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A Study On Bird Migration Due To Climate Change In India

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ABSTRACT

Weather plays a crucial role in the population dynamics of birds, however, the effects of climate change have only just started to be considered. There is already a strong proof that recent climate changes have impacted birds. Climate change is disrupting the natural rhythms of bird migration, threatening their habitats and food sources across various ecological zones. Bird species in India, including long-distance migratory birds like the Himalayan Monal and coastal species such as the Indian Skimmer, face significant challenges due to shifting climate patterns and extreme weather events like cyclones and droughts. These changes are leading to habitat loss, mismatches in breeding cycles, and declines in food availability, posing serious risks to bird populations. To address these issues, this paper proposes two main focuses: firstly, to examine how climate change is contributing to the decline of migratory birds in India, and secondly, to recommend policy changes aimed at mitigating these impacts. Conservation efforts are essential, including the establishment of climate-resilient protected areas, habitat restoration initiatives, and species-specific conservation plans. Strengthening existing wildlife protection laws and incorporating climate considerations into environmental assessments are crucial steps towards safeguarding bird biodiversity. Additionally, promoting sustainable practices and renewable energy sources can help reduce greenhouse gas emissions, thereby mitigating further climate impacts on birds. Through comprehensive research and strategic policy interventions, this paper aims to contribute to the understanding of climate-induced changes in bird migration patterns in India. By emphasizing the importance of proactive conservation measures and legal frameworks, it advocates for a sustainable future where bird species can adapt and thrive amidst ongoing climate challenges.

Keywords: bird migration, climate change, conservation strategies, policy interventions, India

1. INTRODUCTION

Climate change on a global scale is impacting every major category of living beings and altering the functioning of ecosystems from the tropics to polar areas.. The alteration of climatic patterns in recent decades has already had an impact on organisms (1).Bird migration, which is a complex and fascinating response to seasonal climate changes, is likely to be impacted by global change. Birds are the most mobile of vertebrates. Changing climate has been a drastic implication for migratory birds.

These birds depend on specific habitats and food resources in various geographical regions.

In this paper, we shall address 2 focal points

a) How are the complex changes in climate leading to deterioration ion of migratory birds?

b) What policy changes can be suggested to control the decline of migratory birds?

To begin with, birds come from different taxa and regions of various latitudes. Mountain birds, Tropical birds and nomadic birds of Africa, Asia and Australia. Furthermore, they can be classified into long distance and short distance birds.

Survey indicates migratory species are at least 2600 bird specifies of 141 families (2).

Many species' capacity to adapt to climate change is a significant worry, as those unable to adjust their yearly cycles may face higher risks of reproductive mistiming and potential extinction outcomes.

The purpose of this paper is to explain and forecast the migration of birds due to climate change in India and give policy suggestions thereof. Attention is given on the areas of the effect of climate change upon migration in environmental protection and other branches of economy (4). Potential factors such as climate variables, migration distance, and migration dateexplained some of the variation in changes in bird migration over time.(5) Species that inhabit dry, open areas covered the shortest distance, those in wet, open areas covered the least distance, and woodland species fell somewhere in between the other two habitats. (6) As a result, species such as certain long-distance migratory birds that have not exhibited changes in their timing of seasonal events due to rising global temperatures are now experiencing decreases in population numbers. Additionally, other long-distance migrant species have also shown population declines, but these declines are not linked to climate change, leading to speculations about the underlying causes. The primary focus of the research has been on European birds when studying the first arrival dates of migrants. Nevertheless, recent ornithological research shows that a greater number of North American short-distance migrants are changing their migration behaviours compared to long-distance migrants, and are doing so to a larger extent. (7)

Bird migration in India due to climate change is a significant phenomenon influenced by various factors. Studies have shown that climate change impacts bird communities in India, with variations observed under different climate models such as El Nino and Indian Ocean Dipole. Furthermore, research indicates that a large percentage of bird species belonging to India are predicted to shift to higher elevations or northward due to climate change by 2070, leading to changes in their distribution ranges Additionally, the increasing impacts of climate change have heightened the focus on climate-induced migration from disaster-prone areas in India, showcasing how climate variability plays a role in inducing migration alongside socio-economic factors.

Climate change significantly impacts bird migration patterns in India, leading to shifts in species distribution and timing of migration. Research utilizing eBird and GBIF data forecasts that by 2070, 66–73% of bird species in India will move to higher elevations or shift northward, with 58–59% losing part of their distribution ranges and 41–40% gaining range (8). Both RCP scenarios predict increased bird species diversity above 2500 m elevation, particularly affecting regions like the western Himalayas, Sikkim, northeast India, and the western Ghats. Additionally, climate change advances the timing of bird migration at continental scales, showcasing comprehensive changes in migration patterns (9). Furthermore, the demographic impacts of climate change in India reveal that temperature and precipitation variability influence migration outcomes, with women being more sensitive to climate variability, especially in family- and marriage-related migration

Understanding these dynamics is crucial for conservation efforts and developing effective adaptation strategies for avifauna in the face of ongoing climate change challenges.

2. LITERATURE REVIEW

Gupta and Chaturvedi (2022) examined the effects of extreme weather events, exacerbated by climate change, on bird migration in India. They found a correlation between extreme events and disrupted migration patterns but noted a lack of predictive models to forecast future impacts. Future studies should develop and utilize predictive models to better prepare for these impacts.

Mehta et al. (2022) assessed the role of protected areas in supporting migratory birds amidst climate change. The review showed that while protected areas are crucial, many are not strategically located along migratory routes. A gap in the research is the need for spatial analysis to identify and protect critical stopover sites for migratory birds.

Patel and Joshi (2024) reviewed the impact of climate change on the migratory behavior of raptors in India. Their study indicated that higher temperatures and altered wind patterns are leading to changes in migratory routes. However, there was a lack of data on the interaction between climate change and anthropogenic factors such as urbanization. Future research should consider these combined effects to provide a comprehensive understanding.

Banerjee and Das (2024) examined the impact of altered monsoon patterns on the migration of wetland birds in India. They found that changes in monsoon timing and intensity affected wetland availability and food resources. However, their review highlighted a gap in understanding how these changes influence bird health and survival rates during migration. Long-term monitoring and health assessments are recommended.

Srivastava and Rao (2023) explored the impacts of rising temperatures on the breeding success of migratory birds in India. Their review pointed out a significant knowledge gap in understanding the link between temperature changes and reproductive behaviors. They suggested that more experimental studies are needed to elucidate the mechanisms by which temperature affects breeding.

Iyer and Pillai (2023) conducted a comprehensive review of migratory bird species in the Western Ghats region, focusing on changes in arrival and departure times due to climate fluctuations. While the study provided valuable insights into phenological shifts, it lacked detailed analysis on the microclimatic factors

influencing these changes. Future research should aim to incorporate fine-scale climatic data to better understand local influences on migration.

3. EFFECTS OF CLIMATE AND WEATHER EN ROUTE

Various research studies examine how climate change is affecting the distribution of bird species in India. These results suggest that in the next 50 years, a greater number of birds in India will be at risk of losing their habitats due to changing climate conditions. Climate change could change where many birds in India are found, causing their ranges to shrink or grow, as well as changes in their height and distance from the equator. 68% of the habitat area for long-distance migratory birds is at higher risk from climate change, as these birds' migration patterns are closely linked to the climate. (10). As global temperatures rise, the habitats that birds rely on in India are changing. Many bird species are highly specialized, thriving in specific ecological niches. With climate change, these habitats are shifting, sometimes disappearing entirely. For example, the Indian Pitta, which thrives in the dense undergrowth of forests, is experiencing habitat loss due to changing climatic conditions and deforestation.

Birds like the Himalayan Monal, which depend on alpine meadows, are losing their homes as these regions warm and vegetation zones shift upwards. Similarly, coastal birds such as the Indian Skimmer face habitat loss due to rising sea levels and increased storm surges. These shifts not only threaten the birds' survival but also disrupt the intricate web of biodiversity.

4. PHENOLOGICAL CHANGES

Phenology, the study of cyclic and seasonal natural phenomena, reveals significant changes in birds' behaviours due to climate change. Birds' breeding and migration patterns are tightly linked to environmental cues such as temperature and food availability. As climates warm, these cues are becoming unreliable. Research conducted by the Bombay Natural History Society (BNHS) shows that many migratory birds are arriving at their breeding grounds earlier than in previous decades. For instance, the Eurasian Golden Oriole now arrives at its breeding grounds in India about five days earlier than it did 30 years ago. Such shifts can lead to mismatches between the breeding patterns and the food availability, which are crucial for the survival of their chicks.

5. FOOD AVAILABILITY AND DIET

Climate change significantly impacts the availability and distribution of food sources for birds in India. Altered weather patterns and temperatures affect the abundance of insects, seeds, and other food that birds rely on. The resulting scarcity or mismatch of food resources can lead to malnutrition and reduced reproductive success. For example, the Pied Cuckoo, known for its arrival with the monsoon, relies on a steady supply of insects that emerge with the rains. However, changes in monsoon patterns have led to a decline in insect populations, affecting the cuckoo's food supply. This has resulted in declining populations of the Pied Cuckoo in some regions of India.

6. EXTREME WEATHER EVENTS

Climate change is causing more frequent and severe extreme weather events, which put bird populations at great risk.Hurricanes, droughts, and heatwaves can have immediate and devastating effects on birds. These events can destroy habitats, reduce food availability, and directly cause mortality. For instance, the 2019 Cyclone Fani in the Bay of Bengal had severe impacts on bird populations along the eastern coast of India. Studies found that the cyclone caused substantial declines in bird numbers, particularly among coastal and marine species. Similarly, droughts in regions like Rajasthan have led to declines in waterbird populations as their wetland habitats dry up.

7. CONSERVATION EFFORTS AND STRATEGIES

Conservation efforts are crucialto move towards mitigating the climate change impact on birds in India. Strategies include habitat restoration, creating climate-resilient protected areas, and assisting species with adaptation through conservation breeding and relocation. Success stories like the recovery of the Great Indian Bustard, through targeted conservation efforts, show that it is possible to make a significant difference. Organizations such as the Wildlife Institute of India (WII) and the Salim Ali Centre for Ornithology and Natural History (SACON) are actively working to protect birds and their habitats from the effects of climate change.

8. POLICY CHANGES

Strengthening protected areas is crucial. This involves increasing the number and size of protected areas to include critical habitats vulnerable to climate change, such as alpine regions, wetlands, and coastal areas. Establishing buffer zones around protected areas can further mitigate the impact of climate change on bird habitats (MoEF, 2021). Implementing climate-resilient habitats is another essential step. Large-scale habitat restoration projects, particularly in areas most affected by climate change, are necessary. Creating ecological corridors can allow birds to migrate and adapt to changing environments, which is crucial for species needing to move to higher altitudes or different regions due to climate shifts (WII, 2018).

Conservation programs should be species-specific. Developing and implementing conservation plans for threatened species, focusing on those most affected by climate change, such as the Great Indian Bustard and the Indian Skimmer, is vital. Engaging local communities in conservation efforts through education and incentives promotes sustainable practices that protect bird habitats (BNHS, 2019).

Long-term monitoring and research must be established to track changes in bird populations and habitats due to climate change. It is crucial to enhance funding for studying the effects of climate change on birds, which includes examining phenological variations and food availability. This can help in understanding the nuances of these impacts and formulating effective conservation strategies (IISc, 2020).

Climate change mitigation must involve encouraging the utilization of renewable energy sources in order to decrease greenhouse gas emissions, a primary factor in climate change. Encouraging sustainable agricultural practices that reduce habitat destruction and promote biodiversity is also critical (CSE, 2021).

9. LEGAL IMPLICATIONS

Strengthening wildlife protection laws is a priority. Amending the Wildlife Protection Act, 1972, to enhance provisions specifically addressing climate change impacts on wildlife, including birds, is necessary. This could involve stricter penalties for habitat destruction and greater protection for climate-sensitive areas. Strengthening the Biodiversity Act, 2002, to include specific measures for the conservation of bird species affected by climate change is also important (NBA, 2002).

Mandating the inclusion of climate impact assessments in Environmental Impact Assessments (EIAs) for development projects is crucial. This ensures that potential impacts on bird habitats and migration patterns are considered before project approval. Regular updates to EIAs to reflect changing climate conditions and their effects on biodiversity are necessary (CSE, 2021).

Establishing legal frameworks for green bonds and conservation funds specifically aimed at climate change mitigation and biodiversity conservation can attract investment in large-scale habitat restoration and conservation projects. This financial support is crucial for implementing effective conservation strategies (WWF India, 2018). Enhancing enforcement mechanisms for existing wildlife protection and environmental laws ensures compliance through increased penalties and monitoring. Empowering local communities to take legal action against violators of wildlife and environmental laws can be facilitated through legal aid and awareness programs. This community-based legal action is vital for ensuring the enforcement of these laws (SACON, 2020).

10. CONCLUSION

Addressing the effects of climate change on birds in India involves a comprehensive strategy that includes policy modifications and strong legal structures.. By strengthening protected areas, promoting climate-resilient habitats, and enhancing conservation programs, India can mitigate the adverse effects of climate change on its avian populations. Legal reforms, including amendments to existing wildlife protection laws and the incorporation of climate considerations in EIAs, are essential for ensuring long-term conservation success. Effective enforcement and community involvement will be crucial in implementing these measures and safeguarding India's rich avian biodiversity (BNHS, 2019; MoEF, 2021; WII, 2018). Climate change poses a significant threat to bird populations across India. Habitat shifts, phenological changes, altered food availability, and extreme weather events are among the many challenges birds face. Continued research and strong conservation efforts are crucial to lessen these effects and guarantee the survival of bird species in a rapidly evolving world.The future of birds depends on our ability to address climate change effectively and implement strategies that support their adaptation and resilience.

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