot be at the cost of loss of crop yield. These are changing attitudes in the fast-changing countryside of Uttar Pradesh.

Asad R. Rahmani, a renowned ornithologist, and former Director of BNHS, is Scientific Advisor to the Corbett Foundation and Hem Chand Mahindra Foundation. He is Governing Council member of Wetland International South Asia and BNHS.

Mangalajodi Wetland

DHRITIMAN MUKHERJEE

BLACK-NECKED CRANE:
CONSERVATION AMBASSADOR FOR HIGH ALTITUDE WETLANDS



DHRITIMAN MUKHERJEE

Text: **Pankaj Chandan**

Two decades ago, in June 1999, I undertook my first survey of the high altitude wetlands of Ladakh, as part of a WWF-India supported project working towards the conservation of high altitude wetlands. With very little knowledge of the area, I accompanied a team of forest officials who were on a routine visit to eastern Ladakh to disburse salaries to their field staff posted at various locations. We started our journey from Leh and headed towards Tangtsay in Changthang Cold Desert Wildlife Sanctuary, located in eastern Ladakh, at altitudes ranging from 4,000 to 6,000 m above msl.

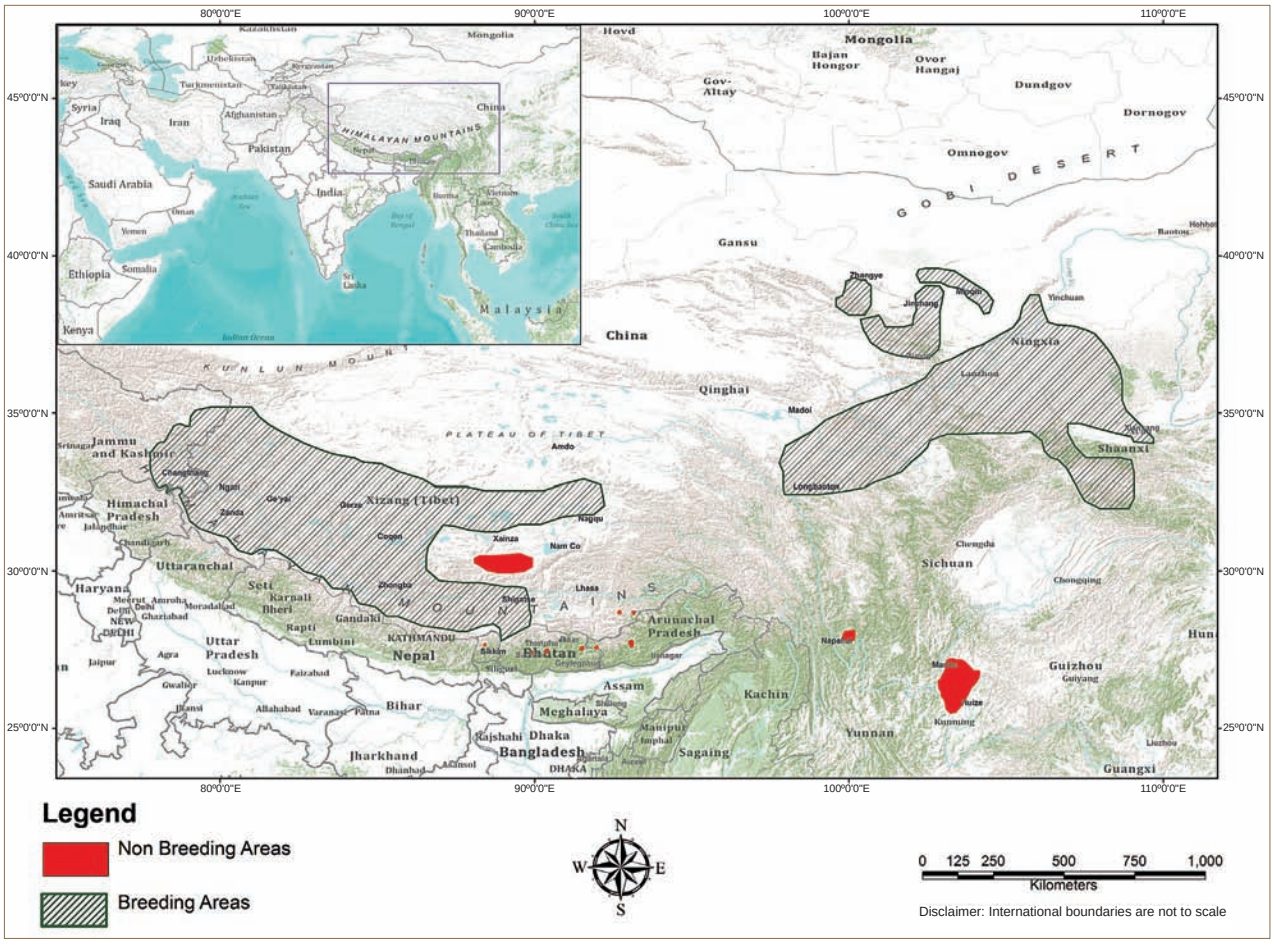
During that visit, my main focus was to document the key high altitude wetlands of Ladakh, and if possible, also sight the black-necked crane *Grus nigricollis*. After a day-long journey by jeep, we reached Tangtsay and stayed at the forest rest house at night. At that point of time, Tangtsay was very cold with night temperature around minus 3° C. Early next morning, we started our journey towards Chushul. The very first sighting we had of wildlife was an upland buzzard sitting on an electric pole close to Sato village, near a fast-flowing stream. As we moved ahead, we saw massive marshes with many species of waterbirds including bar-headed goose, ruddy shelduck, and brown-headed gull. Every time I sighted a waterbird, the black-necked crane was at the back of my mind. As we were driving through the vast, open, high altitude landscape, we sighted many species of mammals, including Himalayan marmot, blue sheep, and Tibetan wild ass (or kiang). Later, as dusk was setting in, Mr Mohammad Abbas, the wildlife official, asked his driver to stop, and looked out with his binoculars. I thought that it must be another usual bird from the area. Then, with great excitement, he told me "Mr Pankaj, you are lucky that you can now sight a black-necked crane during your very first trip to Ladakh." I immediately pulled out my binoculars, and in the dim light, I saw a pair of black-necked crane feeding at the Lungparma Marshes, a memorable sight that has stayed with me to this day.

After an hour's drive, we reached Chushul Marshes, yet another very important wetland of the area. That night we stayed at the army camp at Chushul. I was sure that there would be many pairs of black-necked crane breeding here, but unfortunately I was with a forest team who had their own busy schedule; besides no crane was sighted there. While driving from Chushul towards Loma, we sighted hundreds of Tibetan wild ass grazing in the pastures, along with herds of sheep, goats, and yak. Night was spent in a forest rest house at Nyoma, and the next morning, after meeting forest guards at Nyoma, we returned to Leh.

This small field trip of just a few days in Changthang, with the sighting of the black-necked crane, was the most exciting journey of my life. It was also one of the turning points of my life, as I decided that I would work in the area, focusing on high altitude wetlands and the black-necked crane. In 2000, WWF-India offered me a full-time position to work in Ladakh. During the same time,

PANKAJ CHANDAN

Tso Moriri, a Ramsar site in Ladakh



ANUPAM ANAND

Distribution of black-necked crane

Wildlife Institute of India (WII) was also conducting a very important biodiversity research project in Ladakh, so I got a great opportunity to interact with scientists like Dr Yashveer Bhatnagar, Dr S.A. Hussain, Dr Raghunandan Chundawat, Dr Bivash Pandav, Dr Shiva Kumar and Dr V.P. Uniyal. During these interactions, I gained from their inputs and was encouraged to enroll under Prof. Afifullah Khan of the Department of Wildlife Sciences, Aligarh Muslim University, for a Ph.D. degree on the black-necked crane, especially on its breeding habitat requirements and nesting ecology in the Changthang Cold Desert Wildlife Sanctuary.

Later, with support from my local WWF field staff, especially Tsewang Rigzin and Dawa Tsering, we were able to collect a great deal of information on the status and distribution of the species in Ladakh. Officials of the Department of Wildlife Protection, especially Mr Jigmet Takpa and Mr Mohammad Abbas, played a key role in supporting this study. This enabled our team to collect regular, uninterrupted data on black-necked cranes for two decades. During the course of the study, we recorded six new nesting sites of the species from Ladakh. This long-term study established that Tsokar, Hanle Marshes, Chushul Marshes, Yaya Tso, and marshes in the Upper Indus basin are the main breeding areas of black-necked crane in Ladakh. A nest of a saker falcon, which was the first breeding record of this species in India, was also recorded at Tsokar, on a rocky cliff close to the marsh where black-necked crane nests.

Some wintering areas of black-necked crane (BNC) were also surveyed in Arunachal Pradesh. In January 2006, a flock of 11 wintering birds was recorded feeding on the leftover grain from the paddy crop in Sangti Valley of Arunachal Pradesh. Some of my field visits to Ladakh wetlands with experts like Dr Asad R. Rahmani, Col. R.T. Chacko, and the late Dr Prakash Gole further enhanced my knowledge about black-necked crane and its habitat.

During one of my field visits in June 2010 to Changthang with renowned conservationist Ms Seema Bhat, we visited a place called Loma, which is situated at the confluence of the Indus river, flowing from China, and the Hanle river, which originates from Hanle Marshes

PANKAJ CHANDAN

BNC at Staklung, a high altitude wetland

PANKAJ CHANDAN

BNC feeding chicks at Hanle wetland in Ladakh

– a key breeding area for black-necked crane. On this trip as we reached Loma, we saw a crane sitting on its nest on a mound inside the marshes. I could easily see the crane incubating its eggs with my spotting scope. While I was observing the crane nest, which was the first nesting record from this site, my colleague Mr Phuntsog Tashi whispered, "Sir, snow leopard!" As he pointed towards the rocky mountain behind us, I immediately rotated my scope a full 360°. I could not believe that a snow leopard was sitting on a rock observing us from a distance of 400 m. This was the only time during our entire study that we spotted a black-necked crane and a snow leopard together.

As we moved from Loma to Hanle, we spotted a black-necked crane with a green tag on its right wing — this bird was tagged by us in 1995, and kept visiting Ladakh till 2010, nesting successfully at the same spot where it was tagged. Through many years of observations on the nesting pair, we collected vital data on the breeding of the species. This also showed us that site fidelity is a very important factor for black-necked crane, as this particular pair visited the same site year after year and bred successfully.

Further to my WWF-India study on black-necked crane in Ladakh, and with additional support from the International Crane Foundation (ICF), I also visited many wetlands in Bhutan and China. During these visits, I was able to sight the species in its entire distribution range. This also gave me the opportunity to develop links with crane experts in China and Bhutan. My many visits to Bomdeling and Phobjikha valleys of Bhutan provided information on the wintering ecology of the species. About 600 black-necked cranes regularly visit these two valleys during winter from November to February. At Bomdeling valley, I used to regularly meet my friend Mr Phurpa Wangdi, a local community member whose only mission in life is to protect the black-necked crane in Bhutan. This gave me insights into the contribution of many such unsung members of the local community who have made tremendous contributions towards wildlife conservation across the Himalaya. We felicitated Mr Phurpa Wangdi at the International Conference on black-necked crane conservation at WWF-India, Delhi in 2011, which was jointly organized by MoEF&CC and BNHS.

Black-necked crane is the only alpine species among the 15 species of cranes in the world. It is presently distributed over the alpine regions of India, China, and Bhutan, numbering around 13,500 birds. The main breeding range of the species encompasses Qinghai-Tibetan Plateau in south-central China, and adjacent parts of India (mainly the Changthang region of Ladakh). The wintering range of the species lies in the southern and eastern parts of Qinghai-Tibetan Plateau and the Yunnan-Guizhou Plateau of China. A sizeable population of about 600 birds winters in Bhutan. In India, this crane has been recorded breeding in Ladakh, with frequent attempts at breeding also reported from north Sikkim. A few birds regularly visit Pangchen and Sangti valleys of Arunachal Pradesh during the winter months. Due to

the difficult terrain, inhospitable climatic conditions, and inaccessibility of the area, it was the last of the world's crane species to be discovered.

Changthang Cold Desert Wildlife Sanctuary in Ladakh is the westernmost recorded distribution breeding range for black-necked crane. My recent visit to China in July-August 2019 with renowned crane experts Dr George Archibald, Dr Li Fengshan, and Ms Mary Anne Bishop enabled me to visit the easternmost breeding range of the species, i.e., the Ruoergai Marshes in Gansu Province, which has a breeding population of more than 4,000 black-necked cranes. This makes the Ruoergai Marshes of China the most critical breeding habitat for the global population of the species.

Black-necked crane is a migratory bird, and the breeding habitat is totally different from the non-breeding or wintering habitat. The bird breeds in high altitude wetlands and riverine marshes at altitudes ranging from 3,000 to 5,000 m above msl. The bird spends most of the non-breeding season (in the harsh winter months) at comparatively lower altitudes in China, Bhutan, and India. The breeding habitat of black-necked crane can be broadly classified into two categories: Lacustrine Marshes and Riverine Marshes. In India, the high altitude wetlands in eastern Ladakh are the main breeding grounds of this species. The birds arrive at these wetlands during March and April to breed, and after completing the breeding cycle, leave the wetlands for their wintering grounds in October and November.

These cranes are extremely territorial during the breeding season and spend most of their time with their chicks while foraging in the wetlands or nearby grasslands. While on the nest, especially during incubation and at the time of chick rearing, the birds always remain vigilant. This alert behaviour is part of their survival strategy. Both the male and female contribute almost equally to incubation and chick rearing. The alert behaviour is comparatively less during their non-breeding season, when they spend most of their time in groups, foraging mainly on gleanings in paddy fields and potato fields. During the non-breeding season, the birds roost together at night in small ponds and marshy areas to ensure safety from predators. This bird is not a very long distance migrant. Based on the available information on migration routes of the species, it has been observed that various populations of black-necked crane cover a migration distance ranging from 200 to 1,300 km.

PANKAJ CHANDAN

Pangong Tso, a key staging area within Central Asian Flyway

PANKAJ CHANDAN

Black-necked crane upon its arrival in Ladakh in March

Presently, feral dogs in the breeding areas pose a serious threat to black-necked crane, as they prey on the eggs and chicks of the birds. Overgrazing by livestock owned by nomadic herdsmen, unplanned and unregulated development and tourism are other major threats to the species. Linear infrastructure, especially the massive network of power lines, and raising of plantations in high altitude wetlands, are other causes of concern. At the regional level, climate change with extreme climatic events and rapid glacial melt in some areas is a serious threat to the survival of the species.

During our long-term study, we recorded some very interesting observations and experiences like chasing of yaks by black-necked crane, and an attack on the research team by a breeding pair to protect their chicks. On one occasion, a bird was seen picking up and swallowing a whole pika through its swift neck movements. At Startsapuk Tso, a pair was seen eating the eggs of bar-headed goose. Their courtship displays, mainly in April and May, are quite spectacular. At times while dancing, these cranes were seen picking up pieces of yak dung and throwing it up in the air and then trying to catch the same.

The Changpa nomads in Ladakh consider black-necked crane as a sacred bird and its sighting is considered to be a sign of good luck. These people have been sharing the habitat with the crane since ages and are an excellent example of how humans and wildlife can coexist. The locals, who follow Buddhism, do not harm the species. However, for its overall survival into the future, it is vital that all the range countries urgently protect this 'Conservation Ambassador for High Altitude Wetlands', by affording protection to the species and its habitat in its entire range in India, China, and Bhutan.

It is my dream to use this bird as a powerful catalyst for regional level scientific collaboration between India, China, and Bhutan, using the flyway approach along the Central Asian Flyway (CAF). Within the high Himalayan region, the black-necked crane is an excellent flagship species for the protection of high altitude wetlands and to facilitate regional cooperation. Thung-thung, as this sacred species is called in Ladakh, can also act as a messenger of peace in the region, as migratory birds do not recognize the boundaries created by human beings.

Pankaj Chandan leads WWF-India's initiatives in Western Himalaya. He is a member of Crane & Goose Species Specialist Group of IUCN.

VALUE THE INVALUABLE

SGNP provides several ecosystem services to Mumbai, the financial capital of the country, emphasizing that ecology is the bedrock of economy

Text: **Pooja Patki**
Photographs: **Rushikesh Chavan**

The first time I visited Sanjay Gandhi National Park (SGNP) in Mumbai was during the monsoon of 2018. Light showers made it look as inviting as ever. It was quite an experience to be walking on trails which, in certain patches, were submerged in knee-deep water. Wading our way through it, we finally reached a stream, an actual freshwater stream without any chemical pollutants or rubbish in it, a concept that I believed was impossible for Mumbai. Dipping my feet and eventually dipping myself in the stream, watching birds perched on branches, and the sound of the flowing water washed me over with a sense of calm. All of this at a price of just around Rs 300, including the cost of travel, entry ticket, and a warm cup of tea outside the park.

A substitute for this experience is hard to find. Maybe an adventure water park or a swimming pool may leave me with a similar feeling; however, these parks charge relatively higher, at least a thousand rupees, and would only substitute one aspect of my visit to SGNP. What about the bird sightings, the ambience, or even the serenity? Yet, simply looking at the difference in price between a visit to SGNP and one to an adventure park, should one conclude that the latter provides more value than the former? In that case, should we just have more

adventure parks as they might generate more revenue and are also more valued? If not, then what is the price really and does it truly represent the value of something? All of these questions are extremely important, if we are to undertake conservation in this market-based economy. Let us see what this means.

Over the last decade, the focus of conservation has moved away from predominantly looking only at protecting nature for its intrinsic worth to a view which is largely utilitarian, often linking it to human well-being. towards linking it to human well-being. Its inclusion in the Sustainable Development Goals is indicative of the global acceptance conservation has received. The impact of human activities on the environment and vice versa is, however, not a recent phenomenon. From Plato's writings in 400 BCE to the iconic Chipko movement which began in the 1970s, each has traces of this relationship. Our dependence on natural resources and ecological systems is best communicated through the concept of ecosystem services.

Ecosystems are intricate systems, within which exist complex networks and communities of organisms that interact with each other and with their physical surroundings. These interactions have several by-products, which benefit humans directly or indirectly. For example, wetlands, which are one of earth's most productive ecosystems, provide myriad services owing to their hydrological and chemical cycles. The extensive food chains of wetlands not only support vast biodiversity, but also provide flood control and water purification services.

The services that ecosystems provide are broadly classified into 1. regulatory services that affect climate, water quality, and floods; 2. cultural services such as recreation, spiritual, and aesthetic benefits; 3. supporting services that include photosynthesis, soil formation, and nutrient cycling, and finally 4. provisioning services, such as products directly obtained from the ecosystem. Of particular interest is the last category. Deriving provisioning services from an ecosystem such as fish, timber or firewood, over and above their regenerative capacities, hinders the supply of other services that rely on the stock of such resources. That is, the more we provision from an ecosystem, the less we receive from other services.

This raises an important question – how much of the ecosystem do we leave intact for generation of services such as water purification and prevention of soil erosion, and how much of the ecosystem do we convert into goods. This is where economics comes into play. Economics is the study of management of scarce

Forest degradation has been attributed to many causes, one of them being overharvesting of firewood for energy needs

Communities that live around ecosystems often depend on them for livelihood

resources and understanding the best way to allocate them across several uses. Economics does this by comparing the value of a resource across different competing uses for it. In a market economy, the value of a resource is represented by its price. Assuming that people who wish to buy the resource want to buy it at the lowest possible price, and the sellers of the resource wish to sell at the highest possible price, these buyers and sellers interact in the market and this interaction resulting from self-interest leads them to settle on a price which is optimal for both. This seems a convenient way to trade goods and services, and to determine their prices.

Under the current economic setting, there exists a price tag on the provisioning services that are derived from an ecosystem. Only some aspects of ecological processes and components that are traded in the market, such as wood and other forest produce, are priced, while non-tradable services such as cultural or regulating services are not. Very often, wetland resources and ecosystem services generated from them are undervalued or completely unvalued, owing to their complex and multifunctional nature. Tangible outputs generated from wetlands, such as fishery, have an economic value attached to them; however, non-tangibles such as the functions they carry out or even the aesthetic benefit accrued to humans such as by birdwatching or simply by the existence of wetlands, goes completely unseen. This results in overharvesting of tangible services, which impacts the flow of intangible services. In order to ensure that conservation efforts and corresponding policies take into account this trade-off, valuation of ecosystem services has come to the fore as a new discipline. The idea behind it is simple: ecosystem services valuation will bring to people's notice the value of nature, thereby providing incentives to invest in its conservation.

There is an overt trend to undervalue and, in some cases, completely disregard the value of ecosystems. Especially in the face of growing population pressures and the corresponding increase in consumption, ecosystems such as wetlands are threatened. In the case of wetlands, given the lack of any value assigned, there always exist various interests that would benefit from conversion of wetlands – may it be replacing them with roads or bridges, or converting them into agricultural land. One important way of protecting wetlands is to prove that society will gain more from protecting them than by giving them up for different purposes. Thus, given that the market for ecosystem services is missing, incomplete, or invisible, valuation as one of the guiding principles to decision making becomes a necessity.

Even though the pricing mechanism is handy and agreeable, it does not easily apply to ecosystem services. One of the major issues lies in the fact that ecosystem services are usually subject to open access. This means that these resources do not really belong to anyone, and aren't anyone's property. Since nobody *owns* these resources, no one can be excluded from using them. The essential players of a market – the buyers and the sellers – become null and void. These resources are valuable, but they have no economic value as they are essentially subject to free access.

Secondly, most ecosystem services are externalities, i.e., byproducts of ecosystem functions – and are not priced in the market. For example, my entry fee for SGNP did not account for the benefits that I received from the visit. Moreover, those who enter the park are not the only ones that benefit from it. The services that SGNP provides, from air purification to provision of water to locals, is accrued to people beyond the forests to those that do not pay the entry fee. It is also important to note that most of these

Nature has, over millennia, inspired art and culture; monetary valuations of such benefits are difficult to fully estimate

Revenue from tourism is commonly used in ecosystem valuations, as it represents willingness to pay for ecosystem benefits

When policies do not account for the monetary value of ecosystems, there are very few incentives to protect them, resulting in overharvesting

ecosystem services and products form inputs for a lot of economic goods and services; however, the costs of using these inputs are not included in the final product price.

Ecosystem services are no less a factor of production than land, labour, and capital, and constitute an important part of production processes. When this happens, the benefits that society receives from ecosystem services and the costs that will follow from their depletion or degradation are not imputed, resulting in unfounded policy decisions that lead to misallocation of resources. Further, since ecosystem services are not priced, or their prices do not accurately represent their scarcity, this generates incentives to overharvest and overuse.

Despite water being the most crucial requirement for survival, undervaluation leads to its mismanagement

An important wetland valuation carried out was that of the mangrove wetlands of Bintuni Bay, Irian Jaya, Indonesia in 1991. Though mangroves in Indonesia are constantly under threat of over-exploitation for charcoal, fishing, and other resources, Bintuni Bay is especially endangered because of the demand from the woodchip export industry, overharvesting of which will pose a danger not only to the mangrove ecosystem, but also its ability to support commercial as well as local fisheries. The capturable biodiversity benefit was imputed to be US$ 1,500 per sq. km per year if the mangrove system is kept intact, with total household income (from both marketed and non-marketed sources) estimated to be US$ 4,500 per household per year, and the total revenue generated from commercial fishing to be around US$ 35

million per year (as per 1991 prices). This study looked not only at the production benefits from the wetlands, but also studied the linkages between erosion leading from exploitation and biodiversity. It was estimated that the benefit to agricultural production from erosion control provided by the Bintuni was US$ 950 per household. These figures denote the flow of revenue that the ecosystem would generate, should the ecosystem itself and the linkages be maintained.

Relying solely on valuations comes with its own costs, a prominent reason for this being the definition of ecosystem services itself. An ecosystem function is classified as an ecosystem service only if it provides benefits to humans. Though this definition helps in emphasizing the cost to humans if these ecosystems are not protected, it also implies that the only factor that warrants their protection is their use to humans. This purely anthropocentric valuation often overshadows the intrinsic value of the ecosystem and the scientific basis for its conservation. Further, implicit in the price tag for ecosystem services is the platform for negotiations and exchange, thereby justifying that escalating human needs form a legitimate rationale for overharvesting.

An important question one must also raise is that what if the function, and the consequent service of a particular ecosystem, or even of some species, is not known? If we do not know or understand the contribution of each element, how do we price it? Does then the absence of price imply absence of value? Literature on valuations cites a simple example of the ozone layer. The value of the UV-B protection that the ozone layer provides is overwhelmingly significant in terms of the costs that would have to be put in for medical treatment and the agricultural losses that would accrue in the absence of this service. However, there was no value attached to the ozone layer before this protective function was discovered. There was no demand for something that people did not know existed, and thus, no market for it, making it impossible to price, consequently leading to it have no 'value'.

Valuation needs to be seen as the means to an end, and not an end in itself. It definitely should not be used, incorporated, or interpreted purely in isolation. As estimates of economic valuations are subject to the current state of a society's preferences, aspirations, income and consumption patterns, technological capabilities, expectations regarding the future, and more importantly, the methodology used for valuations, changes in any one of these aspects will change the valuation estimates. Therefore, valuations should only be used as a tool

Lesser species such as Arctic fox are also affected by habitat shrinking

Despite the extensive role that mangroves are known to play in flood control, the entire Bandra Kurla Complex in Mumbai has been built on mangrove habitat

to highlight the complexities of socio-economic and ecological interrelationships, and how human decisions can impact the ecosystem and vice versa.

With a growing body of evidence suggesting that the 21st century will witness grave and drastic problems, from loss of biodiversity to water scarcity, it has never been more imperative to include robust and timely estimates of the value and benefits of ecosystem services in policy decisions. To bring about a change in decision making, it is necessary to instil the values of natural capital into institutions, such as land use policies or subsidies. These institutions have to be formed in a manner that they can help guide decisions of individuals, communities, and of society as a whole. These decisions can further encourage optimal allocation of the natural capital across varied uses. Despite all the technicalities that underlie valuations, one must understand that it is not an elixir to cure all conservation problems. It is simply a language that integrates ecology and varied social sciences that are often viewed to be conflicting, and helps communicate to society the importance of ecosystems and the interactions within. It is now up to us to ensure that this language is not misunderstood or misconstrued.

Pooja Patki is a conservation economist at Wildlife Conservation Trust.

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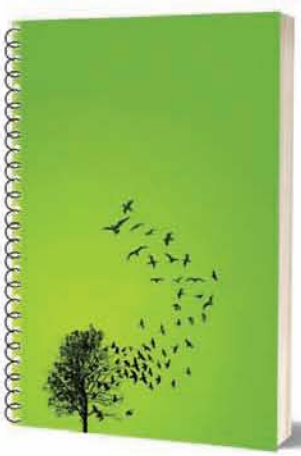

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BNHS CONSERVATION AWARDS

SÁLIM ALI

If ever there was a name that became synonymous with the BNHS, it was that of Dr Sálim Moizuddin Abdul Ali. His passing away left the Society bereft, but enriched by the legacy of a lifetime devoted to understanding the world of nature, to preserve it and to educate others about it. In all that he did, he set the highest standard of excellence.

To fully appreciate his life and work, one must examine his background. He was born in a family of achievers in an age when education leading to a degree was the road to success, and no deviation was permitted from the beaten path. Anyone out of step with this was looked upon with dismay and subjected to enormous psychological and other pressures. Sálim Ali successfully withstood these subtle and not so subtle pressures, ably abetted first by his wife Tehmina, and after her death by his sister Kamoo.

Sálim Ali's interest in birds dated back to his childhood, when he kept and observed birds, including those he could save from the kitchen, with the connivance of the family cook. Shooting down an unusually coloured sparrow at the age of 12 brought him to the Bombay Natural History Society (BNHS) to have the bird identified, and this visit crystallized his lifelong interest in birds. He was, in the beginning, a talented amateur, but he made himself into a professional ornithologist by undergoing specific training under a recognized expert in ornithology, Prof. Erwin Streseman of the Berlin University. The dedication and single-minded devotion he brought to the study of Indian ornithology, and the excellence he achieved therein, was to be recognized nationally and internationally by the honours that were showered upon him by the Indian Government, by universities and learned societies in India and abroad.

Ornithological surveys which Dr Sálim Ali undertook, starting in 1931, laid the foundation of our present knowledge of the avifauna of India. These surveys culminated in the many volumes on birds by Sálim Ali. The most famous among the books he wrote and that established birdwatching and bird study in India, is THE BOOK OF INDIAN BIRDS, first published in 1940 by the BNHS and now in its 13th edition. His other books, such as the BIRDS OF KUTCH, BIRDS OF KERALA, BIRDS OF SIKKIM, and BIRDS OF THE EASTERN HIMALAYAS, are popular presentations of the scientific data collected during the surveys undertaken by him.

The culmination of his studies of the birds of the Indian Subcontinent is the magnificent 10-volume HANDBOOK OF THE BIRDS OF INDIA AND PAKISTAN, which he co-authored with Dr Sidney Dillon Ripley, and which is the definitive treatise on the subject.

Many wild places in India, such as the Keoladeo Ghana National Park, Bharatpur (a UNESCO World Heritage Centre), the forests of Silent Valley in Kerala, and Karnala Bird Sanctuary near Mumbai, to name just a few, owe their survival to his interventions with successive Prime Ministers, since his representations were known to be balanced and based on a scientific approach.

Yet it was as a teacher that Dr Sálim Ali really excelled. The Bombay University had recognized BNHS as a Research Institute in Ornithology, with Sálim Ali as the research guide. His methods were innovative and the student was left to develop his own ability and initiative, with guidance subtly rendered through discussions. The bond that was so established followed the best traditions of the Indian Guru-Shishya relationship. He was thus able to expand the research capabilities of the BNHS when the opportunity offered. The high quality of the research findings is a tribute to Sálim Ali's capacity as a teacher.

The major field projects which he directed as Principal Investigator examined ecological problems, pure or applied, and were managed by the scientists who had been trained by him as students. These projects, some of which are continuing today, cover a variety of useful and necessary subjects: the reduction of bird hazards at Indian aerodromes, the migration of birds in the Subcontinent, the ecology of Keoladeo Ghana National Park in Bharatpur, the present status and future needs of such endangered species of birds as the great Indian bustard, floricans and the rare Jerdon's courser. The rediscovery of Jerdon's courser in Cuddapah district, Andhra Pradesh by one of Sálim Ali's young field biologists is one of the high points in the scientific endeavours of his time. Through these projects he was able to broaden the scientific infrastructure for ornithological field research in India, to increase awareness of the need for conservation.

The BNHS was very much a part of Sálim Ali's life. He was a member of the Society for over 69 years and for the latter part of his life the organization became synonymous with him when he was the Society's President. To the Society, he left whatever he thought was valuable in his possession. A man with a fine natural modesty, he was humane, selfless, sensible, and with a lively sense of humour. Above all, he had the quality that Gandhiji also possessed and which the Arabs call *Baraka* – the ability to bestow a blessing or benediction.

Sálim Ali was a non-conformist, a man who for many years walked a lonely path divergent from the mainstream of science in India. It is a tribute to his determination and genius that, at the end of his life, he had a sizeable population of the conformist mainstream following him, or at least appreciating and commending his more or less singlehanded efforts to study and preserve the birds of his land.

Throughout his life, Sálim Ali worked under financial constraints, so that it was very difficult, and at times impossible, to find means of support for youngsters interested in making a career in natural history studies who approached him for assistance. This was a goal very dear to his heart, and to this end he collected funds, and donated the money he received from various awards

to establish scholarship funds which have, in the past few years, supported some very bright MSc and PhD students, and resulted in excellent work being done. He also established the Sálim Ali Nature Conservation Fund from the Paul Getty Award for nature conservation and education.

The country today is in a very precarious ecological state. A little push in the wrong direction may lead us to become another Ethiopia, with expanding deserts and millions of starvation deaths. It is urgently necessary to scientifically study and evaluate our many threatened habitats, so that we understand what resources are there, what can be replaced from other sources, and what has to be preserved at any cost. In the absence of such studies our ecological wealth is being destroyed, because the value of these natural areas and the consequences of their destruction are not known. BNHS now has senior scientists trained by Dr Sálim Ali who can undertake such studies and give us accurate information, if we can raise the money to support them.

To commemorate Dr Sálim Ali's work, and to enable the Bombay Natural History Society to grow in the way he would have wished it to grow, the Society created the Sálim Ali Memorial Fund. It is our goal to build this up as a very substantial fund, to support activities in vital areas such as nature conservation, scientific studies in natural history, nature education, and publications.

The Society appeals to every individual to support this cause, and help in the realization of Dr Sálim Ali's cherished hope, by donating generously to the Sálim Ali Memorial Fund, which will provide support for independent scientific research and will lead to the conservation of India's rapidly dwindling natural wealth.

SÁLIM ALI AWARDS FOR NATURE CONSERVATION

All of us who love nature were never so enriched by one man as we were by Dr Sálim Ali. In all that he did, he set the highest standard of excellence. To continue his legacy of understanding the world of nature, to preserve it and to educate others about it, BNHS instituted the Sálim Ali Awards for Nature Conservation in 1996, which are supported by the Sálim Ali Memorial Fund.

The Awards recognize individuals of any nationality, for outstanding contributions and achievements in the field of protection, management, and conservation of natural resources, including population, wildlife, pollution and hazardous materials control, education, information, and legislation.

These biannual awards include an amount of Rupees One lakh and a citation, with a trophy initiated in 2019. Since 2008, the scope of the awards was increased to one international, one national, and one community award.

Any individual making an outstanding contribution to the management and conservation of the environment consistent with the policies, aims and objectives of the United Nations Environment Programme (UNEP) is eligible. The candidate for the Award may be associated with a university, foundation, corporation or other type of organization involved in nature conservation activities.

The selection of all awardees follows a due process of nomination.

At present, the Sálim Awards are bestowed in three categories: International, National, and Community.

Sálim Ali International Award for Nature Conservation – 2019

ALEXANDER LOUIS PEAL
Conservationist

Alexander Peal is a conservationist working to protect and preserve the biodiversity and natural heritage of his home country Liberia for decades. During his initial scholastic journey, he became curious about the diverse species of wildlife populations which seemed abandoned, since there were no programmes or official intention for fully protecting, managing and conserving the unique forest environment, except for forest exploitation – mainly timber and wildlife, which was used indiscriminately for food and livelihood. Wildlife conservation and management was not an immediate concern for inclusion even in the forestry curriculum.

After completing B.Sc. in Forestry at the College of Agriculture and Forestry in 1969, and having gained employment in the Department of Agriculture and Forestry as a District Forest officer, Alexander Peal was assigned to the Grebo National Forest, one of the most species-rich and diversified forest ecosystems in southeastern Liberia, where his interest in conservation and management of wildlife grew stronger. He sought training opportunities for building capacity in this area, and was selected for training at the College of African Wildlife Management, Mweka, Tanzania. After this, he returned to head the Wildlife and National Parks section provided for in the Forestry Development Authority (FDA), enacted in 1976.

Earlier, in 1969, it had been recognized that a lack of financial resources was limiting conservation in Liberia, rather than government interest. Dr Kai Curry-Lindahl, who had set up an ecological research station at Mount Nimba in 1962, called for an urgent programme of conservation to be implemented in Liberia. Thus Alexander Peal was appointed the first head of wildlife and national parks in 1978.

In the early 1980s, Peal became associated with Dr Jacques Verschuren, who had been invited to Liberia in the 1960s to consider potential areas for national parks and protected areas, and had returned to Liberia in 1976, as an IUCN advisor on wildlife conservation. This was a fruitful association; along with Dr Jacques Verschuren, Peal carried

out aerial surveillance of various forest regions in Liberia to determine the most likely locations to initiate the first national park projects.

In 1981 and 1982, sponsored by the National Geographic Society and the Zoological Society of San Diego, Alexander Peal and Phillip Robinson conducted a park feasibility study which recommended the establishment of Sapo National Forest, the first official national park of Liberia. Peal and Robinson met personally with the Liberian head of state, Samuel K. Doe, to recruit governmental support for the establishment of Sapo National Park.

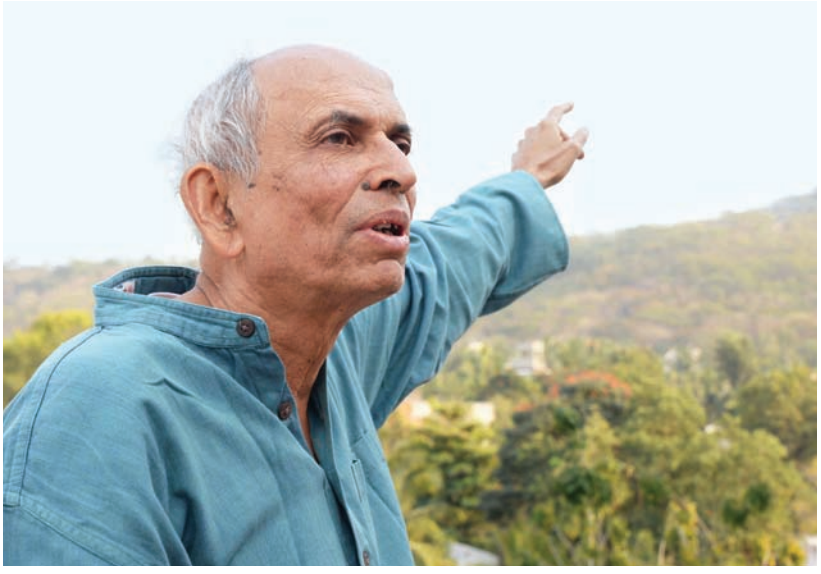
In order to involve public participation and support in Liberia's nature conservation programme, Peal founded the Society for the Conversation of Nature of Liberia (SCNL) in 1986, a non-governmental, non-political and not for profit conservation organization to promote the sustainable use of nature and natural resources to ensure a better environment and improved quality of life for all people, and to spread awareness. This initiative met with numerous problems and lack of resources. The Society became dormant, and the civil war that erupted in 1989 forced SCNL to halt all its activities in 1990.

However, with the persistent efforts of concerned parties, SCNL was reactivated in 1993 under the auspices of the erstwhile US-based Society for the Renewal of Nature Conservation of Liberia (SCRNCL), under the Chairmanship of Alexander Peal, who was in exile during the Liberian Civil War. Two civil wars between 1989 and 2003 all but halted nature conservation activities in Liberia, although a number of small-scale conservation activities were carried out by national and international NGOs during this time, often in collaboration with the FDA. With the return of stability, conservation efforts gathered pace once again, and the year 2001 saw the launch of the Liberia Forest Reassessment (LFR) project, a multi-partner initiative which produced current information on Liberia's forest cover, conducting field visits to identified forest blocks to assess biological and socio-economic characteristics. This movement continues unabated, not least due to the relentless pursuit by Alexander Peal.

Liberia currently has five Wetlands of International Importance designated under the Ramsar Convention. BirdLife International has designated one Endemic Bird Area (Upper Guinea Forests) and nine Important Bird Areas (IBAs) across Liberia (including Sapo National Park and several areas designated as National Forests). Mount Nimba was recently designated an Alliance for Zero Extinction Site. The Upper Guinea Rivers and Streams WWF Global 200 site which straddles the border of Liberia is recognized as a critical region for freshwater conservation.

Liberia has ratified the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Biological Diversity (CBD), and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). In all these activities and more, Alexander Peal has made stellar contributions to bring on board a strife-torn country like Liberia at global platforms with the most enlightened world views on nature conservation.

Sálim Ali National Award for Nature Conservation – 2019



MADHAV GADGIL
Ecologist

Dr Madhav Gadgil (born 1942) is an Indian ecologist, academic, writer, columnist, and the founder of the Centre for Ecological Sciences, at the Indian Institute of Science (IISc), Bengaluru. He has been a visiting professor at Stanford University (1991) and the University of California at Berkeley (1995). After his retirement from IISc, he went back to Pune in 2004 to resume his association with Agharkar Research Institute, where he now holds the Damodar Dharmanand Kosambi Chair of Visiting Research Professor at the University of Goa.

Madhav Gadgil pioneered the scientific study of Sacred Groves and pleaded for their conservation in many ways, including through a paper in the *JBNHS*. His efforts led to the declaration of several new Sacred Groves in Community Forest Resource Areas assigned to village communities of Gadchiroli and Chandrapur districts in Maharashtra. His five-year field studies, commissioned by the Karnataka government to look into the management of bamboo resources of the state, helped to elucidate problems associated with prevalent forest management practices, and resulted in the lowering of extremely high levels of counterproductive subsidies. Madhav Gadgil undertook the first ever systematic census of elephant populations in India, which led to the initiation of Project Elephant. He helped to develop the scientific logic for the selection of Biosphere Reserves, the Nilgiri Biosphere Reserve being India's first area to be so designated. He was a member of the committee set up to examine the proposal for the Silent Valley Hydro-electric project in Kerala, and undertook all the field work on behalf of the committee, which eventually resulted in the shelving of this non-feasible project.

Madhav Gadgil worked with educational institutions, NGOs, and local communities in a variety of projects. These include the Western Ghats Ecology Network constituted by 18 colleges across the states of Maharashtra, Goa, Karnataka, Tamil Nadu, and Kerala during 1990–1993. He organized a network of 45 colleges and NGOs from several Indian states to develop People's Biodiversity Registers during 1995–1996. These have become the model for the People's Biodiversity Registers in India's Biological Diversity Act 2002. He was a member of the committee that framed the rules for the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act

2006. He worked with many village communities granted Community Forest Resource rights to promote prudent, sustainable management, and conservation of select areas as nature reserves.

Dr Gadgil has played an active role in policy making, working with both the government and civil society. He was a member of the committee that framed the mandate of the newly instituted Department of Environment in 1980. He was a member of the Scientific Advisory Council to the Prime Minister of India from 1986–1990. Over 2010–2011, he chaired the Western Ghats Ecology Expert Panel, popularly known as the Gadgil Commission, whose carefully researched report suggested a series of measures for environmentally sound management of this biodiversity hotspot, and has drawn wide public support, particularly following the 2018 floods that devastated Kerala.

Dr Gadgil was a member of UNESCO's committee on Biosphere Reserves, the Indian representative on the Subsidiary Body on Scientific and Technological Advice to the Convention on Biological Diversity in 1995–96. He chaired the Science and Technology Advisory Panel of Global Environment Facility from 1998 to 2002. He was a member of the National Advisory Council to the Prime Minister of India from 2010–12, that proposed measures relating to the Forest Conservation Act. He also served as a member of the environmental education panel of the National Council of Educational Research and Training (NCERT) and as a member of the National Advisory Council. He is a member of the National Tiger Conservation Authority.

Madhav Gadgil has published extensively on environment and conservation issues. His first publication was a series of 10 articles on animal behaviour, published in *Srishtidnyan*, a science magazine in Marathi, when he was in the 10th standard. His doctoral thesis is reputed to be a citation classic. Several of his books have been widely read and used as text-books. His works have been translated into Hindi, Bengali, Gujarati, Kannada, Malayalam, and Chinese. He has written a great deal to demystify conservation science for the general public; this includes regular columns in *Economic Times*, *The Hindu*, and *Sakal*. The Government of India awarded him the Padma Shri in 1981 and the third highest civilian honour, the Padma Bhushan in 2006. He is a recipient of the Volvo Environment Prize and the Tyler Prize for Environmental Achievement.

Gadgil has been credited with the introduction of quantitative investigations in ecology and animal behaviour in India, with humans constituting a vital part of ecosystems. He has conducted extensive researches in the areas of population biology, conservation biology, human ecology, and ecological history. His researches have been documented in over 250 scientific articles, published in various journals and magazines.

The Indian National Science Academy (INSA) elected him as their Fellow in 1984. The Indian Academy of Sciences (IAS) and the National Academy of Sciences, India (NASI), elected him as a Fellow in 1990. He is Fellow of the Third World Academy of Sciences (TWAS), an honorary Fellow of the Association for Tropical Biology and Conservation (ATBC) and a recipient of the National Environment Fellowship of the Ministry of Environment and Forests for his field research in the Western Ghats.

The Council of Scientific and Industrial Research (CSIR) awarded him the Shanti Swarup Bhatnagar Prize for Science and Technology, in 1986. In 1983, the Government of Karnataka honoured him with Rajyotsava Prashasthi. His alma mater, Harvard University, presented him with the Harvard Centennial Medal in 2002. He shared the 2003 Volvo Environment Prize with Muhammad Yunus, a social entrepreneur from Bangladesh.

The University of Southern California awarded him the John and Alice Tyler Prize for Environmental Achievement in 2015, with Jane Lubchenco, a Distinguished Professor of Oregon State University. He is also a recipient of the Vikram Sarabhai Award and Ishwarchandra Vidyasagar Award and the Fergusson Gaurav Puraskar 2019, from his alma mater, Fergusson College.

Sálim Ali Community Award for Nature Conservation – 2019

TSUSEKI AND LIMTHURE
Educators and Conservationists

Tsuseki and Limthure belong to the Yimchunger tribe and are from Fakim village in Kiphre district in Nagaland. They have been making sincere efforts to create awareness about conservation among the local community in their area. The duo runs the Bhutan Glory Eco-Club in the fringe villages of Fakim Wildlife Sanctuary, despite lack of monetary support. The club has conducted reforestation drives on community lands, and is now exploring sustainable livelihoods in horticulture and animal husbandry to reduce dependence on their traditional shifting cultivation, which is now unsustainable and leads to widespread biodiversity loss. With a focus on banning hunting, involving youth in conservation, and biodiversity documentation, they have transformed community sentiments towards conservation. Though they are presently supported through the Mud on Boots Project at the Sanctuary Nature Foundation, they have singlehandedly carried out some commendable work in this field.

"We lay stress on the importance of conservation for a more sustainable future, and encourage nature photography with the slogan 'Shoot with camera, not with gun'," says Limthure, who recently became a forest guard.

PAST AWARDEES

INTERNATIONAL AWARD

Mr Zafar Futehally (1996–1997)
Mr Peter Jackson (1999–2000)
Dr George Schaller (2002–2003)
Dr Nigel Collar (2008–2009)
Mr Pavan Sukhdev (2012)
Prof. Ian Newton (2014)

NATIONAL AWARD

Dr K. Ullas Karanth (2008–09)
Mr Romulus Whitaker (2008–09)
Dr Ravi Sankaran (2012)
Dr A.J.T. Johnsingh (2014)

COMMUNITY AWARD

Kheechan Village, Rajasthan (2008–2009)
Khonoma Nature Conservation and Tragopan Sanctuary, Nagaland (2012)
Sandy Beach Youth Group, Lakshadweep (2014)

SÁLIM ALI-LOKE WAN THO AWARDS (2003)

- Mr T.J. Roberts, Sálim Ali-Loke Wan Tho Lifetime Achievement Award for his efforts and contribution to conserve the flora and fauna of the Indian Subcontinent
- Mr Jamshed P. Irani, Sálim Ali-Loke Wan Tho Special Award for his contribution to Ornithology
- Mr Lavkumar Khacher, first Sálim Ali-Loke Wan Tho Award for Excellence in Ornithology

J.C. DANIEL

Jivanayakam Cyril Daniel was born in 1927 in Nagercoil, Tamil Nadu, and brought up in Trivandrum. From an early age, his parents inspired in him a curiosity in the natural world. He completed his post graduation in Zoology in 1950 from Madras University.

Mr J.C. Daniel joined the Society's Collections as a Research Assistant and served the Society as Curator, Director, Honorary Secretary, and Vice President, during his lifelong association with BNHS. In these various capacities, he bound people together and built a team that reflected the Society's public profile. His deepest concern was the conservation of nature and under his tutelage emerged some sensitive wildlife biologists who continue his good work. To honour his commitment to BNHS, he was nominated as an Honorary Member in 1991.

An unmatched authority on amphibians, reptiles, birds, and mammals, he authored several books, focusing on large mammals and their conservation concerns. His book CASSANDRA OF CONSERVATION is a compilation of his succinct editorials on conservation issues in India. He published numerous scientific papers, while also serving as the Editor of the *Journal of the BNHS* and *Hornbill*. His paper on the tiger in India provided the impetus for Project Tiger which was launched in 1973.

J.C. Daniel was awarded many times for his contributions and remarkable role in the nature conservation movement in India. He was conferred the Peter Scott Award for Conservation Merit in 1988, Award of Kerala Agricultural University in 1989, the Indira Gandhi Paryavaran Puraskar in 1997, the Sanctuary-ABN Amro Lifetime Service to Conservation Award in 2000, and the Distinguished Service Award from the Society for Conservation Biology in 2007.

J.C. DANIEL CONSERVATION LEADER AWARDS

Starting 2019, the BNHS has instituted two new awards, the J.C. Daniel Conservation Leader Award for Young Women and Young Men respectively, to recognize and honour an individual's relentless personal efforts towards nature conservation. These awards are dedicated to the memory of Mr J.C. Daniel, a leader who inspired generations of researchers and conservationists. His dedication and constant endeavour to encourage and promote youngsters in the field of conversation is a quality rare to find today.

It is hoped that these awards will inspire young scientists, both men and women, to build upon the scientific bedrock of conservation that was laid by this visionary.

J.C. Daniel Conservation Leader Award for Young Men – 2019

ANANT PANDE
Ecologist and
Conservationist

Anant Pande completed his Masters in Zoology (Oceanography) from the University of Mumbai (2006–2008) and his PhD in Wildlife Science from Wildlife Institute of India from Saurashtra University (2015–2019). His doctoral research on the nesting ecology and population genetics of the snow petrel, a climate-dependent Antarctic seabird, is the first PhD from India on an Antarctic vertebrate species. Anant has been active in the field of wildlife conservation for the last 10 years. He has been associated with premier research institutes, such as National Institute of Oceanography, National Centre for Polar and Ocean Research, and Wildlife Institute of India. A trained biologist, he has worked on fauna ranging from zooplankton, seabirds, tigers, dugongs, to whales. He has been involved in national research programmes, including Indian Scientific Expeditions to Antarctica (2008–2009, 2013–2014, 2014–2015, 2015–2016, and 2019–2020), All India Tiger Estimation exercise (2010), Cheetah Reintroduction Survey (2011), and National Dugong Recovery Program (2017 onwards), in the preparation of the 5th National Report to Convention on Biological Diversity (2013–2014), and revision of the National Biodiversity Action Plan (2013–2014). His published contributions include peer-reviewed scientific papers (15), book chapters (03), technical reports (07), and popular articles. He has supervised two postgraduate dissertations in M.Sc. Environment Management at Forest Research Institute University (2018–2019), and five internships in ecology, molecular genetics, and marine biology.

He has been the recipient of numerous prestigious research grants, including the Scientific Committee on Antarctic Research (SCAR) Grant for Capacity Building; Association of Polar Early Career Researchers (APECS) Education and Outreach Grant (2016); International Association of Cryospheric Sciences (IACS) Travel Grant (2015); Ravi Sankaran Fellowship for Field Biology, Ecology and Conservation (2012); and Dakshina fellowship of University of Mumbai (2006–2008).

J.C. Daniel Conservation Leader Award for Young Women – 2019

SONALI GARG
Taxonomist

Sonali Garg, a systematist and researcher, has been studying Indian frogs for nearly a decade. She obtained her doctoral degree from the University of Delhi in 2019 with a thesis on integrative taxonomy, molecular phylogeny, and biogeography of Indian ranoid frogs, mentored by Professor S.D. Biju, whom she credits as her greatest source of inspiration, and catalyst in her decision to take up amphibian research as a lifelong commitment. Her early interests in wildlife exploration, biodiversity conservation, and environment protection evolved into a passion for documenting amphibians and understanding their diversification and distribution patterns. These led her to undertake extensive studies on the frogs of the Western Ghats and Sri Lanka. She carried out field expeditions across the Indian subcontinent and neighbouring Southeast Asian regions, and formally described 40 new species and two genera of frogs, along with team members and collaborators. Her research has yielded a significant body of primary data which has conservation implications for nearly half of the known Western Ghats frogs and one-third of all known Indian frogs. She addresses problems of amphibian taxonomy using several integrative approaches, primarily morphological and molecular, but also bioacoustics, internal anatomy, reproductive biology, and natural history.

She has to her credit 18 scientific publications, including comprehensive systematic revisions, in reputed peer-reviewed international journals. She has been a key scientific associate of the nation-wide conservation initiative Lost Amphibians of India (Project LAI) and the Western Ghats Network of Protected Areas for Threatened Amphibians (Project WNPATA), both headquartered at University of Delhi. Sonali is currently a Postdoctoral Research Associate with Council of Scientific and Industrial Research, Government of India, at the Systematics Lab, University of Delhi, where she continues to delve into broader questions surrounding the systematics, phylogenetic relationships, evolution, biogeography, and conservation of South Asian and Southeast Asian frogs.

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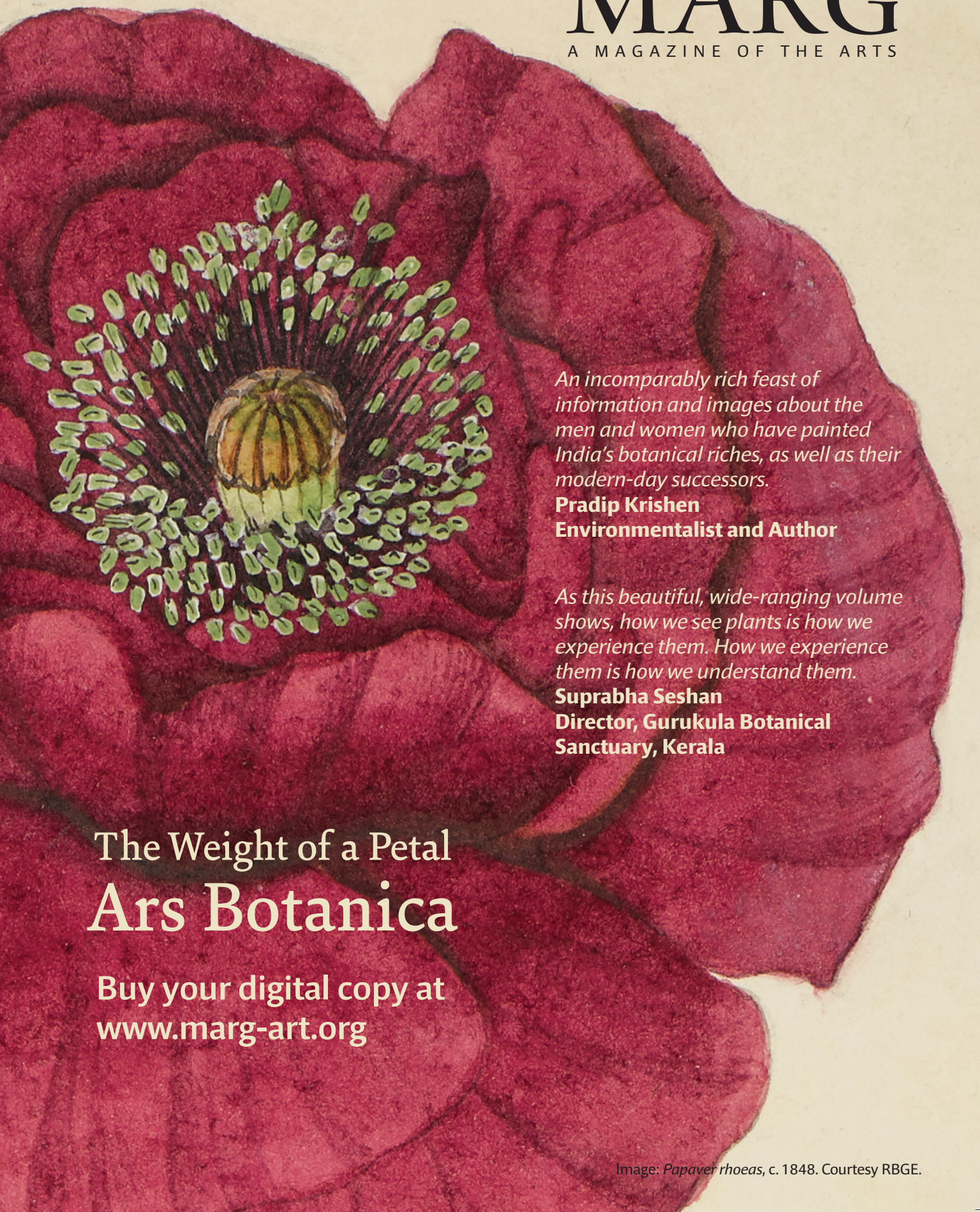

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NATURE TRAILS 2019

November 17	Karnala Bird Sanctuary
November 24	Leopard Trail, BNHS Reserve
December 8	Migrant Watch at Bhandup Pumping Station
December 22	Flamingo Boat Safari
December 28 & 29	Bird Identification Workshop

NATIONAL CAMPS 2019–20

November

- Pachmarhi, Pench and Satpuda National Park
  Date: November 23–28, 2019

December

- Golden Triangle – Ranthambore, Keoladeo and Chambal
  Date: December 17–22, 2019

January

- Lakshadweep
  Date: January 11–14, 2020
- Little Rann of Kutch
  Date: January, 2020

February

- Wild Assam
  Kaziranga National Park and Gibbon Wildlife Sanctuary
  Date: February 15–19, 2020

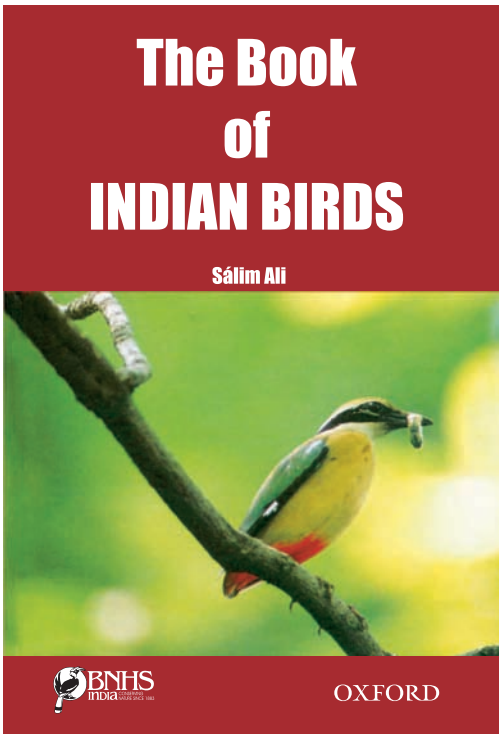
March

- Eaglenest Wildlife Sanctuary
  Date: March 7–11, 2020

INTERNATIONAL CAMP

- Tanzania, The Great Migration
  Date: March, 2020

Published on October 22, 2019, by Mr Debi Goenka for Bombay Natural History Society, Hornbill House, Dr Sálim Ali Chowk, Shaheed Bhagat Singh Road, Mumbai 400 001, Maharashtra, India.



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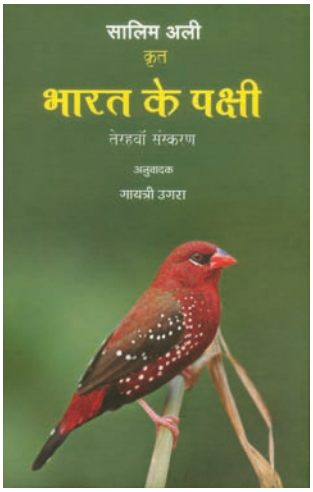

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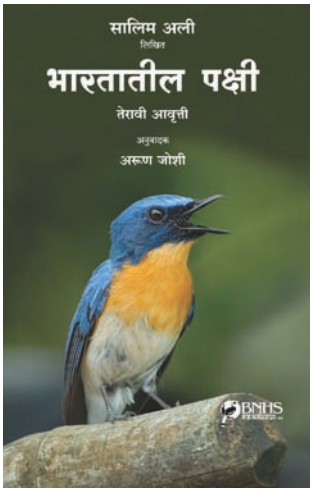

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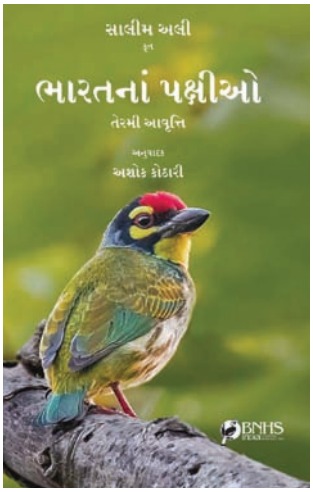

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