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Three significant wetlands close to Kolkata, India, are experiencing habitat degradation and a sharp decline in the number of water birds

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Abstract

The ecosystems on Earth that are disappearing the fastest are wetlands. Because of the tremendous urbanisation that is occurring in developing economies, these destructions are happening much more frequently. Over a fifteen-year period, a study was carried out in three significant wetlands close to Kolkata Metropolis in south West Bengal, India, to estimate the changes in waterbird abundance, both as long-distance and residential/local migrants. During this survey, 51 different species of waterbirds were identified. Of these, twenty-two residential/local migrants showed a notable drop in abundance during the time, whereas all nineteen species of winter migrants had dramatic declining trends. The conversion of wetlands for commercial fishing, the disposal of wetlands for various development projects, the careless removal of aquatic vegetation, contamination from sewage inflow, etc. are some of the main causes. Wetlands are important for hydrological and biogeochemical cycles and offer a variety of ecosystem services, such as reducing the negative effects of climate change and supplying food and other necessities for humankind. Therefore, it is imperative that NGOs and government agencies step in right once to establish a framework for socio-ecological conservation that includes all relevant parties in order to preserve these wetlands for sustainable use and to ensure that threatened species are protected within and around them.

Keywords: Wetlands, waterbirds, threats, sustainable use, conservation

Introduction

In addition to being vital wintering grounds for migrating birds and breeding grounds for rare and endangered species, wetlands are significant inhabitants of the local and regional biodiversity [1, 2, 3, 4, 5]. Birds are a dependable and popular group of animals to utilise as indicators for planning conservation efforts and keeping an eye on ecological conditions [6]. In addition to offering significant environmental benefits [7], wetlands are essential habitats for waterbirds. Nonetheless, wetlands are being destroyed and degraded globally as a result of human activity [8]. Wetland drainage, habitat loss and fragmentation, and pollution-one of the biggest threats to biodiversity globally-are the main causes of wetland degradation [9].

Unfortunately, almost 60% of the world's natural wetlands have either been destroyed and degraded [8] or have been negatively impacted in some way [10, 11, 12, 13] as a result of irresponsible anthropogenic activity. Almost all of the wetlands in the state of West Bengal, India are not only neglected for conservation but are occasionally encouraged for destruction or degradation by the local and national authorities for development and other business purposes, despite the fact that the Indian Ministry of Environment and Forests Prioritised 25 wetlands in the state of West Bengal in 2005 (Indian Ministry of Environment and Forests, 2005). On the other hand, there are also significant issues with the spread of water hyacinths and the discharge of contaminants into water bodies. A good picture of the state of wetlands, their avifaunal richness, and population trends in this area can be obtained from the few trustworthy sources that provide data [11, 13, 14, 15, 16, 17, 18]. I have attempted to provide a thorough examination of the water bird communities in the three significant wetlands that are close to Kolkata Metropolis in south West Bengal, India, in this post, as well as a quantitative assessment of the changes in their abundance from 2010 to 2024. This project aims to investigate the effects of human-caused hazards on waterbird populations and assemblages in those three wetlands situated inside a densely populated industrial belt and very active development projects. My main goals are to:

1. Identify the main threats.
2. Analyse long-term changes in the population of each species of water bird that was seen during the study period.
3. Take the conservation implications of my results into consideration.

Materials and Methods

Study area

Three significant wetlands close to West Bengal's Kolkata Metropolis were the study's locations (Fig. 1). These were:

The complex of Nalban Wetland (22°33.96' N and 88°25.56' E): Situated immediately southeast of the Kolkata city limit, the Nalban Wetland Complex is made up of vast expanses of ponds, marshes, and swamps. It is a part of the Ramsar Site East Calcutta Wetlands. In addition to supporting the largest and possibly oldest integrated resource recovery practice in the world, East Kolkata (Calcutta) Wetlands also sustains a large and economically disadvantaged population of about 20,000 families who rely on the various wetland products; primarily fish and vegetables for their daily sustenance. The Government of India designated East Calcutta Wetlands as a Wetland of International Importance under the Ramsar Convention in 2002 because of its great ecological and sociocultural significance. Approximately 2500 ha remain of the 8100 ha that these marshes once covered. In the past, a great number of water birds used to visit the extensive marshes in eastern Calcutta. But the wetlands quickly disappeared as the city grew to include this area and the new Salt Lake City was constructed over time. These days, only a small portion of the original is left, strewn about in tiny fragments as reminders of the past. The Nalban Bheri is the only significant body of water that still exists in this region. Despite fishing and other leisure activities being conducted there, some water birds continue to visit this area throughout the year. It has long been a preferred wintering place for snipes and long-distance migrating waterfowl. A significant amount of these wetlands are covered in water hyacinth all year long [16, 19]. The wetlands' biodiversity has rapidly changed as a result of modifications to land use and hydrological regimes. Just 162 of the 271 bird species known to have been found in the wetlands have been intermittently seen during the past 30 years. A total of 109 bird species are estimated to have gone extinct in the area, with most of them being water birds. The diversity of the vegetation has been significantly decreased, especially that of mangroves and other brackish water species. Only cultivable freshwater species are supported by the wetland complex, which was once teeming with a wide variety of brackish and freshwater fishes in the early 20th century. The Nalban Bheri is the only significant body of water that still exists in this region. Despite fishing and other leisure activities being conducted there, some waterbirds continue to visit this area throughout the year.

22°34.8' N and 88°16.98' E is Santragachi Lake. The wetland covers 24 hectares, of which 18 ha is a lake that offers waterbirds a suitable habitat. Santragachhi, situated within a heavily populated industrial area, has been negatively impacted by irresponsible anthropogenic activity, leading to degradation. Much of the body of water is covered in water hyacinth (*Eichhornia crassipes*) all year round. The lake provides a diverse range of fish, mollusks, and zooplankton to provide the waterbirds with the necessary food [14, 17]. Khan et al. provided a thorough account of this wetland (2005).

Dankuni Wetland Complex, located at 88°17.76' E and 22°39.9' N: Ten tiny ponds and marshes make up this wetland complex, which is located in the rural zone 9 km to the northwest of the Kolkata Metropolitan border and 17 km to the north of Santragachi Lake. These wetlands cover 44 hectares and are located inside a somewhat rural area. The locals have engaged in pisciculture on Lake 2, the largest wetland in this complex. The complex is bisected to the east by National Highway 2 and runs alongside Howrah-Bardhaman Chord, one of the busiest railway lines in the area.

These wetlands are nearly devoid of dense water hyacinth mats when compared to Santragachi Lake and Nalban Wetland Complex. This is mostly because the local fishing community take proper care of the wetlands to keep them clean for their fishing needs. The majority of these wetlands draw waterbirds all year round, even migratory ones on winter days. Nonetheless, Lake 2 has been found to have the greatest diversity. By mid-2011, the Indian Railways has started to transform the Dankuni wetland complex into a Railway Waggon Factory. As a result, a larger portion of the wetland complex has been eliminated, which has caused nearly every species of winter migratory to disappear from the wetland complex since the winter of 2011 [20].

Waterbird Census:

Waterbird counts were conducted between January 1 and January 30, 2010–2024, to coincide with the extensive Asian Waterfowl Census Programme run by Wetlands International. Using the same techniques as Khan (2010), three to five observers conducted waterbird counts using a combination of on-foot and boat methods, contingent on the size and accessibility of the wetland. Waterbirds in Nalban Wetlands were counted from a country boat as well as on foot, while bird counts in Dankuni Wetlands Complex and Santragachi Wetland were conducted on foot. Every census started at 8:00 a.m. IST and went on until all the waterbirds in the wetland had been counted.

Waterbird Abundance:

Using the following formula [21], comparisons of the abundance of each species of waterbird between 2010 and 2024 were made between the counts' values from 2010 and 2024:

Percent change between 2010 and 2024

$= \{(M_{2024} - M_{2010})/ M_{2010}\} \times 100$

Where M_{2024} is the value for the year 2024 and M_{2010} is the value obtained in 2010.

Results and Discussion

During the course of this investigation, 33597 migratory waterbirds from 51 species were recorded. Of them, 19 were long-distance winter visitors, and the remaining species were either local or residential migrants [22]. IUCN status indicates that with the exception of the Common Pochard (Vulnerable) and Ferruginous Pochard (Near Threatened), the bird species seen throughout the study period are the least concerning. On the other hand, between 2010 and 2024, the majority of waterbirds showed negative tendencies (Table 1). Among all winter migrants, there has been a notable decrease in abundance. Nevertheless, throughout this time 22 residential/local migratory species also displayed falling trends. The main causes of this downward trend differ amongst wetlands.

Numerous socioeconomic causes have a major role in the disappearance of the East Kolkata Wetland. The wetlands are under a great deal of strain due to the quick urbanisation that has followed the rapid population increase. Unplanned urbanisation and earthfilling for infrastructure construction, together with the expansion of agricultural and built-up land, road construction, commercial aquaculture, trash dumping, and sewage systems, are the main causes of the loss of wetland areas. The vast majority of the marsh is converted into aquaculture fields so that fish can have food. As a result, the surrounding habitat is lost, the water quality deteriorates and the land becomes more acidic. Wetland degradation remains continued, even after the Ramsar site was designated [19]. It does so at a slightly slower rate, though.

The second most impacted of these three wetlands is Santragachi Wetland, where the dense human population around

the lake, including apartment complexes and railway yards, poses a major threat to waterbirds. Serious threats to the lake's remaining flora and wildlife include habitat degradation, urbanisation, sewage runoff that severely contaminates the waterbody, and the improper removal of the wetland's aquatic vegetation cover. These caused the waterbirds' roosting, nesting, and eating habitats to be destroyed, which sharply reduced the avifauna's diversity and population. Therefore, government restoration and protection initiatives, together with public awareness campaigns, are critical to the wetland's existence.

The Dankuni Wetlands Complex, which was once the largest remaining contiguous marshland in the lower Gangetic floodplains, has recently suffered the most from large-scale illegal conversion of these wetlands as well as conversion by Indian Railways into a Railway Waggon Factory, starting in mid-2011. As a result, a larger portion of the wetland complex was eliminated, and enormous bodies of water, reed beds, and marshes were covered in fly ash. The Dankuni Wetland Complexes were not included in the state's wetland inventory, a simple action that could have provided protection against industrial encroachment and is the cause of the disaster.

Although wetlands are important for hydrological and biogeochemical cycles and offer a variety of ecosystem services, such as reducing a community's susceptibility to extreme weather events and climate change in general, as well as providing food and many other necessities for humankind, political and economic decisions are moving society away from the desired sustainability of these wetlands. In addition to providing drainage and storage for excess water during the monsoon season, wetlands may hold water during the dry season and maintain a steady water table [23]. These functions are crucial in the highly populated urban and suburban areas in and around Kolkata. It may also be able to control a microclimate [24, 25].

In supporting biological survival and human growth, wetlands provide essential ecological responsibilities that cannot be replaced [26, 27]. In comparison to other terrestrial ecosystems, it also stores a higher amount of carbon [27]. The IPCC (2002) [28] came to the conclusion that "restoration of drained and degraded peat lands is one of the key low-cost greenhouse gases mitigation strategies" in light of these findings. Wetland restoration may be the most effective (low-cost) way to sequester carbon and reduce emissions in the short term because it allows for a rapid rate of vegetative growth and better hydrology [29].

The importance of wetlands conservation has recently increased due to the previously greatly underestimated benefits that these ecosystems offer to society [30]. Today, policymakers have access to enough scientific data to recognise the critical need for taking the necessary steps to preserve wetlands and the services they provide to society [31]. Through the cooperation of all stakeholders from the policy level down to the grassroots community, an integrated approach must be done in order to reverse the rising issues and conserve these delicate wetlands next to Kolkata Metropolis, South West Bengal, India.

Conclusion

Wetland conservation is critical for maintaining ecosystem services as well as for tackling problems like inequality and poverty in order to build a more positive and sustainable future. Even before the extensive devastation began, those three wetlands close to the Kolkata Metropolis had demonstrated their potential to be excellent habitats for water birds. As a result, numerous sectors and organisations urgently need to maintain these wetlands properly. Not only is it necessary to restore these wetlands to safeguard the avifauna, but it is also necessary to provide hydrological and ecosystem services to support the expanding population and agricultural practices. Therefore, in order to save those wetlands, government officials must act quickly and develop socio-ecological conservation frameworks under appropriate legislation. The Indian Biological Diversity Act of 2002 allows for the designation of certain regions as Biodiversity Heritage Sites, which promotes the sustainable use of wetland resources and the conservation of numerous threatened species.

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TABLE 1: LIST OF WATERBIRDS ENCOUNTERED AND COUNTED AT PURULIA WETLANDS DURING 2010–2024 ALONG WITH THEIR ABUNDANCE, % CHANGE OVER TIME (THE % CHANGE IS THE PERCENTAGE INCREASE (POSITIVE) OR DECREASE (NEGATIVE) IN ABUNDANCE BY 2024 RELATIVE TO THE SPECIES' ABUNDANCE IN 2010) AND RESIDING STATUS

Sl. No.	Species	No. of Birds	% change	Residing status
1	Darter (*Anhinga melanogaster*)	21	-75	Resident
2	Great Cormorant (*Phalacrocorax carbo*)	117	-12.6	Resident
3	Little Cormorant (*Phalacrocorax niger*)	375	2.6	Resident
4	Indian Cormorant (*Phalacrocorax fuscicollis*)	28	-5.2	Resident
5	Little Grebe (*Tachybaptus ruficollis*)	385	-15.8	Resident/local migrant
6	Great Egret (*Casmerodius albus*)	38	-9.2	Resident
7	Intermediate Egret (*Mesophoyx intermedia*)	73	-14.3	Resident
8	Little Egret (*Egretta garzetta*)	241	2.2	Resident
9	Cattle Egret (*Bubulcus ibis*)	462	4.8	Resident
10	Grey Heron (*Ardea cinerea*)	31	-1.9	Resident
11	Purple Heron (*Ardea purpurea*)	42	-10	Resident
12	Yellow Bittern (*Ixobrychus sinensis*)	27	1.2	Resident
13	Black-crowned Night Heron (*Nycticorax nycticorax*)	349	-7.8	Resident
14	Indian Pond Heron (*Ardeola grayii*)	431	3.0	Resident
15	Asian Openbill (*Anastomus oscitans*)	206	5.6	Resident
16	Black-headed Ibis (*Threskiornis melanocephalus)*	38	1.5	Resident
17	Lesser Whistling Duck (*Dendrocygna javanica*)	19431	-14.6	Resident/local migrant
18	Fulvous Whistling Duck (*Dendrocygna bicolor*)	175	-39.2	Resident/local migrant
19	Common Pochard (*Aythya ferina*)	237	-51.5	Winter migrant
20	Northern Pintail (*Anas acuta*)	486	-87.8	Winter migrant
21	Common Teal (*Anas crecca*)	342	-76.2	Winter migrant
22	Gadwall (*Anas strepera*)	1274	-29.8	Winter migrant
23	Garganey (*Anas querquedula*)	157	-74.5	Winter migrant
24	Northern Shoveler (*Anas clypeata*)	189	-65.9	Winter migrant
25	Comb Duck (*Sarkidiornis melanotos*)	62	-38.5	Resident/local migrant
26	Cotton Pygmy Goose (*Nettapus coromandelianus*)	157	-27.3	Resident/local migrant

27	Ferruginous Pochard (*Aythya nyroca*)	426	-62.6	Winter migrant
28	Tufted Duck (*Aythya fuligula*)	578	-73.1	Winter migrant
29	Osprey (*Pandion haliaetus*)	17	-9.4	Winter migrant
30	Western marsh harrier (*Circus aeruginosus*)	23	-12.6	Winter migrant
31	White-breasted Waterhen (*Amaurornis phoenicurus*)	461	-14.8	Resident
32	Common Moorhen (*Gallinula chloropus*)	829	-23.2	Resident
33	Common Coot (*Fulica atra*)	1824	-39.2	Local migrant
34	Purple Swamphen (*Porphyrio porphyrio*)	1328	-31.4	Resident
35	Pheasant-tailed Jacana (*Hydrophasianus chirurgus*)	427	-32.8	Resident
36	Bronze-winged Jacana (*Metopodius indicus*)	764	-21.3	Resident
37	Whimbrel (*Numenius phaeopus*)	19	-18.6	Resident
38	Grey-headed Lapwing (*Vanellus cinereus*)	52	-37.2	Winter migrant
39	Red-wattled Lapwing (*Vanellus indicus*)	395	4.0	Resident
40	Common Redshank (*Tringa totanus*)	98	-15.2	Winter migrant
41	Common Greenshank (*Tringa nebularia*)	126	-8.3	Winter migrant
42	Green Sandpiper (*Tringa ochropus*)	67	-14.5	Winter migrant
43	Wood Sandpiper (*Tringa glareola*)	108	-43.2	Winter migrant
44	Common Sandpiper (*Actitis hypoleucos*)	73	-11.8	Winter migrant
45	Pintail Snipe (*Gallinago stenura*)	84	-26	Winter migrant
46	Common Snipe (*Gallinago gallinago*)	53	-48.3	Winter migrant
47	Swinhoe's Snipe (*Gallinago megala*)	22	-56.2	Winter migrant
48	Stork-billed Kingfisher (*Halcyon capensis*)	273	2.8	Resident
49	White-throated Kingfisher (*Halcyon smyrnensis*)	254	4	Resident
50	Common Kingfisher (*Alcedo atthis*)	74	-6.5	Resident
51	Pied Kingfisher (*Ceryle rudis*)	41	-8.5	Resident

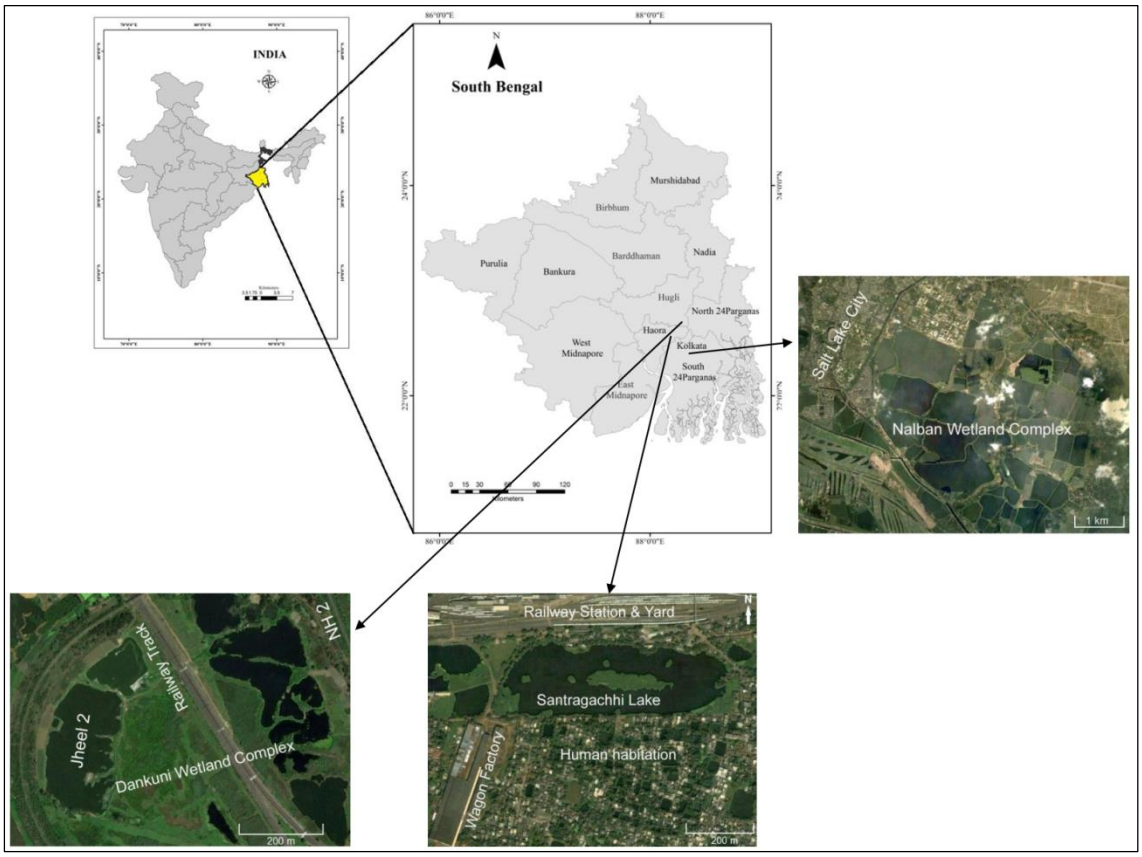

FIGURE 1: MAP SHOWING THE LOCATIONS OF NALBAN WETLAND COMPLEX, SANTRAGACHI LAKE, AND DANKUNI WETLAND COMPLEX

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