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Biodiversity exploration: winter walking trails around Bhandup pumping station

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ABSTRACT

One fascinating Mumbai proximity that serves as a testament to the myriad essential ecological benefits the wetland ecosystem offers is the Bhandup Pumping Station Wetlands in Maharashtra. It could be identified as wetlands by their parameter water levels and soils rich in nutrients. According to the authors, a variety of organisms, such as microbial communities, hydrophytic plants, and animals including waterfowl should illustrate the ecosystem. The biodiversity assessment conducted in swamps in the Bhandup pumping station emphasizes the general ecology specific at the habitat encounter during the assessment. The hydrophytic plants play critical roles in the functioning of the ecosystem by providing homes and assisting in clearing water to ensure that the complex and interdependent web of life is maintained. Additionally, they are well adapted for the fluctuating conditions of wetland environments. The fauna of wetlands is very rich and varied and includes several different types of species. Bird counts have recorded resident and migratory birds, acknowledging the value of wetlands as vital refueling or resting areas for transiting birds. Mammals, amphibians, reptiles, invertebrates, and countless other organisms further add to the ecological prosperity of our wetlands. Microbial populations in a wetland basin also help nutrient recycling and basin welfare by contributing toward quality preservation of water and wellness of the entire ecosystem. Efforts to understand the current state of wetlands focus on studying the diversity of bird, reptile, mammal, fish and insect populations along with key water parameters. Parameters such as biological oxygen demand (BOD), chemical oxygen demand (COD), carbon dioxide (CO_2) levels, turbidity and pH serve as vital indicators of wetland ecosystem health and provide insight into ongoing ecological processes and potential stressors affecting the ecosystem.

Key words: *Wetland diversity, Biodiversity, Water assessment, Pollution*

Introduction

Wetlands are repositories of biodiversity, the quintessence of ecological fertility and fecundity. They form fortresses of life for several plant and animal species. They command the rhythmic tide and motion of hydrosphere, which is the pillar of life on the earth. The biodiversity, the amalgam of life forms at the level of species, their genes and ecosystems, is the very soul of the wetlands, weaving the fabric of life in its diversity and abundance and complexity. It is foundation on which the ethics and vibrancy of ecosystems grows or regresses, conferring upon them numerous ecological, economic, social advantages. The Bhandup Pumping Station wetlands are situated in the expansive stretch of the Thane Creek Flamingo Sanctuary that extends over an area of about 1.2-2 km. They are crucial segments of a wider network of wetland systems that grace the natural beauty of the Mumbai Metropolitan Region. Other

wetland systems include mangroves and estuaries, along with freshwater marshes. Their fundamental distinction consists in their hydrological record, defined by tidal forces, monsoons, and anthropogenic activity such as drainage and water pumping. It is in these watery realms that biodiversity thrives in abundance, coalescing in a tremendous variety of taxa that includes vascular plants and algae, invertebrates, pisces, amphibians, reptiles, avian, and mammals. The life-forms in this varied assemblage orchestrate an intricate symphony of interactions that are woven into the very fabric of wetland ecosystems and are instrumental in nutrient cycling, water purification, and habitat delivery. The Bhandup Pumping Station wetlands are true oasis to a multitude of species, including many in danger of extinction, these wetlands serve as cradles of life for both resident and transient ones. Regardless, the possibility of anthropogenic influences however utterly magnificent biologically, the sacredness of these wetlands are threatened. Indeed, due to inexorable exposure to the encroachment of pernicious urbanization, industrialization, and reckless disposal mechanisms, habitat destruction, pollution, and encroachment have tainted their unearthly quality. These biological assaults have resulted in habitat loss and degradation as well as imperilment to the type of biological integrity upon which they subsist.

Materials and Methods

Study area: Bhandup pumping station (19°09′02"N 72°57′23"E) along the thane creek in Mumbai. The region of pumping station comes under the Airoli flamingo sanctuary. 168 species of birds and mammals have been sighted here.

Field Observation: Stretching 1.2 to 2 km, the Bhandup Pumping Station can be found hidden away inside the newly created Thane Creek Flamingo Sanctuary. This 1,690-hectare sanctuary is located in a Maharashtra suburban area near Mumbai. During December 2023 and February 2024, field surveys had been carried out, with a median of eight visits per month and a total of approximately 24 visits throughout the study duration.

Field observations included visual sightings, specimen collection, aided by key charts for identification, and photography employing digital and phone cameras. Additionally, interviews were conducted with local fishermen, forest officials, and workers to glean insights into the area's biodiversity.

Fig. 1. Bhandup pumping station

Fig. 2. Way to wetland

Species composition

Fishery

Pumping station apart from mangroves, industries, urban settlements and village along both the sides. the inhabiting are mostly fishers depending upon the pumping station and the creek. During the interaction, interview was taken of some local fishers liv-

Table 1. Fish obtained from Bhandup pumping station along the creek

Sr.No	Family	Genus and Species	Common Name
1	Gobiidae	*Boleopthalmus sp*	Mudskipper
2	Cichlidae	*Tilapia mossambica*	Tilapia
3	Megalopidae	*Megalops cyprinoides*	Indo pacific tarpon
4	Bagridae	*Mystus gulio*	long whiskers catfish
5	Portunidae	*Scylla serrata*	mud crab
6	Veneridae	*Katelysia opima*	Edible clam

Insects

Table 2. Insects observed from Bhandup pumping station along with thane creek

Sr. No.	Family	Scientific Name	Common Name
1	Culicidae		Mosquito
2	Pyrrhocoridae		Red bug
3	Gerridae		Water strider
4	Apidae	*Apis indica*	Honey bee
5	Nymphalidae	*Junonia orithya*	Blue pansy
6		*Danaus genutia*	Common tiger
7		*Parantica sita*	Chestnut tiger
8		*Ariadne merione*	Common castor
		Parantica aglea	Glassy tiger
9		*Euploea core*	Common crow
10		*Junonia aiphita*	Chocolate pansy
11	Lycanidae	*Talicada nyseus*	Red pierrot
12	Pieridae	*Hebomoia glaucippe*	Great orange – tip

Avifauna

Table 3. Aves observed

SR.No.	Family	Scientific Name	Common Name
1	Cuculidae	*Endynamysn scolopaceus*	Asian koel
2	Ardeidae	*Egretta*	Little egret
3	Ciconiidae	*Mycteria leucocephala*	Painted stork
4	Charadriidae	*Pluvialis fulva*	Pacific golden plover
5		*Pluvialis squatarola*	Grey plover
6		*Anarhynchus alexandrinus*	Kentish plover
7	Ardeidae	*Egretta gularis*	Western reef heron
8	Alcedinidae	*Halcyon pileata*	Black capped kingfisher
9	Laridae	*Hydroprogne caspia*	Caspian tern
10		*Gelochelidon nilotica*	Gull billed tern
11		*Chroicocephalus genei*	Slender billed tern
12		*Ichthyaetus ichthyaetus*	Pallas gull
13	Recurvirostridae	*Recurvirostra avosetta*	Pied avocat
14		*Chroicocephalus ridibundus*	Black headed gull
15	Anatidae	*Spatula clypeata*	Northern shoveler
16		*Anas crecca*	Eurasian teal
17	Scolopacidae	*Calidris minuta*	Little stint
18		*Calidris ferruginea*	Curlew sandpiper
19		*Limosa limosa*	Black tailed godwit
20		*Limicola falcinellus*	Limocola
21	Phoenicopteridae	*Phoenicopterus roseus*	Greater flamingo

Fig. 3a. Chestnut tiger

Fig. 3b. Common crow

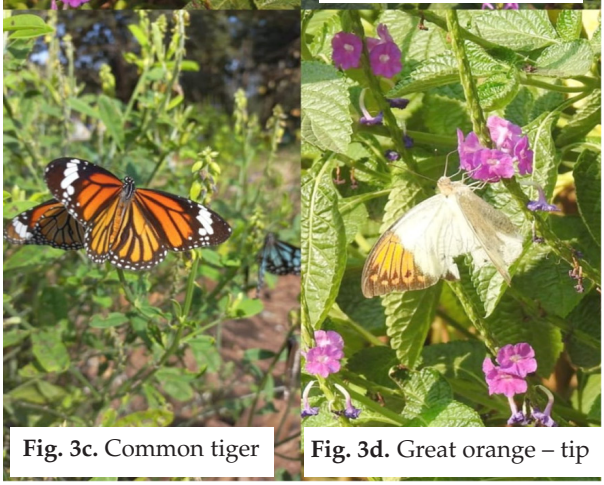

Fig. 3c. Common tiger

Fig. 3d. Great orange – tip

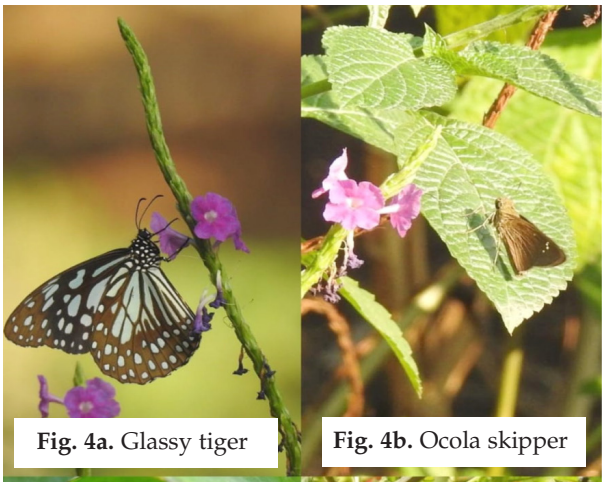

Fig. 4a. Glassy tiger

Fig. 4b. Ocola skipper

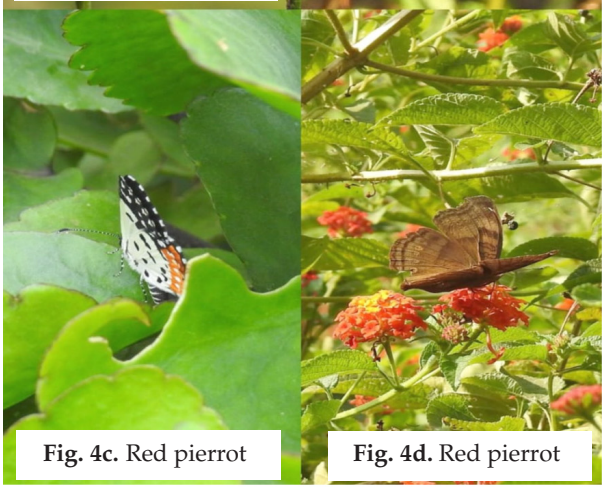

Fig. 4c. Red pierrot

Fig. 4d. Red pierrot

ing by Bhandup pumping station along with the creek. Here are some fish species locally found.

Mammals

Table 4. List of mammals observed

Sr. No .	Scientific Name	Common Name
1	*Funambulus palmarum*	Three striped palm squirrel
2	*Rattus rattus*	House Rat
3	*Herpestes edwardsi*	Common mongoose

Reptiles

Table 5. List of reptiles observed during the survey

Sr.No	Family	Scientific Name	Common Name
1	Agamidae	*Calotes versicolor*	Common garden lizard

Water assessment test

Water samples were collected from the surface in clean and rinsed plastic bottles physico–chemical parameters viz, pH, temperature, turbidity, DO, BOD, COD.

Table 6. Result of water assessment

Sr.No	Test	Results
1	pH	6
2	Turbidity	5 NTU
3	Temperature	29 °C
4	DO	15 mg/l
5	BOD	8 mg/l
6	COD	86 mg/l

Present status and threats

Wetland species are threatened and endangered and some species have totally disappeared in ecosystem. Ongoing construction of electricity lines, the instal-

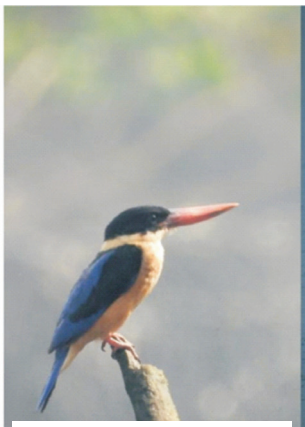

Fig. 5a. Black capped kingfisher

Fig. 5b. Painted stork

Fig. 5c. Western reef heron

Fig. 5d. Little egret

Fig. 6a. Pacific golden plover

Fig. 6b. Eurasian teal

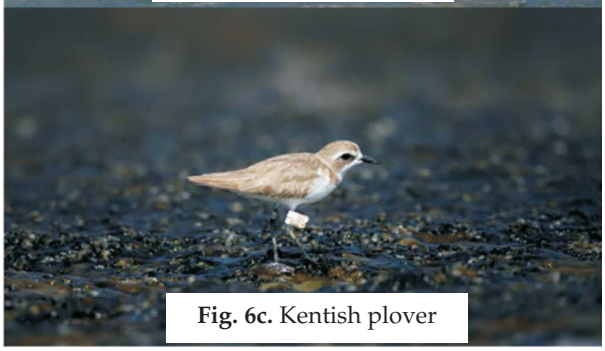

Fig. 6c. Kentish plover

lation of electrical lines may lead to habitat fragmentation, dividing wetland areas and disrupting wildlife movement patterns. Fragmentation can isolate populations, reduce genetic diversity, and hinder access to food, water, and mates.

The effluents from industries contain toxic chemicals to aquatic animals, birds, and humans. These effluents cause pollution of water sources, which are fed on by the wetland animals. The animals take the pollutants directly when drinking the contaminated water. Sickness or infections might result, and it may lead to reproductive problems or death if not treated. The contaminated products in the form of heavy metals, pesticides, or industrial effluent enter the bodies of water animals. This process is known as bioaccumulation, and as animals seek food, the predators at the top of the food chain consume the contaminated prey. Biomagnification occurs when the concentration of pollutants in the predators increases as they move up the food chain. The birds and mammals also eat the contaminated animals, and the predators at the top have high levels of toxic substances, which affect their health and cause death. Furthermore, pollutants in water can interfere with the reproductive and developmental systems of wetland animals. Wetland animals may also be impeded by the inability to disperse or migrate through polluted water; polluted water bodies may dissuade animals from using many parts, limiting access to suitable breeding, feeding, or overwintering areas and affecting population size and gene circulation. These services may be harmed by water pollution, weakening wetland ecosystem health and survival and diminishing wetlands' capacity to support wildlife and offer humans with essential services.

Wetland habitats fish populations may decline

Fig. 7a. Pied avocat

Fig. 7b. Pallas gull

Fig. 7c. Northern shoveler

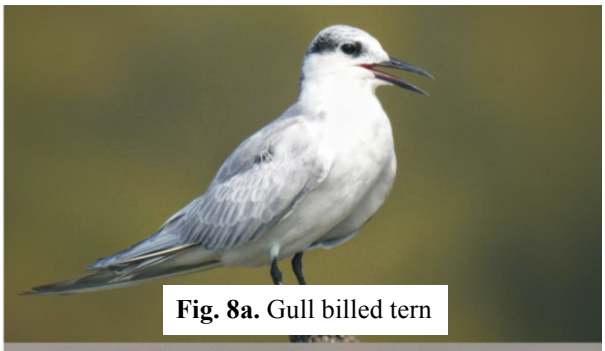

Fig. 8a. Gull billed tern

Fig. 8b. Gull billed tern

Fig. 8c. Slender billed tern

with overfishing. This further disrupts the food chain and ecosystem control measures. Other wildlife species that depend on fish as their food source are affected as well, thereby reducing their levels as they also perform ecological roles in the presence of fish. They include insect control when they feed on fish, nutrient cycling, and habitat creation. Overfishing disrupts all these ecological activities thereby creating an imbalance in the ecosystem controls. The elimination of some fish species due to overfishing results in the depletion levels or local extinction of economically important fish or those on the vulnerable species, dipping biodiversity thereby compromising the resilience of the wetland habitat to environmental pressures.

Discussion

For water parameters, water was collected every 1st of the 3 months (December, January and February) and the mean was calculated. To test the pH, which compared to normal range was slightly acidic as it can be harmful locals living nearby. Turbidity is normal while temperature fluctuated according to the time 27- 30°C. While the survey several observation was made where harmful effluent from industries along with local apartments was discarded in the water. As the water is consumed by animals and villagers, fishers living by, it is harmful. The sighted fishes were commonly consumed by locals. Mud crabs was observed widely around the wetland mostly near the creek. Mosquito, water strider, common tiger, blue pansy and chocolate pansy were sighted the most. Greater flamingo was sighted throughout the season along with terns and egret. The given mammals and reptiles were sighted every visit.

Fig. 9a. Caspian tern

Fig. 9b. Painted stork

Fig. 9c. Black tailed godwit

Fig. 10. Greater flamingo

Conclusion

The wetlands of Bhandup Pumping Station is vital ecosystems that require urgent conservation attention and sustainable management practices. Mitigating the threats of pollution and infrastructure development is essential for preserving the ecological integrity, biodiversity, and ecosystem services provided by these wetland habitat. Collaborative efforts involving government agencies, conservation organizations, local communities, and industries are necessary to implement effective conservation measures, restore degraded habitats, and ensure the long-term sustainability of these valuable ecosystems for future generations.

Fig. 11. Ongoing construction of electricity line

Fig. 12. Effluents in water

Conflict of interest: We have no conflict of interest to disclose.

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