Conservational measures of avian species

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Abstract: We are losing avian diversity at an alarming rate, due to destruction / degradation of natural habitat i.e. forest and grass lands, lack of sufficient rains in National Parks and also due to poaching by villagers, 'baheliyas' for various purposes and for illegal export to foreign countries. Although Wild Life (Protection) Act, 1972, Government of India (as amended in 1991), does not allow poaching and illegal trade of birds and wild life, somehow it is continuing uninterrupted. Conservation efforts by the Central Ministries, Government of India, Ministry of Environment & Forests, Government of India, Research Institutions, Agricultural Universities, State Veterinary Departments, NGOs like WWF India, New Delhi, Wild Life Institute of India, Dehradun, BNHS (Bombay Natural History Society, Mumbai), SACON (Salim Ali Centre for Ornithology and Natural History, Coimbatore (T.N) and others are underway for the conservation of avian genetic resources in the country.

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Introduction: Biodiversity, encompassing ecosystem, genetic, and species diversity, is crucial for maintaining ecological balance (7,11). India, renowned for its geomorphological diversity, harbours rich biodiversity, which is, however, declining due to rapid urbanization (9). Understanding diversity across habitats is vital for grasping community structures, niche relationships, and identifying significant landscapes for biological preservation (13) . The global erosion of biodiversity primarily results from human activities (7,11). Avian diversity plays a pivotal role in maintaining ecological balance, serving as a crucial component of food chains(15). Birds are fascinating, attractive, and environmentally significant, indicating the overall health of nature and estimating natural surroundings' quality (4). As exterminators, birds regulate insect and rodent populations, maintaining trophic levels and acting as excellent bio-indicators Urbanization, human disturbance, and habitat destruction have disrupted and reduced avian diversity (16). However, birds continue to thrive in urban areas, performing diverse functional roles, such as seed dispersal, scavenging, ecosystem engineering, nutrient deposition, and predation.

There are more than 11,000 species of birds globally,[1] populating every country across all regions, displaying behaviours shaped by their unique ecological challenges, and equipped with the ability to adapt.[2] For example, while some species have evolved to adapt to extreme climates, others can fly long distances to more suitable climates.[a],[3] Bird species contribute to the preservation of rural and urban ecosystems through pollination, seed dispersal, forest regeneration, scavenging, and weed and pest control. Around 5 percent of the plants used by humans for food and medicine are pollinated by birds.[4] Bird droppings also contribute to nutrient distribution. In this context, the role of sea birds is especially crucial. These birds eat fish and other sea creatures on the high seas and nest in large colonies on land. The excrement of the birds provides concentrated nutrients to the soil at their coastal breeding grounds,[5] enabling plant and grass growth.

Additionally, many birds consume pests in large quantities, thereby rescuing crops threatened by pests. Barn swallows consume up to 60 insects an hour, and western bluebirds are known to prevent damage to grapes in vineyards by feeding on invertebrate pests.[6] Larger birds like the barn owl feed on rodents. Birds such as woodpeckers support the protection of other bird species—the cavities hollowed out by woodpeckers are often used by other cavity-nesting species for shelter and protection from predators.[7] Scavenging birds, such as vultures, eagles, kites, ravens, and crows play an indispensable role in the food chain.[8] The loss of bird species is likely to increase insect and rodent populations and vector-borne diseases.[9] For example, the population decline of vultures in the mid-1990s in India[10] led to

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a sudden increase in the population of stray dogs, especially in cities.[11],[12]

When avian species become extinct, their specific functions and benefits are also removed. Bird diversity is therefore critical, especially since introduced species often struggle to perform the critical roles of native species.[13]

Key Practices in Bird Conservation

The field of bird conservation encompasses a range of practices designed to protect avian species, their habitats, and their ecosystems. Below are some of the key strategies that have proven effective in bird conservation:

Habitat Preservation and Restoration

Birds rely on healthy habitats for breeding, feeding, and migration. Habitat destruction is one of the leading causes of bird population declines. Conservationists prioritize the protection of critical habitats such as wetlands, forests, grasslands, and coastal areas. In cases where habitats have been degraded, active restoration efforts are undertaken, including replanting native vegetation, re-wetting drained wetlands, and controlling invasive species.

Nest Protection and Artificial

Nests Birds face numerous challenges in finding safe places to nest due to habitat loss and predation. Artificial nest boxes, platforms, and other structures can provide safe, sheltered spaces for species that require specific nesting conditions. The design and placement of these artificial nests are critical; they must mimic the natural nesting environment and be placed in predatorfree areas to maximize their effectiveness.

Maintenance of bird biodiversity

Birds mark the changing seasons and their numbers indicate the health of the ecosystems they inhabit. Birds hold great cultural, ecological, and economic importance—providing valuable services to natural and agricultural systems. Birds are also in steep decline. A study published in *Science* in 2019 found that North American bird populations have declined by an alarming 3 billion individuals since 1970, a loss of nearly 30% of all birds. To stop the staggering loss of birds, we must identify the causes of their decline, recommend solutions in conservation practice and policy, and broaden awareness of the need for an urgent response.

Monitoring and Research

Effective bird conservation relies on continuous monitoring and research. Tracking bird populations, their migration patterns, and the health of their habitats allows scientists to identify threats and take action to mitigate them. This also helps conservationists understand the needs of different species, such as their preferred nesting sites, food sources, and environmental conditions. Data-driven decisions help focus conservation efforts on the species and habitats that need attention most.

Community Engagement and Education

For bird conservation to be successful, it must involve the wider community. Educating local populations, school children, and birdwatchers about the importance of birds and the role they play in ecosystems fosters a deeper connection to nature. Citizen science projects, where local residents monitor bird populations or participate in habitat restoration activities, can help gather valuable data and raise awareness of conservation efforts.

Invasive Species Control

Invasive species often disrupt natural ecosystems by preying on native birds, outcompeting them for resources, or spreading diseases. Conservationists implement strategies to control invasive species, such as trapping predators or managing the spread of non-native plants. This can include efforts to restore the native flora and fauna of an area to ensure that bird populations are supported.

Understanding adaptation to change

To augment ongoing bird research, MCB biologists Sarah Wanamaker and Ellen Ketterson are investigating strategies to breed a well-studied songbird—in this case, the dark-eyed junco—in a lab environment. At Kent Farm Research station, researchers are able to control variables that affect birds' reproductive activity. Since 2000, the team has been experimenting with variables, such as indoor and outdoor housing, population density, temperature, and humidity, to study their effects on birds' health and reproductive success.

Depending on the year, researchers have:

- isolated birds in pairs, or allowed them to fly freely;
- artificially lengthened daylength or advanced the photoperiod;
- separated birds using visual barriers;
- altered the sex ratio; and
- offered various nesting materials.

While the number of birds and manipulation varied from year to year, however, most years produced somewhere between 0 and 5 young, which often did not survive their first year.

The number of birds has been variable across years but has ranged from 20-50 birds (10-25 pairs). In 2021, researchers had 5 pairs outdoors and 3 pairs indoors. In 2022, they housed 8 pairs outdoors and 3

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pairs indoors. Until 2022, all captive breeders had been wild-caught birds, mostly from Mountain Lake Biological Station in Giles County, Va. Now, there are both wild caught and first-generation captive-bred breeders.

Researchers discovered that one of the most important factors for successful junco breeding in captivity is population density. By keeping density low, with no more than 16 birds in one outdoor space, the team has been able to successfully rear 36 young over the past two years. This is a promising increase from previous years, which averaged 0-2 surviving young.

Another major breakthrough was offering more food. Researchers ensured that the birds had access to numerous types of worms every day during breeding season. Researchers also fed mealworms nutrient-dense items in the days before they were fed to the birds, increasing nutrient density. Because nestlings and young fledglings exclusively eat insects, the diet allowed them to thrive.

Current Approach on Avian Conservation

In December 2019, the Ministry of Environment, Forest and Climate Change, Government of India proposed a draft 'Visionary Perspective Plan (2020-20230)' (VPP) for the conservation of avian diversity, their ecosystems, habitats and landscapes in the country.

The VPP highlights that India ranks among the top 10 countries in bird diversity globally, with 1,317 species of birds, and is a mega-biodiversity country, with many endemic species. India's territory also includes regions such as the Eastern Himalayas and the Western Ghats**,** which are categorised as 'global biodiversity hotspots' that are under severe threat and requiring urgent conservation measures. India is also a signatory to several international conventions and treaties that mandate the conservation of natural resources and biodiversity for the protection of the planet. These include the Convention on International Trade in Endangered Species of Wild Flora and Fauna, Convention on Conservation of Migratory Species of Wild Animals, and International Union for Conservation of Nature and Natural Resources.

The VPP also notes that the Indian Constitution stipulates that it is the duty of every Indian citizen to protect the country's natural environment, including forests, lakes, rivers, and wildlife, and to have compassion for living creatures. The Constitution further exhorts the states to protect and improve the environment and safeguard the forests and wildlife in their territory.

Programme 10 of the VPP discusses the conservation of aviation diversity in urban areas and notes that birds and bird species have either declined or entirely wiped out from the urban landscape. Mounting urbanisation and the intense pressure exerted on the natural resource capital of urban areas have led to the depletion of habitats that support avian diversity. Various bird species in the country have been adversely impacted by increasing urbanisation and are witnessing a decline in their populations. Against this backdrop, it is necessary to devise policies and master plans for urban development in the country that integrate habitats for nature and biodiversity conservation. However, insufficient data on urban avifauna and their ecology poses difficulties.

The VPP builds on existing databases such as Asian Waterbird Census and eBird to propose the generation and consolidation of baseline information on birds and their populations in cities and towns in the country. It recommends studying the impact of urbanisation on avian diversity, their habitats, and behaviour, including their foraging and nesting ecology. The VPP further urges the development of Best Practice Guidelines for integrating environmental issues such as habitats for nature conservation into master plans and development plans in cities and towns. Another objective is coordination between Central and State government departments, urban development agencies, relevant institutions, and other stakeholders to incorporate the Best Practice Guidelines in urban policy and planning.

The VPP further proposes evaluating the implementation of the guidelines by various State governments. It also suggests measures for effective implementation, including monitoring bird-human interface in urban environs for emerging health and other issues. The VPP has also specified thrust areas and an implementation schedule for each, categorised into long-term, medium-term, and short-term applications. Conducting bird census in urban agglomerations and developing a bird atlas for select cities through citizen science initiatives are suggested strategies.

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