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# ASSESSING BIRD SPECIES RICHNESS AND ENVIRONMENTAL INFLUENCES ON WETLANDS IN HARYANA: IMPLICATIONS FOR CONSERVATION

**Nidhi[1], Dr. Purnima Shrivastava[2]**

**Research Scholar[1], Supervisor[2]**

**Bhagwant University**

**Ajmer, Rajasthan, India**

**dnidhi126@gmail.com[1], brijpoornima@yahoo.com[2]**

## Abstract

This paper examines the richness of the bird species and the environmental factors that impact the wetlands in Haryana, India, and the conservation implications of the same. Wetlands are highly important as habitat to many species of birds but due to human activities and degradation of the environment, their biodiversity is at risk. The study will determine the species richness and abundance of different wetland habitats, the seasonal changes in the numbers of birds and the migrations. The main aspects of the environment, which include water quality, vegetation, and human activity are examined to determine how the same affects the diversity of birds. Also, the paper examines how agriculture, urbanization and tourism affect the population of wetland birds. The results will provide a summary of the nature of conservation issues in the wetland in the state of Haryana and recommend some management to minimize the loss of species of birds in these delicate ecosystems.

**Keywords:** Richness of bird species, Wetland ecology, Haryana wetlands, Migration, Environmental, Conservation, Anthropogenic, Water quality, Vegetation, Biodiversity conservation.

## Introduction

Wetlands have a high ecological productivity that is world renowned due to the services they offer which include, but are not limited to, filtering of water, storage of carbon and hosting of a diverse species of species. These ecosystems such as lakes, marshes and riverine wetlands that occur in Haryana are very instrumental in supporting a large number of bird species, most of which use the ecosystems to feed, breed and rest during migration. Nevertheless, the wetland habitats in the state are increasingly being threatened by human activities especially agricultural expansions, urban developments and escalating tourism. The activities also cause habitat degradation, pollution, water shortage, and disruptions that have a major impact to the bird population. With the growing anthropogenic pressures, there is an increased need to observe and be aware of the forces that determine the diversity of wetland birds (Parul & Kumar, 2023). The purpose of the study is to add to the overall explanation of the biodiversity of wetland in Haryana by determining individual species richness, seasonal variation and the impact of the environment and human activities on all these ecosystem types. Finally, the study will be useful to develop practical inquiries that would facilitate the creation of conservation policies to maintain the ecological integrity and sustainable development of these critical habitats to its inhabitants, including wildlife and the people (Shan et al., 2021).

### 1 Wetland Ecosystems in Haryana

The Haryana wetlands are vital in the sustenance of biodiversity of the area and in sustaining the bird populations. They are defined by the availability of water that is usually of different depths and support the migration and permanent birds. This research will examine the key wetland locations in Haryana, their ecological values, and how they help in ensuring that there is a balance in the environment (Malik et al., 2014).

**Table 1: Major Wetland Sites in Haryana**

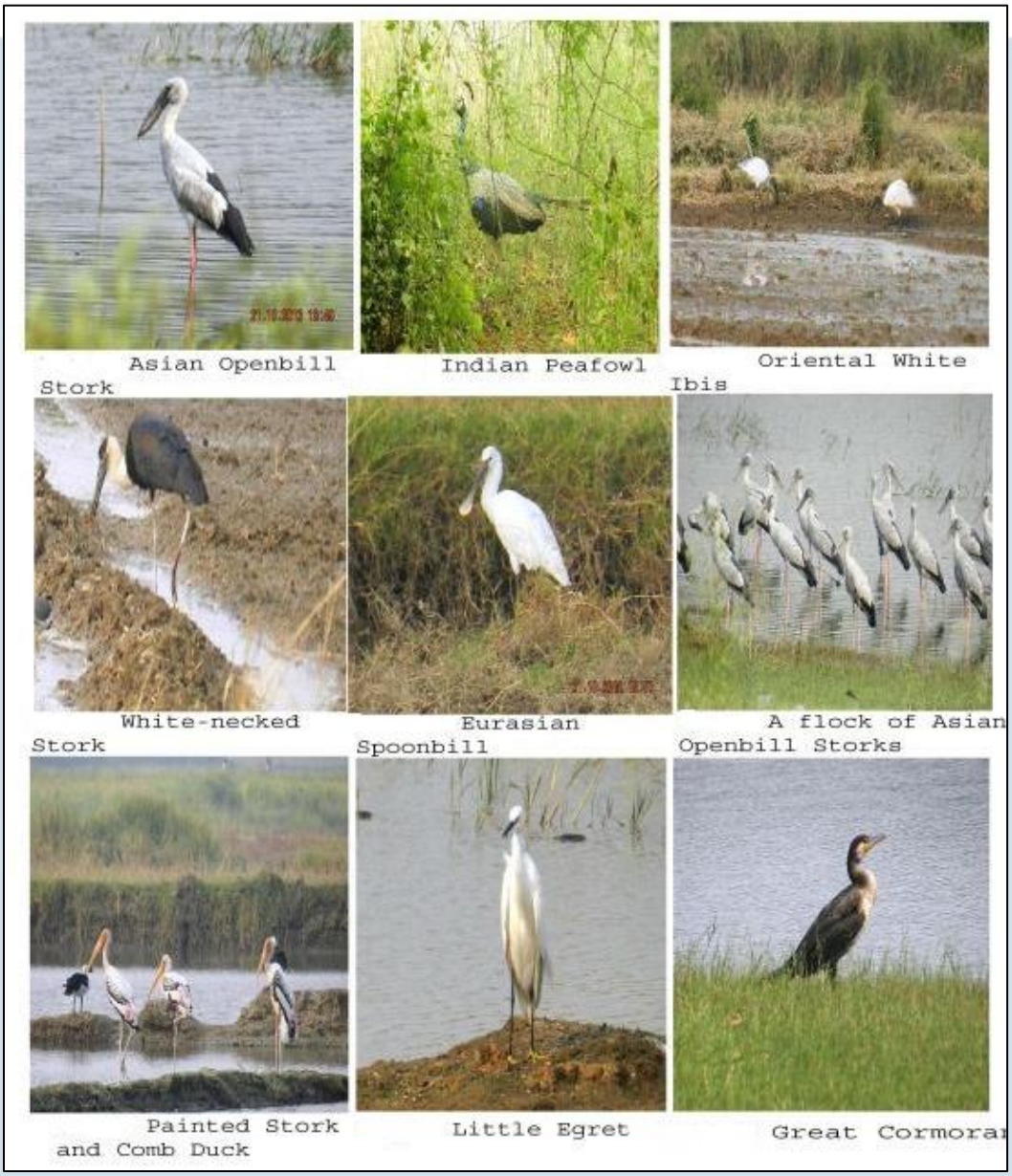
| Wetland Name | Location | Size (Hectares) | Key Bird Species Found |
|---|---|---|---|
| Sultanpur Lake | Gurugram | 1,400 | Migratory ducks, cranes |
| Bhindawas Lake | Jhajjar | 2,500 | Waders, egrets, herons |
| Kunjpura Wetland | Karnal | 300 | Painted storks, pelicans |

Source: Author's compilation

**2. Importance of Bird Diversity in Wetlands**

Bird biodiversity in wetlands is a significant indicator of well being of the ecosystem. High diversity of the bird species represents a healthy environment where the food resources, vegetation, and water quality are diverse (Kacergyte et al., 2021). The wetlands within Haryana are very vital to the resident and migratory birds, with most of them depending on the wetlands as nesting, feeding and resting during the migration period.

**Fig 1: Bird Species in Haryana Wetlands**




Source: Author's Conceptualization

### 3. Bird Species Richness and Abundance in Haryana's Wetlands

The richness of the bird species in the wetlands of Haryana is an indicator of the number of species in the wetlands whereas abundance is a measure of the number of species of a certain species. The wetlands that sustain a large variety of bird species are Sultanpur Lake, Bhindawas Lake and Kunjpura Wetland which harbor both migrating as well as resident populations of birds. These habitats are rich because their size, the vegetation cover and quality of water are factors that determine the availability of important resources such as nesting areas and food sources by the birds. In these regions, there are high numbers of waterfowl, waders, and raptors, which contributes to the avian biodiversity of the region (P. Kumar et al., 2016).

The number of species of birds differs across the year with the migration birds being higher during the winter months and resident species showing constant populations. The wetlands within the state of Haryana serve as an important stop over area to migratory birds and a refuge of the migrating species such as the Bar headed Goose and the Painted Stork. The knowledge of the species richness and abundance pattern in these wetlands is important to understand the health of these ecosystems and how they contribute to the sustenance of the bird populations especially during the migration seasons when the habitats are under a high pressure.

### 4. Seasonal Variations in Bird Populations

The seasonal changes of bird population in wetlands are characterized with the migration pattern, breeding, and climatic conditions. In this section the fluctuation of bird population throughout the year will be discussed in terms of the influx of migratory species during the winter season and the nesting patterns of the resident species during the breeding season (Norris and Marra, 2007).

**Table 2: Seasonal Variations in Bird Populations at Sultanpur Lake**

| Month | Migratory Birds Count | Resident Birds Count |
|---|---|---|
| January | 5,000 | 1,200 |

| | | |
|---|---|---|
| April | 3,200 | 2,500 |
| October | 6,000 | 1,500 |

Source: Author's compilation

**5. Migration Patterns of Wetland Birds in Haryana**

The wetlands in Haryana are important stopovers of the migratory birds, especially when they are making long trips, between the breeding and wintering areas in the north and south respectively. These wetlands are the resting, feeding, and replenishing places of species such as the Bar headed Goose, Siberian Crane, and Northern Pintail as well as when migrating. Seasonal variations in climate in terms of temperature and daylight time play a critical role in determining the timing of movement in that migration occurs in response to environmental signals. Indicatively, several species of migrants can be seen coming into the wetlands of Haryana in the months of October and November and leaving in the months of March or April when the weather is warmer (Goyal et al., 2025).

Besides being critical in the survival of these bird species, these migration patterns are also critical in ecological balance of the wetlands in Haryana. Wetland habitats are good sources of water, food and safe resting areas to birds. The timing and success of migration though, can be influenced by environmental changes, e.g., water level and food supply. These trends will be important to study the ecological functions of the wetlands of Haryana, and to develop effective conservation programs to ensure that these important stopover of habitats can still perform their functions despite the effects of climate change and human activities.

**6. Environmental Factors Influencing Bird Diversity**

Haryana has wetland ecosystems with environmental parameters that contribute to the sustenance of the bird populations in the wetlands. The availability of food sources by the birds, especially aquatic insects and fish, is directly influenced by water quality, such as factors such as pH, turbidity

and pollutants levels. Healthy water bodies are promoted by clean and well-oxygenated water and this supports the existence of a variety of birds. On the other side, water quality can be affected by pollution, agricultural runoff, and encroachment and cause the decrease in bird population when their food resources are reduced and the conditions of the habitat are decreased (Oindo et al., 2001).

Bird diversity also needs the vegetation cover, which is the source of food and shelter and nesting places. Thick reeds and water plants and trees give the birds important breeding and protective elements against predators. The habitat structure i.e. shallow waters or mudflats affects the type of birds that can be found in a given area i.e. waders like mudflats. Human activities (i.e., reclamation of wetlands areas, invasive species) can alter the structure of vegetation and habitat, which, in turn, can lead to changes in bird population, by making them unavailable to appropriate habitats. Consequently, these environmental factors are important to the sustainability of the diversification of the bird species in the wetlands of Haryana.

**7. Impact of Water Quality on Bird Habitats**

Ecosystems of wetlands heavily rely on clean and stable water bodies to exist. Water quality may be compromised by agricultural runoff or pollution, which may cause damage to the populations of birds by decreasing their living environment and food supply. This part will examine the water quality of the important wetlands in the state of Haryana and measure its effect on the bird species (Mott et al., 2023).

**Fig 2: Water Quality Testing at Bhindawas Lake**


Source: Author's Conceptualization

**8. Vegetation and Its Role in Supporting Bird Diversity**

Wetland vegetation plays a very critical role in the sustenance of birds, through the availability of vital resources like food, shelter, and nesting areas. The structural basis of wetland ecosystems is reeds, marsh grasses, and aquatic plants which provide complex habitats and sustain a great variety of bird species. Reeds and marsh grasses, in turn, provide good nesting areas to such species as the Indian Reed Warbler and Eurasian Coot, whereas aquatic plants are a rich source of food to such species as the Northern Pintail and Common Teal. The variety in the plant species also contributes to the formation of microhabitats that would support different species of birds with different habitat preferences (Skowno & Bond, 2003).

Human activity (e.g., reclamation of land, agricultural growth, introduction of invasive species, etc.) can alter the vegetation cover, thus altering these habitats and making them vulnerable. The

removal of natural vegetation by monocultures or alien plants reduces the number of resources that the birds can access, which makes species richness and abundance decline. Deforestation may also lead to a loss of vegetation cover thus fragmentation of the habitats where the birds cannot find the right areas to nest and feed. The reduction of native vegetation species has a direct effect on the overall biodiversity and strength of wetlands, hence the vegetation management is a determinant in conserving wetlands.

**9. Anthropogenic Impacts on Wetland Bird Populations**

The loss and degradation of wetland habitats in Haryana is mostly caused by human activities that comprise agricultural development, urbanization, and tourism. Activities in agriculture like drainage of wetlands to grow crops, use of pesticides and irrigation patterns that impact on water flow can significantly transform the hydrology of wetlands, thereby decreasing the supply of water and food to the birds. Such activities also cause pollution not to mention destroying important habitats, which not only affect the quality of water but also cause problems with the health of the bird populations. Wetlands losing their natural state to farmlands cause the biodiversity of the area to decrease significantly, as species that depend on the wetlands cannot survive in new environments (Chawaka et al., 2017).

Urbanization also aggravates these pressures by invading the wetland areas, which leads to fragmentation of habitats and more disruption of human activities. Building of buildings, roads and infrastructure usually has a direct effect on habitat destruction and higher pollution levels, and the development of infrastructure to support tourism might raise the level of human traffic, which causes stress to the bird populations and disrupts their natural behavior. With the expanding human settlements and the rise in the number of tourists, the fragile balance maintained by the wetlands and the ecosystem finds further degradation, thereby reducing the frequency of birds. To ensure the sustainable performance of the wetland habitats and prevent the destruction of the avian species, it is necessary to address these anthropogenic effects.

### 10. Agricultural Expansion and Wetland Habitat Degradation

The agricultural development has been very high in Haryana which has resulted in wetland drainage and conversion of wetland lands to crop production. The effects of agricultural activities on the population of wetland birds, especially its habitat erosion, diversion, and degradation, will also be discussed in this section (M. E. Mitchell et al., 2022).

**Table 3: Impact of Agricultural Expansion on Wetland Bird Diversity**

| Wetland Site | Area Lost to Agriculture (%) | Bird Species Affected |
|---|---|---|
| Sultanpur Lake | 30% | 5 species |
| Bhindawas Lake | 15% | 3 species |

Source: Author's compilation

### 11. Urbanization and Its Impact on Wetland Birds

Haryana is experiencing rapid urbanization that is seriously encroaching on the wetlands habitats thus destroying important nesting and feeding ground of the bird population. Due to the growth of cities and development of wet land by construction of roads, buildings and industrial belts, the space in which birds can breed is further reduced. The habitat fragmentation in which large continuous wet-lands are divided into small and isolated ones decreases the efficiency of these environments and complicates food, breeding, and migration of birds. Populations become isolated too, and this fragmentation may result in inbreeding and decreased genetic diversity that make species more susceptible to changes in the environment (Tang et al., 2020).

Besides the loss of habitats, urbanization presents the problem of noise and light pollution which may interfere with the natural behavior of wetland birds. Traffic, construction and other activities in the city distract bird communication, especially during breeding and migration. On the same note, light pollution may confuse night animals, including migratory birds which use natural signals to guide them. This causes higher levels of stress, decreased reproductive success and even

displacement out of important wetland regions. The consortium of the habitat loss, fragmentation, and pollution requires keen city planning and governance to provide security to the wetland bird populations in Haryana.

**12. Tourism and Its Effects on Wetland Bird Habitats**

Although tourist activities may give rise to substantial economic gains through creation of local employment opportunities and provision of foreign exchange, their impact on wetland biomes may be extremely negative without proper control measures. Sensitivity of wetlands like the Sultanpur Lake and the Bhindawas Lake is the reason why more human activities have been observed in these areas in Haryana due to tourism development in the wetlands. Tourist disturbances in the form of boat trips, hiking and photography may result in stress accumulation in the birds especially when it is time to breed and during migrations. The constant human access may make birds stop nesting, affect their feeding behaviors, and prevent the possibility of rest and recovery during the migration process (Yuan et al., 2014).

Besides, tourism-related actions usually carry along with them an additional burden of litter, wastes and construction of infrastructures, which even further diminish the wetland habitats. The inadequate disposal of money and wastes may affect the quality of water, as well as the health of the bird species and food supply. The landscape as well as the natural operation of the ecosystem can also be changed due to invasive species of plants brought by tourists, the building of roads or hotels in the vicinity of wetlands. Such sustainable tourism practices as restricting access to specific areas during the vital times and encouraging eco-friendly tourism are needed to reduce all these effects and save the populations of birds that rely on the wetland habitats in Haryana.

**13. Conservation Strategies for Wetland Bird Species in Haryana**

Wetlands in Haryana need effective conservation plans to prevent the loss of bird species in the area. In this section, a series of conservation initiatives such as establishment of conservation

spaces, environmental rehabilitation, and environmental tourism shall be suggested. It will also highlight the role of the local communities in conservation (R. C. Gupta et al., 2012).

**Table 4: Proposed Conservation Strategies for Haryana Wetlands**

| Strategy | Description |
|---|---|
| Habitat Restoration | Reintroduce native vegetation and improve water quality |
| Community Engagement | Involve local communities in monitoring and protection |
| Sustainable Tourism Practices | Implement eco-friendly tourism policies and regulations |

Source: Author's compilation

## Conclusion

Bird species richness and environmental factors underpinning the wetland ecosystems in Haryana is a study that is necessary to formulate a sound and informed conservation strategy. Through studying seasonal changes in the bird population, migration, and the overall effects of human action e.g. urbanization, agriculture, and tourism, we obtain a much better insight on the ecological processes that influence these habitats. Such knowledge plays a central role in the identification of the major threats and opportunities of conservation so that management interventions would be targeted and sustainable. The management of the bird species will not only protect the diversity of the bird species but will also result in improving the health and resistance of the wetlands in Haryana thereby guaranteeing the survival of these wetlands to be used by the future generation as well as to provide ecological services, including water filtration, carbon sequestration and biodiversity support. Through such insights incorporated in the local and regional policies, we will be able to leave an imprint in terms of protection and recovery of wetland habitats.

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