



CONSERVATION OF BIODIVERSITY AND ENVIRONMENTALLY FRIENDLY IN RESPONSE TO CLIMATE CHANGE AND BIRD POPULATION AT NANJARAYAN LAKE

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ABSTRACT

Ecological indicators can be used to monitor ecosystems in order to protect and manage the environment. Since it is impractical to monitor every aspect of an ecosystem, a select few species or groups of species can be used as proxies for more general trends. The biological elements selected for this purpose are referred to as bioindicators. Bioindicators are creatures that are used to keep an eye on the environment's health, the presence of pollution and how it affects ecosystems, the development of environmental cleanup efforts and the testing of new substances, as well as to spot changes in the environment's natural features.

Keywords: Biodiversity; Bird population; Nanjarayan lake; Climate change; Conservation; Ecosystem.

Biodiversity

The phrase used to describe the diversity of life on Earth offers commodities and services that keep humans alive through the expression of ecosystems. Ecosystem changes and losses are occurring at rates that have never been observed before due to human forces. More quickly and widely than at any other time in human history, people are altering ecosystems. Natural habitats are under additional pressure due to climate change. The Millennium Ecosystem Assessment, a thorough analysis of the relationships between ecosystem health and human well-being, predicts that by the end of the century, climate change would likely

overtake other primary drivers of biodiversity loss. The capacity of some species to migrate may be restricted due to projected changes in temperature, land use, and the spread of exotic or alien species, which would hasten the extinction of species. (1)

The Convention on Biological Diversity (CBD) is extremely concerned about how climate change may affect biodiversity. The Convention also acknowledges the fact that there are excellent potential for reducing climate change and adapting to it while increasing biodiversity preservation. (2)

BIODIVERSITY TO REDUCE THE IMPACTS OF CLIMATE CHANGE:

Adopting biodiversity-based adaptive and mitigating techniques can increase ecosystem resilience and lower the risk of harm to people and natural environments. While adaptation to climate change refers to changes in natural or human systems in response to climatic stimuli or their effects, which moderates harm or exploits advantageous opportunities, mitigation is defined as a human intervention to reduce greenhouse gas sources or enhance carbon sequestration. (3)

Examples of activities that promote mitigation of or adaptation to climate change include

- Maintaining and restoring native ecosystems,
- Protecting and enhancing ecosystem services,
- Managing habitats for endangered species,
- Creating refuges and buffer zones, and
- Establishing networks of terrestrial, freshwater and marine protected areas that take into account projected changes in climate.

ECOSYSTEM MONITORING

The natural ecosystem must be protected and managed. An ecological indicator may perform it (Nguyen, 2007). Conservation organisations want to keep an eye on all interesting qualities in a natural habitat. Conservation organisations may decide to keep an eye on a set of indicators, such as physical, chemical, or biological characteristics that reflect the condition of environmental parameters that are not included in a sample, in the absence of full data on entire ecosystems. The creatures and their associations are observed for any alterations that would point to an issue with their ecology. Individual species or collections of species are frequently chosen to serve as biological markers. Providing data for ecological

assessments, which can give early notice of changes that could negatively affect species or ecosystems, is one of the goals of monitoring (Burger 2006). (4)

A few of the biological and physical components can be utilised as indications of broader circumstances because it is impractical to monitor all of them. The biological elements selected for this purpose are referred to as bio indicators (Matsinos and Wolf, 2003). Environmental health is tracked using creatures called bioindicators. In order to sustain the structural and functional qualities of an ecosystem, they are also important for ecological health. Bioindicators are used to track the progress of environmental cleanup, identify changes in the environment, check for pollution and its effects on the ecosystem in which the organism lives, and test compounds (Saulović *et al.*, 2016). (5)

The finest tools for gauging conservation efforts to preserve biodiversity are bioindicators. Some of them are employed to evaluate the effects and risks to biodiversity, while others are employed to assess the sustainability of biodiversity use (EEA, 2007). Since ecological systems are too complicated to fully measure, indicators must be used in order to comprehend the state of the ecosystem (KBO, 2013). Birds serve as effective environmental health indicators (Carignan and Villard, 2002). They exist in a variety of habitats, reflect alterations in other animals and plants, are sensitive to climatic changes, and have a strong public appeal (IUCN, 2010). Birds can serve as bioindicators since they are more susceptible to environmental toxins than other vertebrates (Vashishat and Kler, 2014). In addition, volunteer efforts frequently centre on birds, and it is possible to involve local communities in monitoring plans and initiatives (IUCN, 2010). Birds are indicators of the integrity of the environments that provide us with clean air and water, fertile soils, an abundance of wildlife, and the natural resources on which our economic development depends (The State of the Birds, 2009). Birds are bellwethers of our natural and cultural health as a nation. Indicators of ecological change are frequently found in long-term datasets of bird counts since birds are popular research and monitoring subjects (Amat and Green, 2012). Never before has there been a chance for us to provide environmental indicator decision makers with information and recommendations. (6)

Ornithologists have made a special contribution to the quantity and quality of knowledge that is currently available to us on the characteristics of useful environmental indicators. Globally threatened species, common bird monitoring programmes, summarising trend data from several species, and geographical questions about the distribution of biodiversity are also given attention (Bibby, 1994). Two objectives drive this seminar paper: Review the effectiveness of birds as indicator species in light of the

scientific material that has been published, and make suggestions for setting up a trustworthy monitoring programme. (7)

What changes might we expect in the future?

Predicted impacts associated with such a temperature increase include

- A further rise in global mean sea level of 9 to 88 cm,
- More precipitation in temperate regions and Southeast Asia, associated with a higher probability of floods,
- Less precipitation in Central Asia, the Mediterranean region, Africa, parts of Australia and New Zealand, associated with a greater probability of droughts,
- More frequent and powerful extreme climatic events, such as heat waves, storms, and hurricanes,
- An expanded range of some dangerous “vector-borne diseases”, such as malaria, and
- Further warming of the Arctic and Antarctic, leading to more sea-ice disappearance.

Birds as indicators of environmental change Relationships between the distribution and abundance of creatures and some characteristics of the natural environmental conditions affecting their assessment and reproductive success have long been a goal of biologists. Investigations have been done on migration and dispersal patterns, as well as other ecological issues. Animals have been used as markers of environmental change; however this practise has been questioned (Michael, 1986). Birds are an important resource for monitoring ecological change. According to Amat and Green (2012), they can serve as trustworthy markers of nutritional status and the number of other organisms. (8)

The habitat in which birds thrive experiences both predictable and unpredictable changes, and bird populations react to these shifts in predictable ways. A direct and straightforward cause-and-effect relationship exists between environmental change and birds. One or more intermediate factors or a number of interrelated impacts are more frequently responsible for the effects of environmental changes on bird populations. The quickest and most obvious responses of birds to environmental changes are behavioural and physiological, involving alterations in individual traits. Birth, death, and dispersal rates are three fundamental population rates that are impacted by these changes. A number of secondary population factors, including as density, population size, geographic range, habitat occupancy, age structure, sex ratios, or the percentage of breeding birds, can also alter as a result of changes in these three fundamental population parameters (Temple and Wiens, 1989). (9)

Birds are now recognised as useful proxies for broader changes in nature and as good indicators of environmental changes. According to BLI (2001), the willed bird index (WBI) examines the average population trends of a selection of typical wild birds as a measure of the general health of the environment. To enable formal assessment and interpretation of regional, national, and global targets to limit the pace of bio diversity loss, WBI provides scientifically reliable representative indicators for birds. WBI tracks the local extinction and colonisation rates of widespread and recognisable bird species. By doing this, they provide insight on how human impact is evolving as well as the sustainability of human usage of the environment. By classifying species related to environments. It is feasible to develop indices depending on habitat. (10)

Consequently, they offer a glimpse into the condition of those environments and serve as sustainability indicators for human usage. A dynamic stability that tends towards an equilibrium composition of surroundings is thought to exist in the bird community. Under similar environmental conditions, this composition can be repeated or constant, allowing for the identification of the community type. This suggests that the existence of several bird species groups preserved and maintained the environmental natural equilibrium. The community of bird species has emergent characteristics in the structure and operation of the environmental balance, which is not the least on the list. This concept makes no taxonomic distinctions that would suggest co-occurring species are interfering rivals. Forming communities with predictable and structured functional attributes for one or more limiting resources. (11)

Why does climate change affect birds?

Climate change has a direct impact on birds since it causes changes in temperature, precipitation, and moisture as well as a generally more changeable climate and more intense weather. Birds are the classic "canaries in the coal mine" since they are very weather-sensitive and are already exhibiting signs of climatic change. Future climate change will also have an indirect impact on birds by changing their habitats due to rising sea levels, altered fire patterns, and modifications to vegetation or land use. For instance, with 1.5 to 4°C of warming, Europe's Mediterranean coastal wetlands—essential habitat for migrating birds could be completely lost. (12)

Birds and their ecological communities are already showing a strong response to climate change in two major ways: changes in the timing of key life cycle events and changes in range. It's important to note that these responses in turn put birds at risk and increased threat. (13)

New Bird sanctuary at Tripur – Tamil Nadu

The 17th Birds Sanctuary of Tamil Nadu will be announced as a new Birds Sanctuary in Nanjarayan Tank in the Tiruppur District. The lake covers 125.86 hectares in total. For migratory birds, this is a crucial location for breeding and wintering habitats. Along with a number of species of reptiles, fish, amphibians, and plants, it is home to almost 130 bird species. Additionally, a conservation centre will be built on the property to raise awareness among locals and visitors. The Centre will be in charge of fostering training and research initiatives in the area of flora and wildlife conservation. These new bird sanctuaries will represent yet another significant step in the conservation of birds in Tamil Nadu. (14)

Nanjanarayan Lake

One of the biggest lakes in Tamil Nadu's Tiruppur district is Nanjarayan Lake. It has a catchment area of 280 acres and covers 4490 acres. More than 25000 migratory birds used to pass through it annually. It is located at the mouth of the Nallar River and undergone numerous changes over the 20th century. In the 2000s, it was overflowing with dyeing unit waste water. (15)

Following a significant campaign, the local government had them removed. The pond's impure water was pumped away, and fresh river water filled it up once more. For the usage of the field employees, the department would also spend 2.32 crore on the purchase of 256 electric two-wheelers. (16) To boost the amount of green space in the State, the government created 1,000 mini-forests, according to the Minister for Environment and Climate Change. For a Meendum Manjappai express display, the government will collaborate with the Indian Railway Catering and Tourism Corporation (IRCTC) in an effort to raise public awareness about the usage of sustainable materials as opposed to single-use plastics. The state's industries will be evaluated for their environmental friendliness by the government and the industries department, and strategies to encourage businesses to adopt green practises and products will be developed. (17)

Which birds have been found here?

The undisturbed mudflats (sediment deposits) in the middle of the lake ensure a thriving ecosystem and also attract many birds. Pelicans, painted storks, coots, etc can be found here. (18) It is also a haven for migratory birds. In 2010, four bar-headed geese, one of the world's highest-flying birds from Europe were spotted in the tank. A flock of 14 ruddy shelducks that breed in parts of Europe and Central Asia was spotted in 2020. (19)

What are the threats to birds here?

Birds' natural habitat is being destroyed. The de-silting operation carried out by the Tamil Nadu government's Public Works Department (PWD) in 2015 resulted in damage to the mudflats. (20) Due to the effluents from neighbouring dyeing plants that are discharged into the lake, water pollution is also a significant problem. The habitat of birds may be restored if the tank is designated as a bird sanctuary. Plans include for a butterfly garden, watchtowers, and a conservation centre. (21)

CHALLENGES FACED IN CONVERSION

Why it is being converted to bird sanctuary?

The Kaliveli wetlands are home to over 20,000 birds annually, according to a 2004 assessment by Bird Life International and the Indian Bird Conservation Network. Long-distance migrants from Siberia and chilly subarctic Central Asia use the lake as a feeding area as well. Black-tailed Godwits, White Storks, Eurasian Curlews, Ruff, and Dublin are a few of the migrating birds. This is why turning the wetlands into a bird refuge is needed. In addition, the government has suggested creating a 478 sqkm wildlife sanctuary in Cauvery South that would border the sanctuary in Cauvery North. At a cost of Rs. 5 crore, a Detailed Project Report (DPR) would be created. (22)

When a sanctuary is established, the issue of establishing an Eco-Sensitive Zone (ESZ) will come up, and because all 18 of the hamlets on the Kadavur hills are situated inside the ESZ limit, they will suffer greatly. The woodland has been managed and protected by the local residents. (23) In exchange, they gather tamarind, palmyrah leaves, medicinal herbs, and some palatable fruits from the forest. Because of the inhabitants' commitment to protection, the animal population has increased significantly. If a sanctuary is established, these activities will be limited, depriving the locals of a means of subsistence. The majority of locals are impoverished. (24)

CONCLUSION

Overall, this evaluation and analysis of articles published in the field of birds as indicators offers important takeaways for ecologists and other environmental specialists. The number of publications using birds as an indicator suggests that the use of birds for environmental monitoring and management is widespread and set to continue growing. According to my analysis, birds are useful in applications including environmental quality, ecosystem integrity, and restoration, and they are utilised to analyse environmental and climate change as well as provide early warnings of environmental change. Therefore, it is imperative to

put up the greatest effort in the identification of countrywide biodiversity conservation sites and in the preservation of endangered species, including the conservation of birds and other wild creatures like those found at Nanjanarayan Lake. (25)

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