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Avifaunal Diversity in Coastal West Bengal

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ABSTRACT

Birds occupy different ecological niches and plays crucial role in managing the ecosystems. Even within the niches, the feeding habits of the birds vary as some species stick on a generalist diet while others prefer more specialized food resources, a situation which sometimes alters the natural ecosystem. It is crucial to identify the bird diversity in the coastal ecosystem and its relationship with local floral community.

Keywords: Avifauna, Flora, Coastal Ecosystem, Similarity Index, Species diversity.

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1. INTRODUCTION

West Bengal, a state in Eastern India, is rich in biological diversity and among them birds form a special place. As the state is quite diverse in landforms and is the only state in India which got access to both Himalayas in north and Bay of Bengal in south, it also harbours some specific endemic species which are under threatened list in IUCN [Dutta,2016]. Species diversity increases markedly in the ecotones, and it is found that edge effects increase the local biodiversity. A study in Germany concluded that edge effects does affects bird community composition and increases the species abundances of different bird species. It should be noted that edge effects play crucial role in altering different species as negative interaction with habitants can be detrimental for certain species. Forest fragmentation, sea water encroachment and urban developments can flush out species that can't adapt to those conditions. [Green et.al.,2003] This can further harm the overall ecosystem and can in turn lead to habitant alteration. As the study showed that forest fragmentation can result in nesting decline and can result in decimation of habitants for Shrub breeders who usually dwell on forest edges. As coastal ecosystems form the ecological boundary between two ecosystems of terrestrial and aquatic, birds play a huge role on determining the health and ensuring that the habitant remain secure to support a large genetic pool of different species.[Green et.al.,2003] Also, birds are critical in maintaining the floral diversity as they acts as pollinating agents which is important for dispersal of seeds of different species of plants especially in coastal ecosystems.[Dutta,2016] Currently in the age of conservation it is crucial for us to determine the diversity and role birds play in maintaining different local ecosystems. [Dutta,2016]

2. MATERIALS AND METHODS

Study Area

Digha is a coastal town situated on the district of East Midnapore. The beaches form linear coastal features that buffer the wave energy which is generated over the large areas of the Bay, both driven by winds and tides. The beach face is marked by various sediment logical structures and bio-turbations. The amount of silt and clay fractions has increased in the extensive tidal flats of the lower foreshore region. Dotted with rows of casuarinas trees few meters from the seashore provides a scenic beauty. The slope the land is gradually tilted towards the sea and is dominated by grasslands in the upper slope and the sandy beaches in the lower slope. Effect of erosion, notably Aeolian is highly noticed with the exposure of bundles of roots from the soil surface. Vegetation is highly diverse in the northern slope [Kenkel et.al.,1987] [MacArthur,1964].

The study was taken in four different study areas,

- Coastal sandbar: Talsari is geologically a sandflat and is taught to be formed by the continues deposition of silt by the river. The place has vast stretches of green paddy fields, numerous rivers, blue hills and extensive beaches.
- Rural region with swampy vegetation: Digha Interior is composed of villages with farmlands and ponds and patches of vegetations which forms a perfect landscape that showcases human-wildlife interactions.
- Coastal forested region: Udaypur with its Vegetation is highly diverse in the northern slope of the coastal region and is overlapped with patches of agricultural lands The beach is muddy, because of high content of clay than sand.
- Coastal Beach: Tajpur beach shows the perfect interaction between the terrestrial and coastal ecosystems as rows of Casuarina trees and other vegetations forms the bulk of floral diversity along with coastal avifauna species that makes frequent visit.

Midnapore is located at 22.25°N 87.65°E and is 23 meters above sea-level. The climate follows a hot tropical monsoon weather pattern. Summers last from April to mid-June with diurnal highs ranging from the upper 30°C to the mid 40°C and lows in the low 30°C. Monsoon period lasts from middle of June to late fall with rains from the southeast monsoon maximising the annual rainfall to around 1500 mm. Winters last for 2 to 3 months and are mild; typical lows are from 8 °C – 14 °C.

Methods

For this type of survey, Line Transect Method was chosen where A line walked by the surveyor who either places each individual within several distance bands (above) or estimates perpendicular distance to each individual (below). [Järvinen et.al.,1975] Estimates density and delectability. A constant length was kept during each survey and the species present around us were accounted for .[Järvinen et.al.,1975] The individual conducting this survey had to cover the whole length of the area , if not then half of the length had to be covered and individuals were recorded and later identified with the help of Grimmett Birds of Indian Subcontinent book. In some places i.e., during the study of aquatic species the individual had to take up a position form where he can view the lake properly and can identify the bird species before noting them down. [Järvinen et.al.,1975] Several parameters were measured for assessing the species diversity at an area. In this rostrum only qualitative analysis were done. Similarity indices were calculated in these papers are Jaccard's similarity indices, Jaccard's dissimilarity coefficient and Baroni-Urbani and Buser Coefficient. [Real et.al.,1999]

Jaccard's Similarity Index: It juxtaposes the species number in two different sets to detect the similar members in two sets in the form of percentages ranging from 0% to 100%. Similarity depends upon the higher values of the percentages. [Real et.al.,1999] [Real et.al.,1996]

$$Jaccard(A,B)Sj = \frac{(A \cap B)}{(A \cup B)}$$

Where A and B are two sets of habitants

Jaccard's dissimilarity coefficient :1-Sj

Baroni-Urbani and Buser Coefficient: These parameters got the ability to make use of negative matches [Real et.al.,1996]

$$S_B = \frac{\sqrt{ad} + a}{a + b + c + \sqrt{ad}}$$

Where a=number of species present in both sets

b, c=number of species present in one set but absent in next and vice versa

d=number of species absent in both sets

Results

The avifaunal diversity was analysed in the winter season as it will also help us to understand the migratory bird population in the coastal ecosystem. Hence the month of February in the year 2020 was selected. A list of avian species was prepared from each habitant and was catalogued according to orders. Nearly twenty-eight species were documented across sixteen orders. Lack of time and expertise had made the identification quite low.

	Digha	Talsari	Udaypur	Tajpur
Columbiformes	16	2		1
Piciformes	5		1	
Passeriformes	22	14	6	2
Cuculiformes				1
Coraciiformes	9	3	1	1
Apodiformes	2	2		
Psittaciformes	1			
Pelecanifromes	9		3	1
Anseriformes	15			
Ciconiiformes		2		
Bucerotiformes			1	
Charadriiformes				1

Figure 1. Number of individuals across 12 orders found in 4 study areas.

The study area around Digha locality has registered the highest bird count in both number of individuals as well as orders with 79 individuals across 8 orders. It is followed by Talsari locality with 23 individuals across 5 orders. The third place is taken by Udaypur locality with 12 individuals across 5 orders and finally it is the Tajpur locality with 7 individuals across 6 orders.

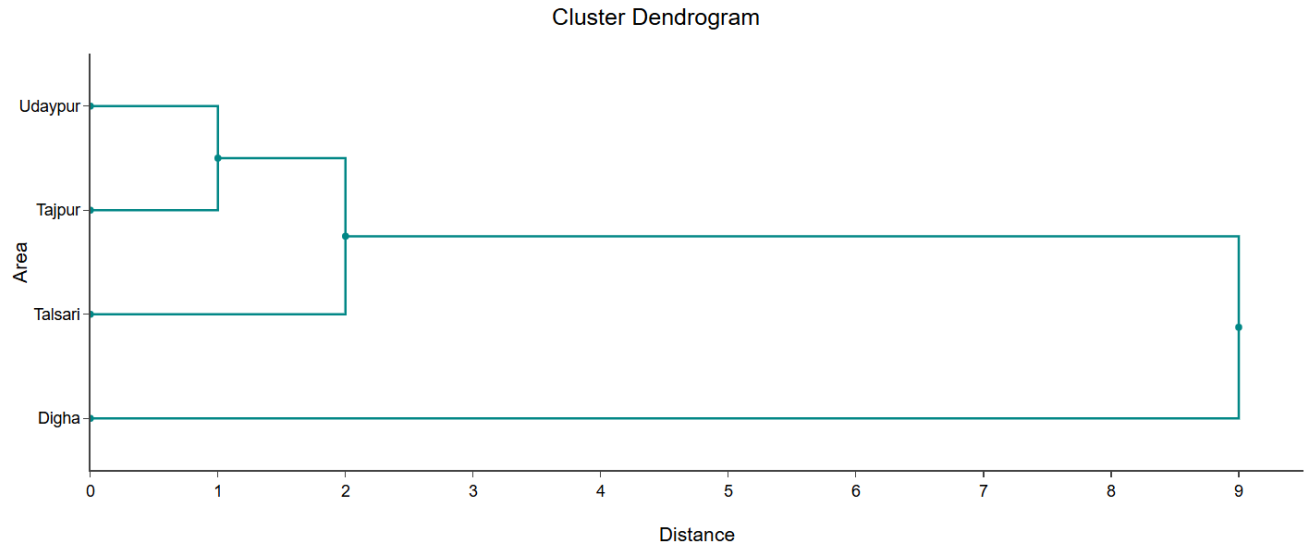

Figure 2. Dendrogram analysis showing the habitant similarities (by NCSS Software by NCSS, LLC 2020).

The distribution of avian species in a diverse habitant is shown in Fig 3 was represented in a dendrogram plot using Single Linkage along with Nearest Neighbour analysis type with the scaling and distance method were done utilising Standard Deviation and Euclidean respectively. Cluster Cutoff was taken as 1.00 (Fig 2). The similarity index of different habitants were calculated on the basis of Baroni-Urbani and Buser Coefficient with 1 signifying total similarity between any two habitants.

	Digha	Talsari	Udaypur	Tajpur
Digha	1	0.34	0.33	0.12
Talsari	0.34	1	0.16	0.05
Udaypur	0.33	0.16	1	0.06
Tajpur	0.12	0.05	0.06	1

Figure 3. Similarity of bird species between different habitants.

Digha being shown in the higher-level cause of the highest number of species diversity obtained from it with about 20 species. Talsari on the other hand came second with only 11 species count and it misses the orders Piciformes and Psittaciformes. Tajpur and Udaypur have been clumped together but they stayed in the lowest hierarchy cause the orders Columbiformes, Piciformes, Cuculiformes, Apodiformes, Psittaciformes, Anseriformes, Ciconniformes, Bucerotiformes and Charadrifformes were absent in one or in either of them. The absence of orders can be further explained due to absence of respective habitants or food sources of time of study.

On the similarity scale Digha has the largest similarity of species from other habitants while Udaypur and Tajpur have a unique diversity of species even with a low count, which can be explained with the nature of their habitants as Tajpur study was based solely on the coastal beach (Fig 4).

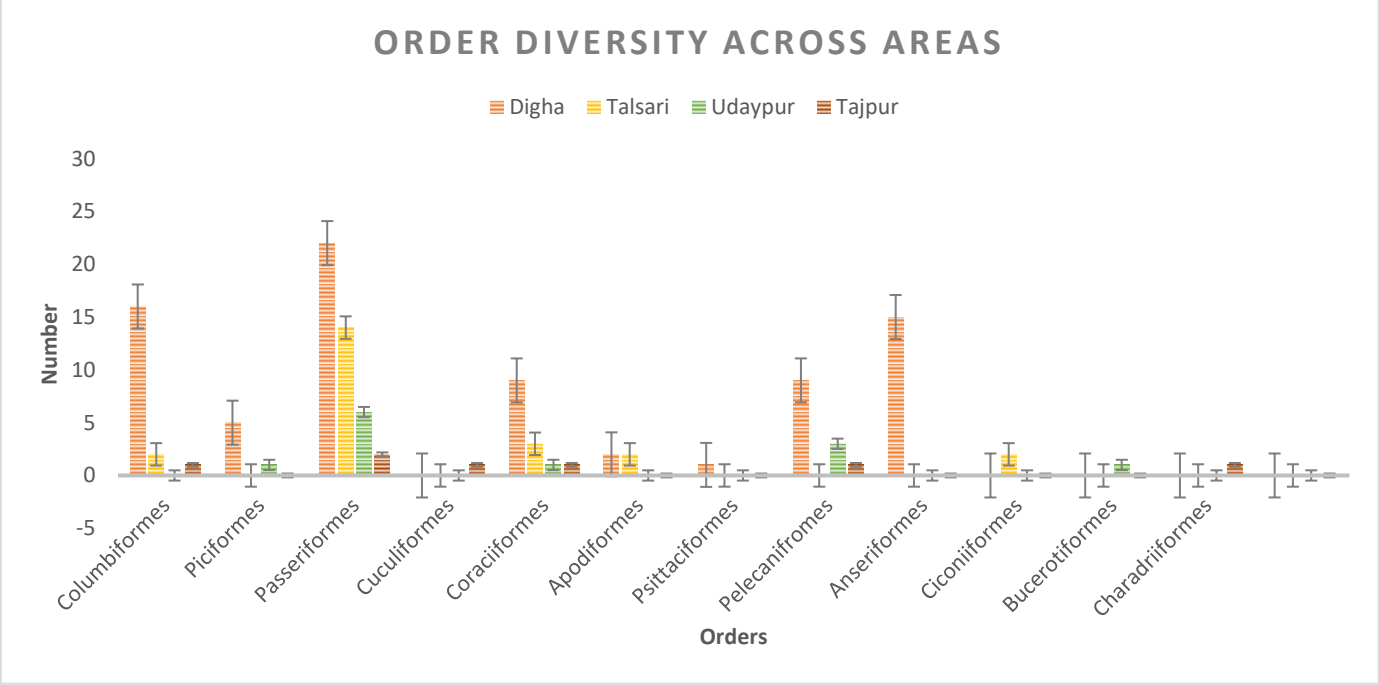

Figure 4. Distribution of Orders of different Avian species according to the area of study.

The area of Talsari, Udaypur, Tajpur and Digha were 0.82 sq km,0.21 sq km ,0.10 sq km and 0.57 sq km respectively and a correlation was done to analyse the effect of bird diversity on the area size Executing a pearsons correlation with 0.05 level of significance a positive correlation of 0.48 was obtained which signifies that study area did influence the species diversity count.

3. DISCUSSION AND CONCLUSION

The study concluded that there's a high diversity of bird population in the coastal region. Vegetation diversity and habitant diversity are crucial for the highly diverse avian orders (Fig 2). On the other hand, human settlements rarely proved to be a roadblock for bird habitants as Digha locality got the highest number of individuals and diverse orders (Fig 3). Also, the numbers are low in Talsari and Udaypur not because of study regions or vegetation diversity but of the timing of the study which was done in a time when bird mobility are low. Despite this those two regions still registered quite a high bird count which signifies the importance of those regions to bird species. Also, size of the area directly helped in bird diversity as certain species are territorial while other have showed inter and intra specific coexistence.

The disproportionate number of individuals across the habitants can be explained cause of the following reasons.

a) Nature of the area

b) Time of survey

c) Study location

As Tajpur study area was solely located on the beach, it was hard to spot a bird habitant nearby and most of the species that were spotted were in motion and the study was taken in the afternoon which resulted in a further lower bird count. Bird mobilisation decreases after feeding in the morning and they typically stay in their shelter during afternoon. In Digha locality, the habitant was far more diverse comprising of grasslands, woodlands, human habitants as well as cultivated land. Moreover, the study time was taken in the early morning, when the activity and mobilisation of birds remain highest. In both Talsari and Udaypur the study was taken in afternoon and late evening respectively. The only reason the bird count remains highest cause of the increased vegetation diversity in these two localities and low human interactions.

As seen in the study of Tu et al, 2020, grasslands indeed increased avifaunal diversity. Tall grasslands and marshes including bamboo grasslands got a positive effect on bird species as they increase the species diversity. [Tu et.al.,2020] The variable grassland habitant of Digha showed a great deal of species diversity in compare to other study areas (Fig 3). According to the study by Xu et al, 2022, it is seen that tree diversity and average subbranch greatly increases bird diversity. [Xu et.al.,2022] This is seen in Digha and Udaypur regions with the presence of numerous floral species. It also explains the reason most of the birds spotted in Tajpur were of few avifaunal orders as most of the Tajpur beach were devoid of diverse form of vegetation. In Yang et al., 2020, it shows how urban vegetation can influence bird diversity. It is also found that park isolation, park shape and environmental noise had little or no influence on bird diversity. [Xang et.al.,2020] This explain the high bird diversity as well as avifaunal orders which are present in the Digha study area. Tree diversity varied greatly across the regions and our study can directly correlate the positive impact of vegetation on avifaunal species. [Zellweger-Fischer et.al,2020]

As the survey was carried out in 2020, bird diversity might have changed in four years. Current human encroachment is still a threat to the costal biodiversity and government intervention with stringent enforcement on construction activities can help solve biodiversity crisis.

References

[1] Datta, M. (2016). Status, guild and diversity of avian fauna from a wetland site and surroundings, in Krishnagar, a City beside tropic of cancer, West Bengal, India. International Journal of Fauna and Biological Studies, 3(4), 68-75.

[2] Green, D. M., & Baker, M. G. (2003). Urbanization impacts on habitat and bird communities in a Sonoran desert ecosystem. Landscape and urban planning, 63(4), 225-239.

[3] Järvinen, O., & Väisänen, R. A. (1975). Estimating relative densities of breeding birds by the line transect method. Oikos, 316-322.

[4] Kenkel, N. C., & Booth, T. (1987). A comparison of presence-absence resemblance coefficients for use in biogeographical studies. Coenoses, 25-30.

[5] MacArthur, R. H. (1964). Environmental factors affecting bird species diversity. The American Naturalist, 98(903), 387-397.

[6] Real, R. (1999). Tables of significant values of Jaccard's index of similarity. Miscellania Zoologica, 22(1), 29-40.

[7] Real, R., & Vargas, J. M. (1996). The probabilistic basis of Jaccard's index of similarity. Systematic biology, 45(3), 380-385.

[8] Tu, H.-M., Fan, M.-W. and Ko, J.C.-J. (2020) 'Different habitat types affect bird richness and even-ness', Scientific Reports, 10(1). doi:10.1038/s41598-020-58202-4.

[9] Xu, W. et al. (2022) 'Relationship between vegetation habitats and bird communities in Urban moun-tain parks', Animals, 12(18), p. 2470. doi:10.3390/ani12182470.

[10] Yang, X., Tan, X., Chen, C. et al. The influence of urban park characteristics on bird diversity in Nanjing, China. Avian Res 11, 45 (2020). https://doi.org/10.1186/s40657-020-00234-5

[11] Zellweger-Fischer, J. et al. (2018) 'Identifying factors that influence bird richness and abundance on farms', Bird Study, 65(2), pp. 161–173. doi: 10.1080/00063657.2018.1446903.