One-month Internship Report on the Biodiversity and Ecosystem Services of East Kolkata Wetlands



Submitted by: Sivansh Gupta

Affiliation: Don Bosco School Park Circus
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Acknowledgement

I wish to express my sincere gratitude to the Nature Environment and Wildlife Society (NEWS) for offering me the opportunity to undertake this internship at the East Kolkata Wetlands (EKW). I am deeply indebted to the local communities and fishermen, whose cooperation and traditional knowledge offered me a deeper understanding of the socio-ecological dynamics of the wetlands. I am especially thankful to the fishermen of Nalban Fisheries Project and 4 no. Bheri Fishermen Cooperative Society for giving me their time during my field visits. I also extend my sincere thanks to Mr. Anupam Pal, who guided me throughout the field visits, bird identification, and reporting.

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Executive Summary

This one-month internship at the East Kolkata Wetlands was a hands-on learning experience that combined field-based bird census surveys with the study of ecosystem services in a unique urban wetland ecosystem. The internship included three key field visits: an orientation session at Nalban Bheri, a structured bird census at Nalban Bheri, and a comprehensive survey on bird diversity and ecosystem services at 4 No. Bheri.

The East Kolkata Wetlands, a Ramsar-designated site, play a pivotal role in Kolkata's urban sustainability by integrating wastewater treatment, aquaculture, agriculture, and biodiversity conservation. Through bird counts, species identification, and observation of ecosystem processes, I gained insights into the rich avian diversity, including herons, storks, cormorants, pigeons, barbets, and other passerines. Simultaneously, the wetlands revealed themselves as a hub of ecosystem services — from provisioning services such as fisheries to regulating services like wastewater purification and climate regulation.

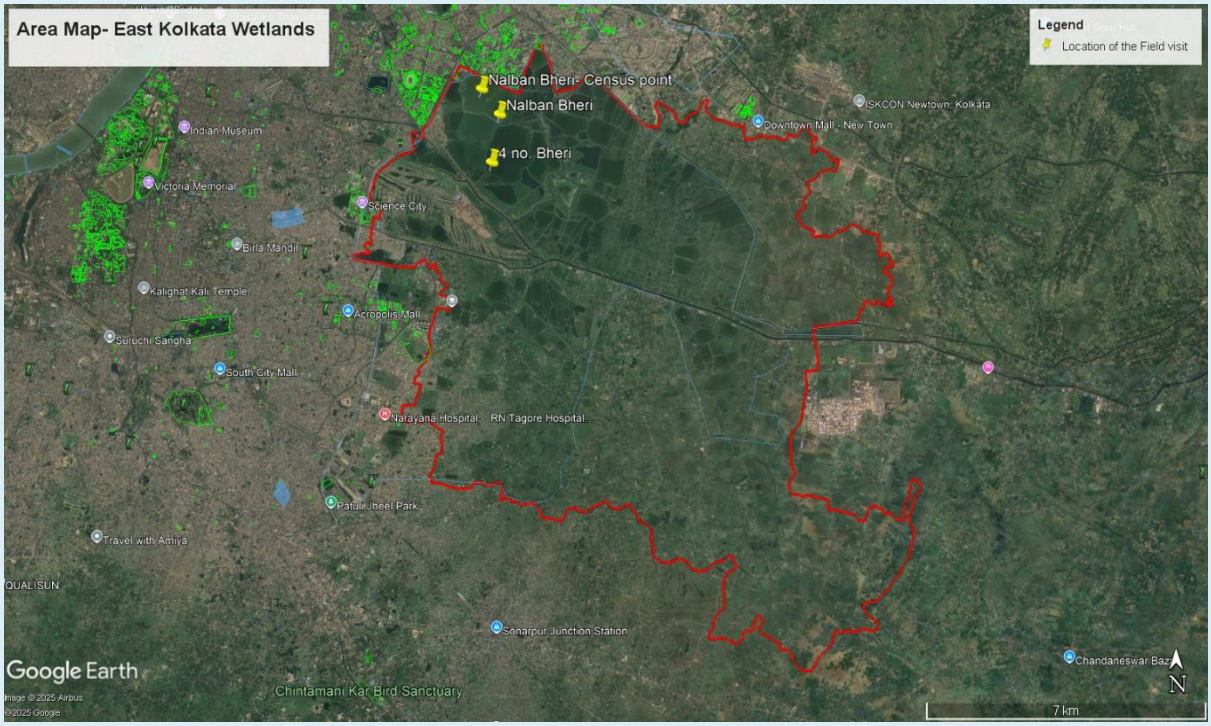
This report documents the methodologies, observations, results, and reflections of my internship. It highlights both the ecological significance of the wetlands and the challenges posed by urban pressures such as pollution, trash accumulation, and encroachment.

1. INTRODUCTION

India has a total 93 Ramsar sites. These sites represent a significant portion of the country's total wetlands, which include both naturally occurring and human-made water bodies of varying types. The East Kolkata Wetlands (EKW), designated as a Ramsar Site in 2002, is an extensive wetland system spanning over 125 km² on the eastern fringe of Kolkata. This unique landscape comprises sewage-fed aquaculture ponds, natural marshes, agricultural lands, and human settlements. It plays a crucial role in the ecological functioning of the city by naturally treating approximately 900 million litres of wastewater daily through an efficient resource recovery process. In addition to its wastewater treatment function, EKW provides a range of vital ecosystem services, including flood mitigation, carbon sequestration, and climate regulation—earning it the title "Kidney of Kolkata." The EKW harbour rich biodiversity, including 380 floral, 10 amphibian, 29 reptile, 123 bird (including nearly 15 winter migrants), 79 fish, 24 crustacean, and 13 mammalian species. Biodiversity is under threat, with bird species richness dropping from 248 to 120–130 within 30 years, and key indicator species, like the 'Vulnerable' (IUCN Red List Ver. 3.0) Fishing Cat, the state animal of West Bengal, disappearing due to habitat fragmentation. Additionally, the mixing of industrial effluents with sewage causes heavy metal contamination, threatening the livelihood of 100000 fishermen dependent on these wetlands' ecosystem services.

2. Study Area Description

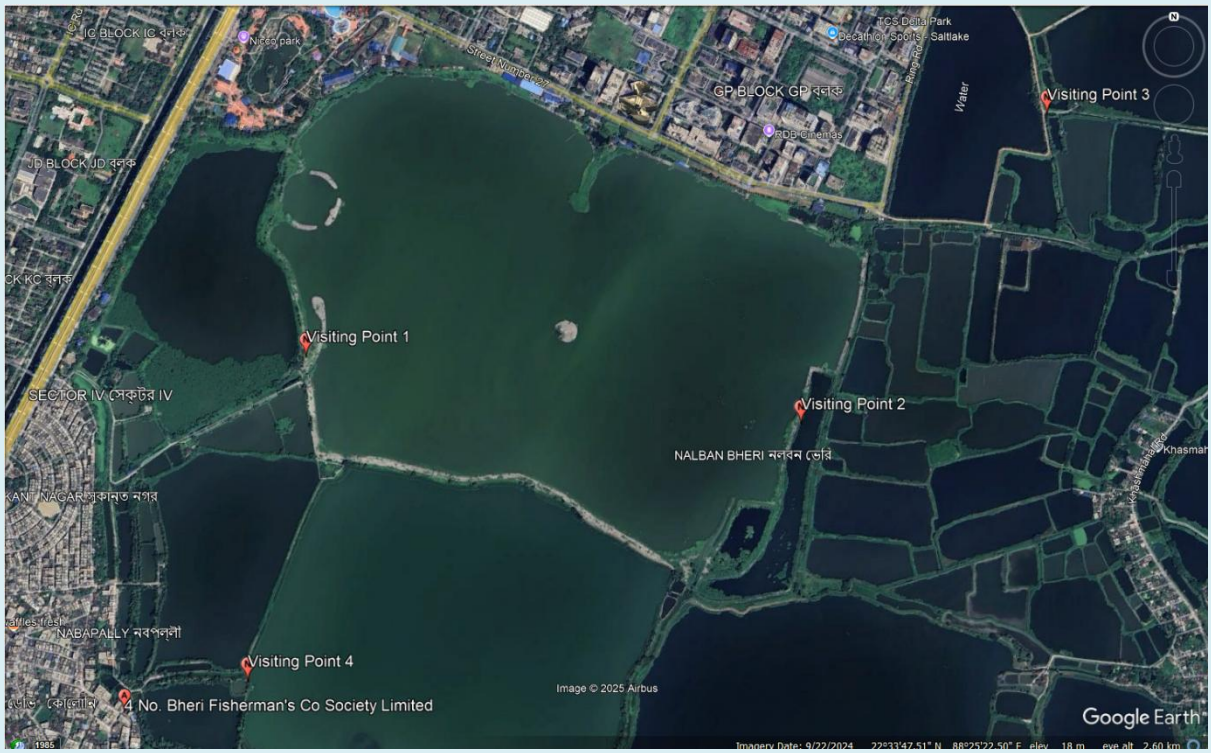
The fieldwork was conducted in **Nalban Bheri** and **4 No. Bheri** within EKW. These sites consist of interconnected **bheris (fish ponds)**, where city wastewater is channelled, promoting plankton growth and supporting fisheries. Surrounding habitats include agricultural land, grass patches, and semi-urban settlements.



Map 1: Area Map of East Kolkata Wetlands

Nalban Bheri- Nalban Bheri, a cluster within the East Kolkata Wetlands, covers approximately **267.45 hectares**, comprising around 18 fishponds was the main study area of our project. This State Fisheries Development Corporation Limited owned bheri is one of the most prominent and accessible parts of the East Kolkata Wetlands. It is a vast network of interconnected fishponds surrounded by agricultural fields, patches of vegetation, and semi-urban landscapes. The site is not only ecologically important but also culturally significant, as it doubles as a **recreational and picnic spot** for local residents.

4 No. Bheri Fishermen's Cooperative- The 4 No. Bheri Fishermen's Cooperative represents the heart of the **traditional wastewater-fed aquaculture system** of the East Kolkata Wetlands. Managed by local fishing communities, this site demonstrates how urban sewage can be transformed into a resource. This area was chosen for understanding ecosystem services & avian diversity of the area.



Map 2: Study Area At Nalban Bheri & 4 No. Bheri

4. Objectives

1. To document the diversity and abundance of bird species at Nalban Bheri, located within the East Kolkata Wetlands (Ramsar Site), through systematic field observations and data collection.
2. To identify the ecosystem services offered by wetlands, including provisioning, regulating, cultural, and supporting services.

5. Methodology

5.1 Bird Survey Methodology: The bird survey was done in 3 pre selected points in EKW using point count method. Each point was surveyed for 10 minutes. The surveys were carried out in early morning (between 07:00 am to 08:30 am) when bird activity was typically high. All birds seen or heard within a 50 meter radius in each point will recorded as observation (Bibby, C.J., Burgess, N.D., Hill, D.A., & Mustoe, S.H., 2000).

5.2 Ecosystem Services observed: Ecosystem services were documented through direct field observations, photographic evidence, and interaction with local stakeholders. Services were classified according to the Millennium Ecosystem Assessment framework into provisioning, regulating, supporting, and cultural services.

5.3 Data Recording Tools and Techniques

- GPS units for precise location recording
- Digital cameras for species documentation and habitat photography

- Field notebooks for behavioral observations and ecological notes
- Species identification guides for accurate taxonomic classification

6. Observations & Results

6.1 ECOSYSTEM SERVICES

Ecosystem services represent the diverse benefits that natural environments provide to human society and ecological communities. The concept, formalized by the Millennium Ecosystem Assessment (2005), categorizes these benefits into four primary types: provisioning services that provide direct products, regulating services that control natural processes, supporting services that maintain ecosystem function, and cultural services that provide non-material benefits.

6.1.1 Provisioning Services

Aquaculture Production

The East Kolkata Wetlands demonstrate a sophisticated integrated aquaculture system where fish production serves as a primary provisioning service. Field observations revealed active fish distribution networks connecting the bheri systems to various markets and distribution points throughout the region. The aquaculture operations utilize a sustainable approach by incorporating wastewater treatment into the production cycle, creating a circular economy model that maximizes resource efficiency.

Water Resource Management

The wetland system functions as a critical water resource hub, processing and purifying wastewater while simultaneously supporting aquaculture activities. The systematic introduction of wastewater into bheri systems serves dual purposes: providing essential nutrients for primary productivity and treating municipal wastewater through natural biological processes.

6.1.2 Regulating Services

Wastewater Treatment and Purification

One of the most significant ecosystem services observed is the natural wastewater treatment capacity of the bheri systems. Wastewater is systematically channeled into the ponds where it undergoes biological treatment processes. The organic matter in the wastewater serves as a nutrient source for plankton communities, which form the base of the aquatic food web. This process effectively removes pollutants while creating a productive aquatic ecosystem.

6.1.3 Supporting Services

Primary Productivity

The systematic introduction of nutrient-rich wastewater supports robust plankton communities, which serve as the foundation of the aquatic food web. This enhanced primary productivity

supports both fish production and diverse bird populations, creating a self-sustaining ecological cycle.

Habitat Provision

The varied microhabitats within the wetland complex support different ecological niches. Shallow areas provide feeding grounds for wading birds like Indian Pond Herons and Asian Openbill Storks, while deeper waters support diving species like Little Cormorants. Vegetation zones offer nesting sites for species such as Common Tailorbirds.

Biodiversity Conservation

The field surveys documented remarkable avian diversity across both study sites. A total of 23 distinct bird species were recorded across the two locations, demonstrating the wetlands' capacity to support diverse wildlife communities.

6.1.4 Cultural Services

Recreation and Education

Field observations documented the wetlands' use as recreational spaces for local communities, serving as picnic spots and areas for environmental education. The sites provide opportunities for nature observation, research activities, and environmental awareness programs.

Traditional Livelihood Support

The integrated fish farming operations support traditional livelihoods of local fishing communities, maintaining cultural practices while providing sustainable income sources.

6.2 Observation on Birds

6.2.1 Bird Species Diversity and Abundance

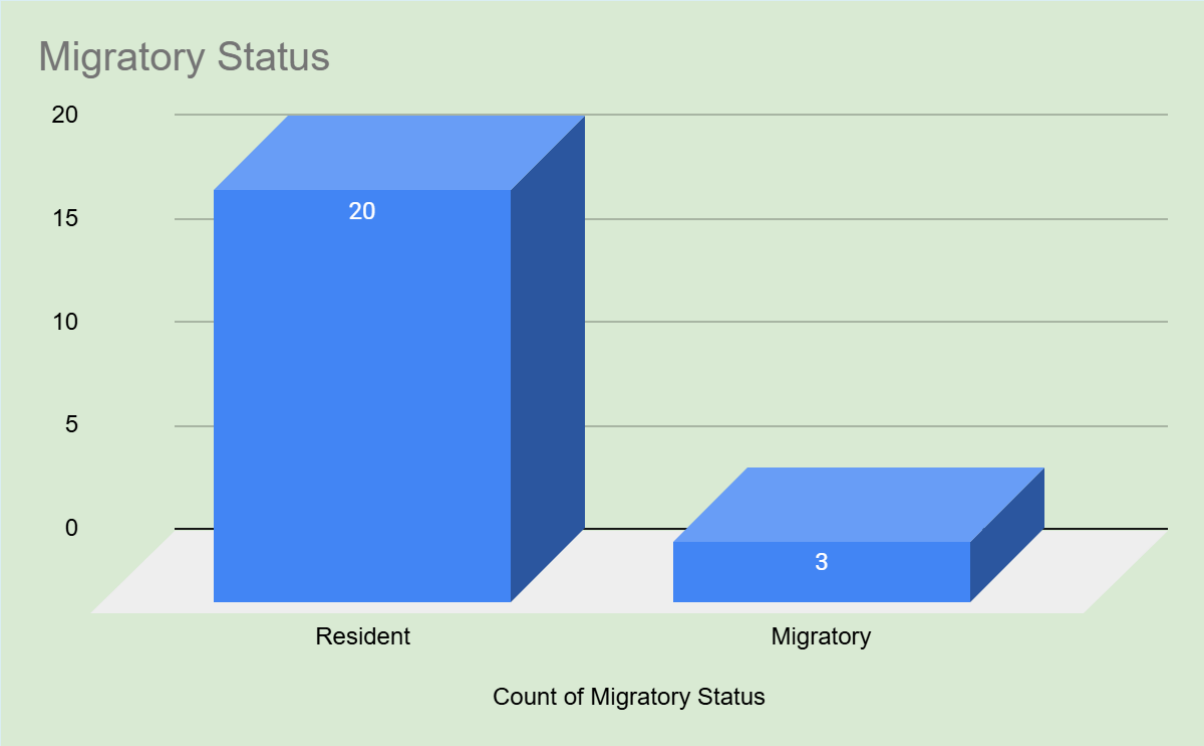
During the survey, we recorded a total of 23 bird species. Among them 3 species are migratory & rest of them are non-migratory.

Table 1: Bird Checklist

Sl No	Bird Species	Habitat Specialization	Migratory Status	Scientific Name	IUCN Status
1	Indian Pond Heron	Wetland	Resident	*Ardeola grayii*	Least Concern (LC)
2	Black-crowned Night Heron	Wetland	Resident	*Nycticorax nycticorax*	Least Concern (LC)

3	House Crow	Anthropogenic Environment	Resident	*Corvus splendens*	Least Concern (LC)
4	Little Cormorant	Wetland	Resident	*Microcarbo niger*	Least Concern (LC)
5	Coppersmith barbet	Not-Specialized	Resident	*Megalaima haemacephala*	Least Concern (LC)
6	Indian Pied Myna	Not-Specialized	Resident	*Gracupica contra*	Least Concern (LC)
7	White-throated Kingfisher	Not-Specialized	Resident	*Halcyon smyrnensis*	Least Concern (LC)
8	Asian Openbill Stork	Wetland	Resident	*Anastomus oscitans*	Least Concern (LC)
9	Common Tailorbird	Not-Specialized	Resident	*Orthotomus sutorius*	Least Concern (LC)
10	Yellow-footed Green Pigeon	Not-Specialized	Resident	*Treron phoenicopterus*	Least Concern (LC)
11	Common Myna	Not-Specialized	Resident	*Acridotheres tristis*	Least Concern (LC)
12	Black Bittern	Wetland	Migratory	*Botaurus flavicollis*	Least Concern (LC)
13	Purple Heron	Wetland	Resident	*Ardea purpurea*	Least Concern (LC)
14	Black Drongo	Not-Specialized	Resident	*Dicrurus macrocercus*	Least Concern (LC)
15	Red-vented Bulbul	Not-Specialized	Resident	*Pycnonotus cafer*	Least Concern (LC)
16	Black Kite	Not-Specialized	Resident	*Milvus migrans*	Least Concern (LC)
17	Rufous Treepie	Not-Specialized	Resident	*Dendrocitta vagabunda*	Least Concern (LC)
18	Spotted Dove	Not-Specialized	Resident	*Spilopelia chinensis*	Least Concern (LC)
19	Common Hawk-Cuckoo	Not-Specialized	Migratory	*Hierococcyx varius*	Least Concern (LC)
20	Barn Swallow	Not-Specialized	Migratory	*Hirundo rustica*	Least Concern (LC)
21	White-breasted Waterhen	Wetland	Resident	*Amaurornis phoenicurus*	Least Concern (LC)

22	Greater Coucal	Not-Specialized	Resident	*Centropus sinensis*	Least Concern (LC)
23	Plain Prinia	Emergent Vegetation	Resident	*Prinia inornata*	Least Concern (LC)



This chart indicates that most among 23 bird species only 3 birds are migratory, which includes Black Bittern, Common Hawk-cuckoo & Barn Swallow.

Bird Census Using Point Count:

During field visits at EKW, bird census was conducted at Nalban Bheri & 4 No. Bheri in 3 pre-selected points.

Census Point Coordinates:

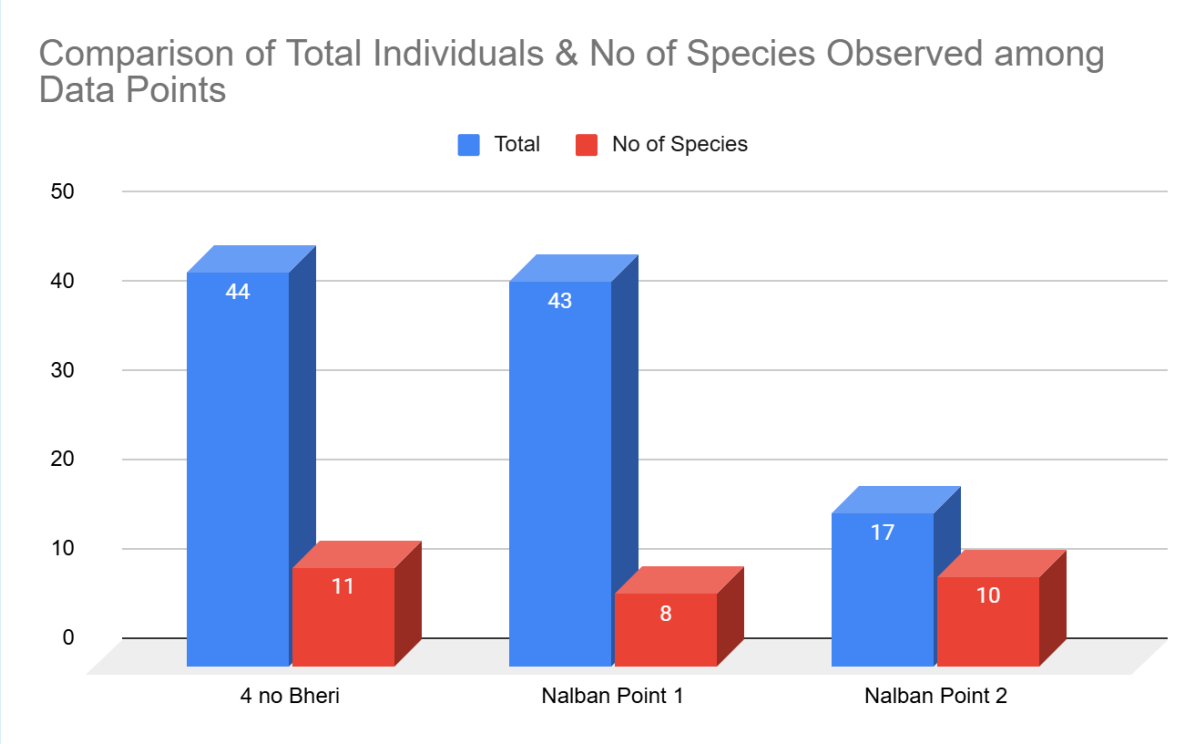
- Nalban Bheri Point 1: 22°34'09"N, 88°26'25"E
- Nalban Bheri Point 2: 22°33'53"N, 88°26'08"E
- 4 No. Bheri: 22°33'24"N, 88°25'15"E

TABLE 2: Bird Census Data

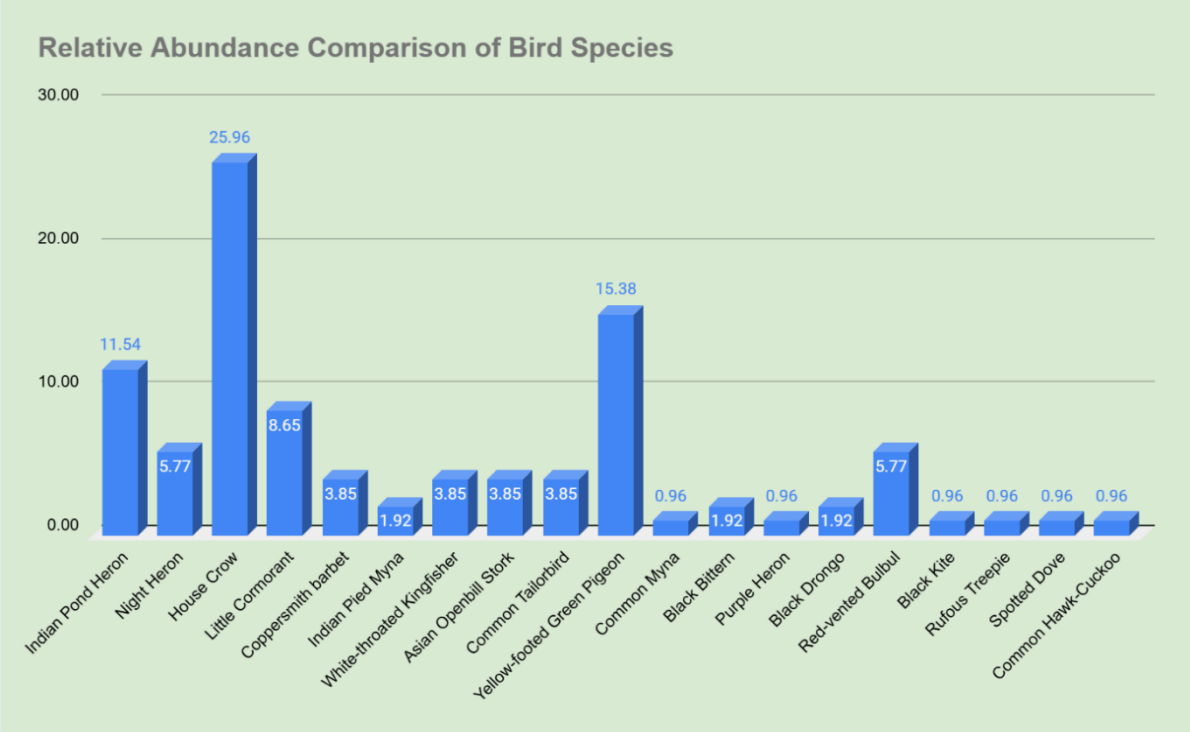
Sl. No.	Bird Species	Scientific Name	IUCN Status	4 no Bheri	Nalban Point 1	Nalban Point 2	Total	Abundance	Relative Abundance
1	Indian Pond Heron	*Ardeola grayii*	Least Concern (LC)	2	10		12	0.115384615	11.54
2	Night Heron	*Nycticorax nycticorax*	Least Concern (LC)	6			6	0.057692308	5.77

3	House Crow	*Corvus splendens*	Least Concern (LC)	14	13		27	0.259615385	25.96
4	Little Cormorant	*Microcarbo niger*	Least Concern (LC)	5	2	2	9	0.086538462	8.65
5	Coppersmith barbet	*Megalaima haemacephala*	Least Concern (LC)	3		1	4	0.038461538	3.85
6	Indian Pied Myna	*Gracupica contra*	Least Concern (LC)	2			2	0.019230769	1.92
7	White-throated Kingfisher	*Halcyon smyrnensis*	Least Concern (LC)	2	1	1	4	0.038461538	3.85
8	Asian Openbill Stork	*Anastomus oscitans*	Least Concern (LC)	3		1	4	0.038461538	3.85
9	Common Tailorbird	*Orthotomus sutorius*	Least Concern (LC)	2	2		4	0.038461538	3.85
10	Yellow-footed Green Pigeon	*Treron phoenicopterus*	Least Concern (LC)	4	12		16	0.153846154	15.38
11	Common Myna	*Acridotheres tristis*	Least Concern (LC)		1		1	0.009615385	0.96
12	Black Bittern	*Botaurus flavicollis*	Least Concern (LC)		2		2	0.019230769	1.92
13	Purple Heron	*Ardea purpurea*	Least Concern (LC)			1	1	0.009615385	0.96
14	Black Drongo	*Dicrurus macrocercus*	Least Concern (LC)			2	2	0.019230769	1.92
15	Red-vented Bulbul	*Pycnonotus cafer*	Least Concern (LC)			6	6	0.057692308	5.77
16	Black Kite	*Milvus migrans*	Least Concern (LC)			1	1	0.009615385	0.96
17	Rufous Treepie	*Dendrocitta vagabunda*	Least Concern (LC)			1	1	0.009615385	0.96
18	Spotted Dove	*Spilopelia chinensis*	Least Concern (LC)			1	1	0.009615385	0.96
19	Common Hawk-Cuckoo	*Hierococcyx varius*	Least Concern (LC)	1			1	0.009615385	0.96
		TOTAL		44	43	17	104		
		No of Species		11	8	10			

During census, a total 19 species was observed, with a total count of 104 individuals.



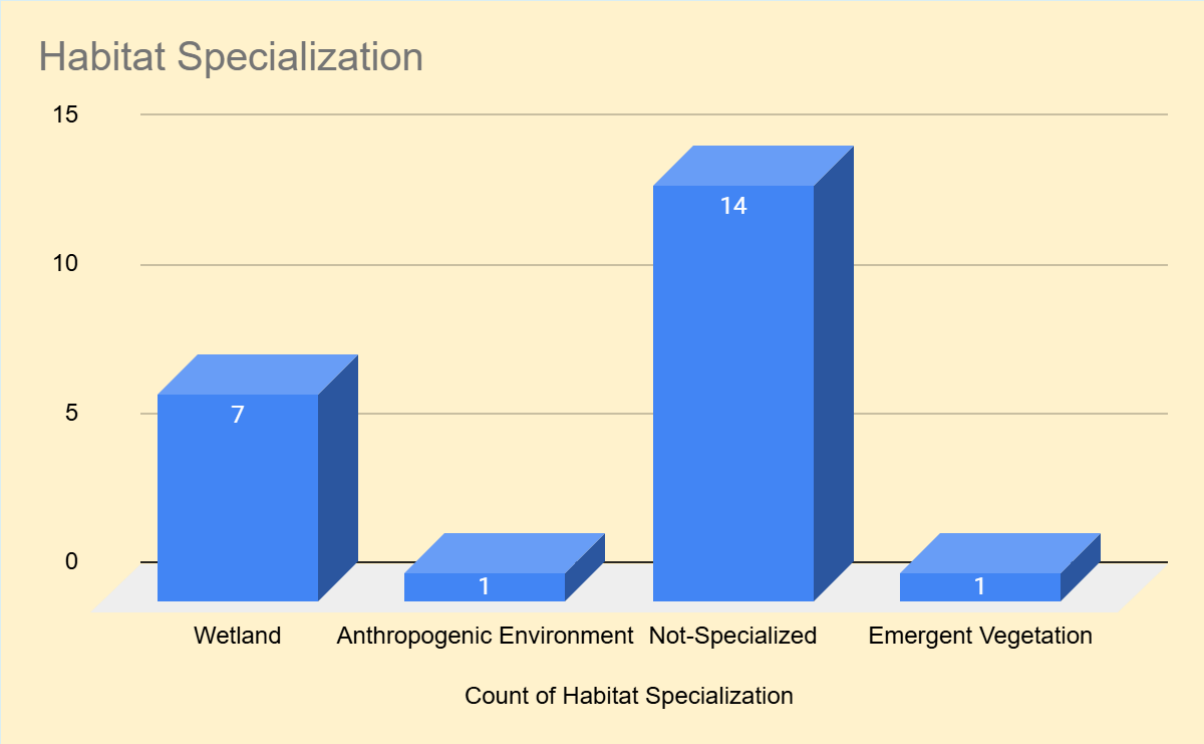
The 4 No. Bheri census point is having 11 species with a total count of 44 individuals. The Nalban Point 1 is having 8 species with a total count of 44 individuals. The Nalban Point 2 is having 10 species with only 17 individuals.



From This chart it can be concluded that, House Crow had the highest relative abundance followed by Yellow-footed Green Pigeon & Indian Pond Heron. As per Simpson's diversity (1-D), the value is 0.87, which indicates higher species diversity (value closer to 1 indicates higher diversity).

6.2.2 Habitat Use by birds

Different species demonstrated specific habitat preferences within the wetland complex. 7 bird species among 23 species inhabit in wetlands. House crows are generally found in areas where anthropogenic activity is generally high. 14 species have vast variety of habitats, which cannot be specified. Indian Pond Heron, Asian Openbill Stork, Purple Heron were primarily observed in shallow areas of the bheris, utilizing their long legs and specialized bills for prey capture. Little Cormorants showed preference for deeper water areas where they could effectively dive for fish. Black Kites, Black Drongos and Barn Swallows utilized open airspace above the wetlands for hunting insects and small prey. Common Tailorbirds and Plain Prinias were associated with emergent vegetation and terrestrial-aquatic interface zones. Birds like House Crows, Common Mynas demonstrated flexible habitat use across multiple microhabitats.



6.2.3 Photographic Documentation



Figure 1: Asian Openbill

Figure 2: Coppersmith Barbet





Figure 3: Common Hawk-cuckoo



Figure 4: Black-crowned Night Heron

Figure 5: Little Cormorant

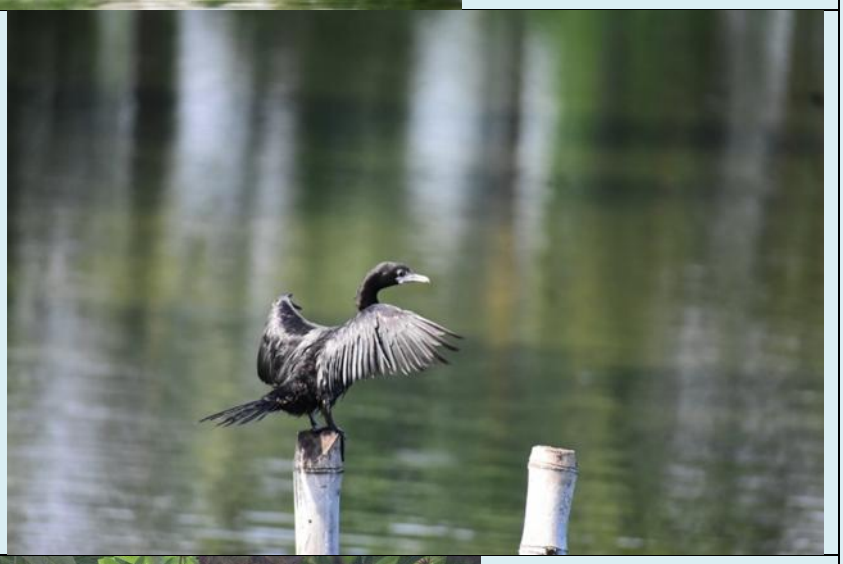




Figure 6: Yellow-footed Green Pigeon



Figure 7: Indian Pond Heron

Figure 8: House Crow



6.3 Threats to East Kolkata Wetlands

The field observations reveal several critical threats that pose significant challenges to the long-term sustainability of the East Kolkata Wetlands ecosystem services and biodiversity.

6.3.1 Urban Encroachment and Land Conversion

Rapid urbanization around Kolkata has led to the progressive conversion of wetland areas for residential, commercial, and industrial purposes. The increasing land values and development pressure threaten the physical integrity of the bheri systems. Illegal land filling and construction activities reduce the effective area available for wastewater treatment and aquaculture operations, compromising the wetlands' capacity to provide ecosystem services.

6.3.2 Solid Waste Pollution

As observed during field visits, significant accumulation of plastic waste, household garbage, and construction debris throughout the Bheri areas directly impacts water quality and habitat suitability. This type of solid waste pollution clogs water circulation systems, reduces dissolved oxygen levels, and creates physical barriers that hinder wildlife movement and feeding activities. The aesthetic degradation also reduces the cultural and recreational value of the wetlands.

6.3.3 Invasive Species and Ecological Disruption

Introduction of non-native fish species and aquatic plants can disrupt existing ecological relationships and reduce native biodiversity. Some invasive species, like suckermouth catfish, outcompete native fish varieties, affecting traditional aquaculture practices and reducing the economic viability of fish farming operations.

7. Discussion

The provisioning services extend beyond fish production to include water resource management, where the wetlands serve as a natural treatment facility that would otherwise require expensive infrastructure investment. During the visit, it was observed that the East Kolkata Wetlands successfully integrate multiple environmental functions while supporting both human needs and biodiversity conservation.

East Kolkata Wetlands processes an estimated 900 million Liters of municipal wastewater daily while simultaneously supporting aquaculture production. This dual functionality demonstrates how natural systems can provide economic and environmental benefits concurrently. The regulating services, particularly flood control and climate moderation, provide crucial urban resilience benefits for Kolkata's 14 million residents, especially during monsoon periods when the wetlands can retain significant excess water volumes.

The wetlands' role as recreational spaces and traditional sources of livelihood demonstrates the cultural value of ecosystem services. The maintenance of conventional fishing practices while

integrating modern waste management represents a successful model of sustainable development that preserves cultural heritage while addressing contemporary environmental challenges.

The avian community serves as an effective bioindicator of ecosystem health. The presence of water-dependent bird species alongside terrestrial species indicates successful maintenance of diverse microhabitats. During field visits, a total of 23 bird species were recorded. According to the seasonal bird monitoring data for August 2024, conducted by NEWS, 22 types of bird species were recorded in this area, indicating a similar level of bird diversity.

The East Kolkata Wetlands exemplify urban ecosystem resilience by providing multiple services, including waste treatment, food production, flood control, and biodiversity conservation.

8. Challenges Faced During the Internship

8.1 Field Access Limitations

Dense vegetation overgrowth at specific locations limited access to predetermined census points, potentially affecting comprehensive species documentation and requiring adaptive sampling strategies.

8.2 Weather Constraints

Heavy rainfall during initial orientation visits limited field time and observation opportunities, necessitating the rescheduling of planned activities.

9. Conclusion

The East Kolkata Wetlands represent a unique and valuable ecosystem that effectively combines multiple services including wastewater treatment, aquaculture production, biodiversity conservation, and cultural benefits. The documented avian diversity of 23 species indicates a healthy ecosystem, while the integrated management approach shows sustainable resource use. The wetlands serve as an example of how traditional ecological knowledge can be combined with modern conservation methods to create sustainable urban ecosystem management. Although this wetland lacks proper waste management and faces a major threat from invasive species, a field visit to EKW allows us to make some recommendations.

Key Recommendations:

1. Systematic monitoring of birds is necessary, as they serve as indicators of ecosystem health.
2. The sewage canals and Bheris need to be kept free from plastic pollution and, therefore, implement regular waste management protocols to maintain water quality.

3. Aquatic vegetation management strategies need to be implemented to optimize the use of plants like water hyacinths, Lemna minor, and Lemna Major in the filtration process.
4. Community awareness programs should be conducted, and wetland stewards should be encouraged to establish visitor education programs to promote sustainable and recreational use.

The study demonstrates that properly managed wetland systems can provide multiple ecosystem services simultaneously, supporting both human needs and biodiversity conservation. The East Kolkata Wetlands thus stand as an exemplary model of integrated ecosystem management, and if protected and managed effectively, they can continue to serve as a global benchmark for sustainable urban ecosystems - balancing ecological resilience with socio-economic well-being.

10. References

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4. East Kolkata Wetlands Management Authority. (2025). Management Plan for East Kolkata Wetlands. Government of West Bengal.
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11. Annexures

Annexure I: Daily Field Observation Sheets

Field visit for Orientation at Nalban

Field Visit for Bird Census at Nalban Bhe

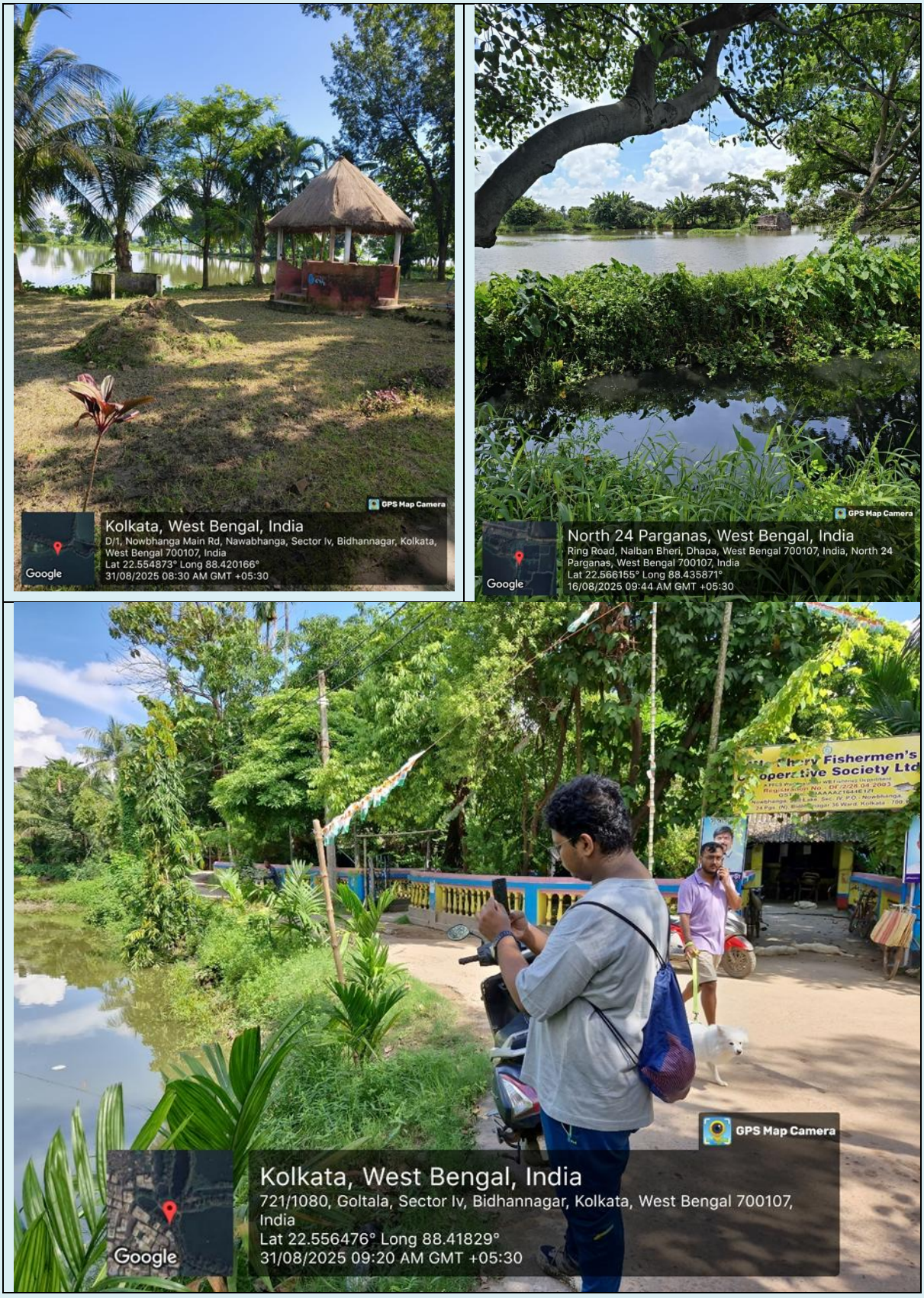
Field visit for Understanding Ecosys

Bird Data of EKW.xlsx

Annexure II: GPS Location Photographs






GPS Map Camera
Kolkata, West Bengal, India
D/1, Nowbhanga Main Rd, Nawabhanga, Sector Iv, Bidhannagar, Kolkata, West Bengal 700107, India
Lat 22.554873° Long 88.420166°
31/08/2025 08:30 AM GMT +05:30
Google
GPS Map Camera
North 24 Parganas, West Bengal, India
Ring Road, Nalban Bheri, Dhapa, West Bengal 700107, India, North 24 Parganas, West Bengal 700107, India
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16/08/2025 09:44 AM GMT +05:30
Google
GPS Map Camera
Kolkata, West Bengal, India
721/1080, Goltala, Sector Iv, Bidhannagar, Kolkata, West Bengal 700107, India
Lat 22.556476° Long 88.41829°
31/08/2025 09:20 AM GMT +05:30
Google

Annexure III: Photographic Plates

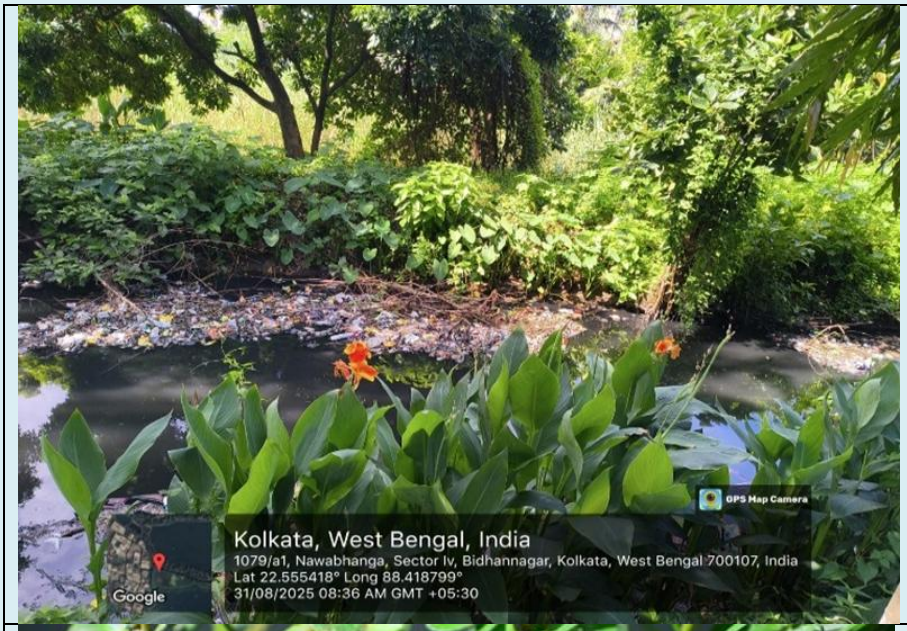


Figure 9: Accumulation of plastic & household waste in sewage canals.



Figure 10: Checkered Keelback



Figure 11: Suckermouth Catfish, a major threat to Indian freshwater ecosystem.



Figure 12: The connection between bheri & sewage canals.



Figure 13: Fish market at 4 No Bheri



Figure 14: Fisherman with boat at 4 No. Bheri





Figure 16: Parthenium: An invasive plant.



Figure 17: Fishermen on their way to harvesting at 4 no. Bheri