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Water Birds of Subhas Sarobar and their Diversity Assessment: Capacity Building in Research Aptitude of Students of Rammohan College, Kolkata

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Abstract: ***Birds perform numerous important ecological services and are sensitive indicators of biological diversity and environmental trends. Around the world, birds may be found in nearly every climate and at nearly every height. They are a natural method of eradicating pests from farms, gardens, and aquatic habitats. Numerous bird species react to even little alterations in the structure and make-up of their habitats, making them useful as environmental change indicators. The Subhas Sarobar is a sizable body of water close to the East Calcutta Wetland (220 43'6" N, 880 24'3" E), which is home to several water bird. The West Bengal Pollution Control Board, a division of the West Bengal Government, first reported the presence of an avifauna in this environment in the year 2000. The current authors looked into the avifauna's actual state in Subhas Sarobar (2019–2020). In contrast to the 7 species reported in 2000, 13 species of water birds belonging to 6 Orders and 6 Families were discovered during a field survey. The Shannon-Wiener index has been used to gauge their diversity. They have been discovered to be in homeostasis, despite anthropological disturbance.***
Keywords: Subhas Sarobar, Bird, Water, Shannon-Wiener, Kolkata

I. INTRODUCTION

Around the world, birds may be found in nearly every climate and at nearly every height. Numerous bird species react to even little alterations in the structure and make-up of their habitats, making them useful as environmental change indicators. Anywhere there are aquatic birds, you can tell a lot about the environment and if everything is okay or if something is wrong. Additionally, it demonstrates the biological significance or, to be more precise, the biodiversity significance of a location. Wetlands frequently occur near lakes or on their own as distinct geographical phenomena. Ecosystem services are advantages that people, society, and the economy derive from nature; examples include the provision of and purification of water, the prevention of flooding and storms, the storage and regulation of carbon dioxide, the provision of food and materials, and many other provision, scientific knowledge, recreation and tourism (Prasad et al., 2002, Tak et al., 2010). The presence and richness of aquatic bird populations are indicative of the health of lakes because they provide safe habitat and food sources for adults and nestlings as well as necessary nesting and roosting areas in and around the lakes (Joshi, 2012). One of the most crucial ecological factors for determining the habitat quality is the diversity of the avifauna. Nowadays, habitat degradation and human disturbances are to blame for a decline in avifaunal diversity (Dutta, 2011). Every body of water offers a perfect location for ducks and waders to stop over while arboreal migrants like waders can move through the area, if remain undisturbed. The extinction of avian species as a result of nesting places being reduced and habitat being lost owing to land reclamation for construction (Lad and Patil, 2015). A tropic level is maintained by birds, a vital animal group in an environment. To safeguard them, it is crucial to conduct in-depth research on the avifauna and their ecosystem. Ali (1939, 1995, 2002), King (1911), Waite (1920), Mahabal (2006), Thakor et al. (2010), and Parwate et al. (2012) conducted earlier studies on the avifauna of India.

The Shannon index, sometimes referred to as Shannon's diversity index, Shannon-Wiener index, Shannon-Weaver index, and Shannon entropy, has been a common diversity index in the ecological literature. Claude E. Shannon first introduced the measure to measure the entropy (uncertainty or information content) in text strings. The concept is that it becomes harder to correctly predict

which letter will be the next in the string the more distinct the characters are and the more evenly distributed their proportionate abundances are across the string of interest.

The uncertainty (entropy or degree of surprise) connected to this prediction is measured by the Shannon entropy (Shannon, 1948). The formula most frequently used is as follows:

$$H = \sum_{i=1} p_i \ln p_i$$

where, p_i is the proportion of characters belonging to the i^{th} type of letter in the string of interest. In ecology, p_i is often the proportion of individuals belonging to the i^{th} species in the dataset of interest. Then the Shannon entropy quantifies the uncertainty in predicting the species identity of an individual that is taken at random from the dataset.

One of East Calcutta's most significant recreational areas is Subhas Sarobar (220 43'6" N, 880 24'3" E), where the Internal Road network was actually constructed between 1946 and 1950. For East Calcutta, this lake, which has a total area of about 98 acres including the water bodies, was planned by the C.I.T. to provide filling materials for the construction of this road networks. A total of 100 acres of land were excavated to create the lake, which was given the name "Subhas Sarobar Lake" in honour of the great Son of the Soil, Netaji Subhas Chandra Bose. This lake was created as part of the second five-year plan is called Subhas Sarobar. Dr. Bidhan Chandra Roy, the then-Chief Minister, spearheaded the project's construction. Large debris produced during the lake's excavation was eventually used to build the chicest shopping mall and cultural hub at the lake's northern most corner.

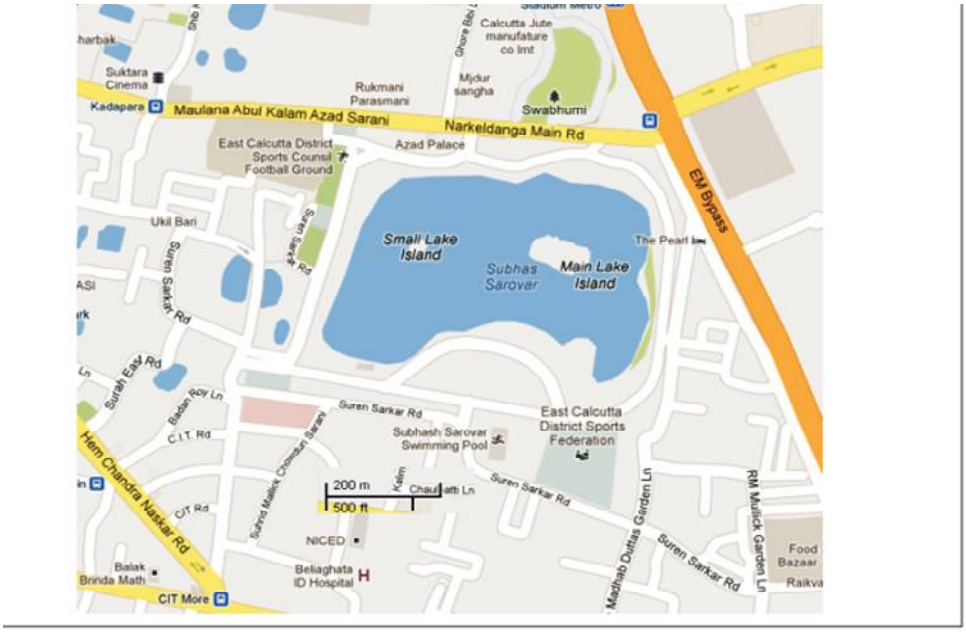

Fig1. Map of Subhas Sarobar

II. METHODS

1) Subhas Sarobar is having an island of 20 X 20 M at the middle which is full of vegetation
2) Birds were observed in the winter season at 8 am to 9 am (December,2019 to January,2020) each week in a fixed day (Friday)
3) Birds were counted by binocular (Olympus)
4) Photographs have been taken by using SONY DSC HX 300V
5) Birds were again counted from photograph
6) Birds were identified from photograph
7) The day, the number birds were highest, those numbers were considered for S-W index calculation.
8) The total number of all the species were counted
9) Individual species number were divided by total number
10) Log of fraction calculated
11) Log value have been multiplied with fraction value

12) Summation have been calculated
13) e^H has been calculated

III. RESULTS

The following water birds were observed and their respective number in the day of count:

GRUIFORMES: Rallidae					
White-breasted Water hen	Amaurornis phoenicurus	42	0.141	-1.958995389	-0.27621835
Common Coot	Fulica atra	40	0.135	-2.002480501	-0.270334868
PELECANIFORMES: Ardeidae					
Little Egret	Egretta garzetta	50	0.168	-1.7837913	-0.299676938
Indian Pond-heron	Ardeo lagrayii	40	0.135	-2.002480501	-0.270334868
Purple Heron	Ardea purpurea	1	0.003	-5.80914299	-0.017427429
Great White Egret	Ardea alba	10	0.033	-3.411247718	-0.112571175
SULIFORMES: Phalacrocoracidae					
Little Cormorant	Microcarbo niger	15	0.05	-2.995732274	-0.149786614
CHARADRIIFORMES: Charadriidae					
Red-wattled Lapwing	Vanellus indicus	15	0.05	-2.995732274	-0.149786614
CHARADRIIFORMES: Jacanidae					
Pheasant-tailed Jacana	Hydrophasia nuschirurgus	20	0.06	-2.813410717	-0.168804643
Bronze-winged Jacana	Metopidius indicus	32	0.108	-2.225624052	-0.240367398
CORACIIFORMES: Alcedinidae					
Common Kingfisher	Alcedo atthis	10	0.033	-3.411247718	-0.112571175
Stork-billed Kingfisher	Pelargopsis capensis	6	0.02	-3.912023005	-0.07824046
White-breasted Kingfisher	Halcyon smyrnensis	15	0.05	-2.995732274	-0.149786614
		296		H	-2.295907143
				H X -1	2.295907143
				e^H	9.933442983

The birds are well diversified. There were 13 species of 6 Orders and 6 Families, their distribution is equivalent to even distribution of 10 species. So richness and evenness is good as an urban lake with high degree of anthropological disturbance and presence of fisheries.

Discussion

In the year 2000, only seven species of birds were identified at Subhas Sarobar by West Bengal Pollution Control Board. These species were shown in the list below:

1. Great Cormorant	*1. Phalacracorax carbo*
2. Indian Shag	*2. P. furcicollis*
3. Little Cormorant	*3. P. niger*
4. Intermediate Egret	*4. Egretta intermediae*
5. Little Egret	*5. E. garzetta*
6. Common Kingfisher	*6. Alcedo hercules*
7. Black Headed Tern	*7. Larus ridibundus*

Nothing has been mentioned about their abundance in 2000. In 2020, we have found 13 species of water birds, including one local migratory bird, purple heron, *Ardea purpurea.* Their abundance is equivalent to even distribution of 10 species of birds.

IV. CONCLUSION

Water hyacinth were abundant around the island and some parts of the water body, which is nest building site of Jacanas, water-hen and coot. The kingfisher and cormorant were plenty due to presence of fisheries in the lake and nearby. Regular monitoring of the bird population may help in assessment of Ecological Health of Subhas Sarobar.

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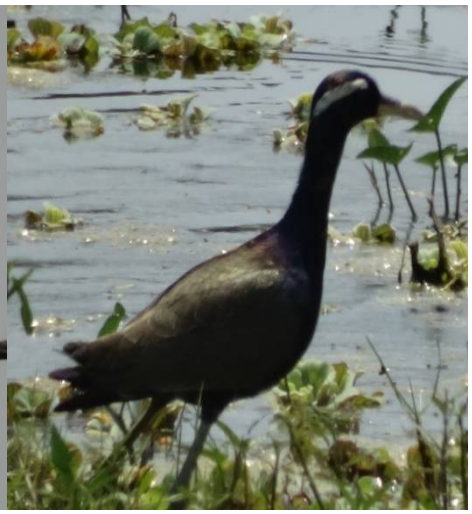
Great White Egret

Little Cormorant

White Breasted Kingfisher

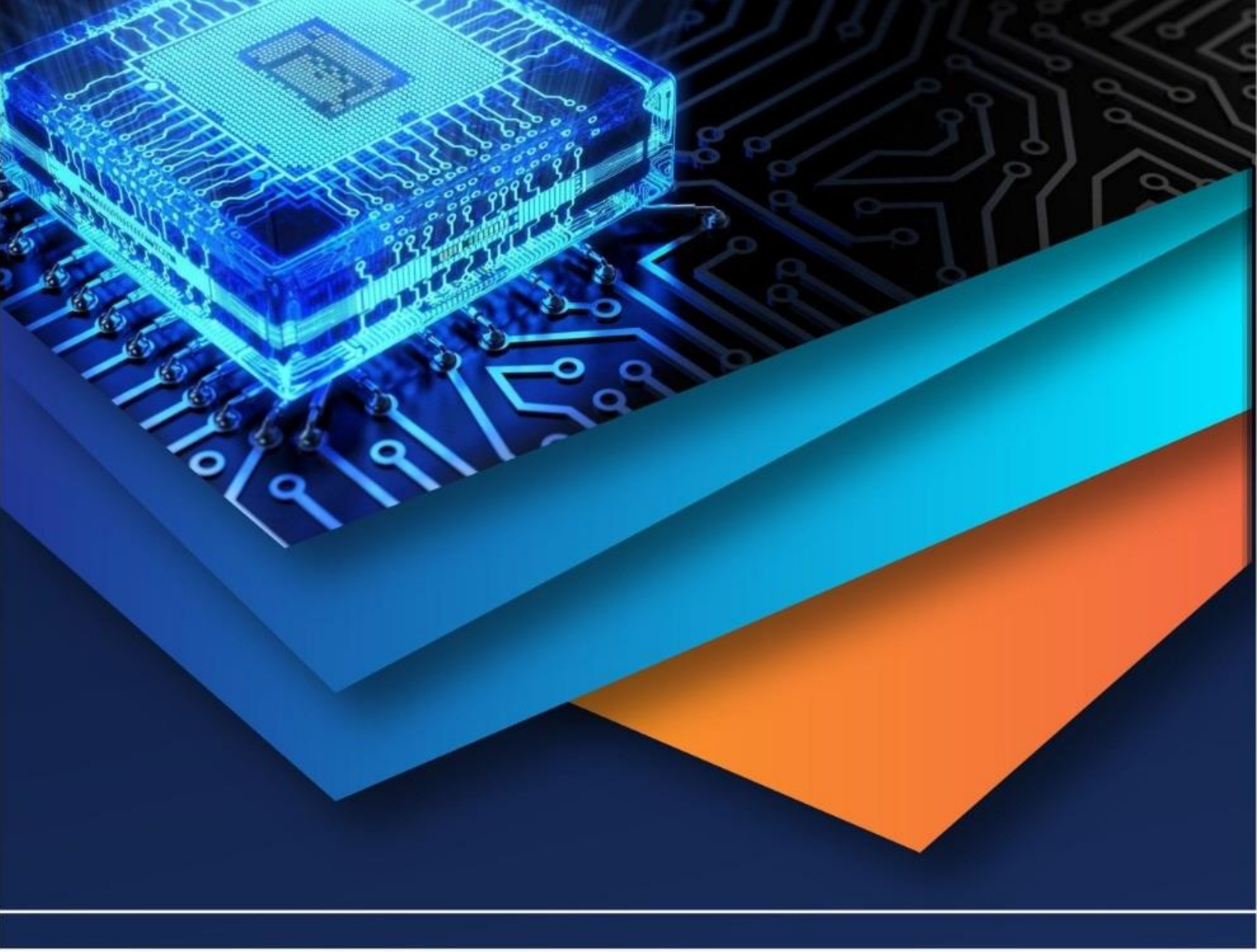


Bronze Wing Jacana

Little Egret

Pheasant Tailed Jacana

Purple Heron



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