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Increasing urbanization: A threat to the avian population

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Abstract
Anthropogenic intervention is the central cause of environmental changes. Such environmental alterations severely affect different animal and bird species which in turn change their habitats in an attempt to minimize the adverse effects. Birds are considered as excellent bioindicators as they respond very efficiently to the changes in the environment that affect them in numerous ways. In the present study, we found that, the number of inhabitant bird species is far less (nine) in an urban area as compared to the number of inhabitant bird species (eighteen) of a rural area with a similar kind of ecological set up. Additionally, we found that there was no migrant bird species in the urban study area. Air pollution, soil pollution, noise pollution, increasing urbanization and habitat fragmentation make an urban habitat less suitable for avian species than a rural area. The results of the current study also emphasize on the need to conserve birds. As birds inhabit in almost all types of ecological environment (urban and rural), conservation of these species solely within protected areas is not a logical solution. Studies should focus on the adverse effects of anthropogenic alteration on birds in order to generate awareness for effective conservation of avian species especially in urban areas.

Keywords: Environment, bird, urban, rural, conservation

1. Introduction

Birds are useful biological indicators which are sensitive to anthropogenic changes in their environment [1]Unfortunately global diversity of birds is decreasing persistently primarily due to anthropogenic disturbances [2]. Like most other vertebrates they are also expected to respond rapidly to changes in landscape alteration, composition and function. Also birds are used as potent indicators of long-term environmental disturbances, such as air pollution, urbanization and landscape change [3].

Rapid urbanization results in the elimination of natural resources and diminishes animal or plant diversity. According to IUCN Red List of endangered birds, 1226 bird species are already recognized as threatened worldwide and in this regard India is ranked at 7th position which harbors 88 threatened bird species [5]. Due to change in land–use pattern, bird population has declined by 20% to 25% since pre agricultural period [6]. An ideal example in this regard is the Indian sparrow population which is rapidly declining due to urbanization [7]. Not only birds, progressing urbanization is also affecting the overall species diversity of the world [7]. Recent studies have revealed that birds are the most studied fauna as they serve as a major pointer of the adverse effect of urbanization on surrounding environment [7].

The present study is a comparative analysis of bird diversity of 2 pond based ecosystems, one in an urban area and the other in a village area of Southern part of West Bengal, India with an aim to uncover the effect of urbanization on avian diversity in similar ecosystem setup.

2. Materials and methods

The study was conducted in two separate areas of West Bengal viz Sinthee area of Kolkata (22º 32' N, 88º 48' E) and Dakshin Barasat area of South 24 Parganas (20º 20' N,22º06' S).We selected two large pond based localities as the study areas from the 2 locations mentioned previously. The first area i.e., the site at Sinthee area was marked as area I and the second area i.e., the site at Dakshin Barasat area was marked as area II in the present study. Area I was an urban area under Kolkata Municipal Corporation which was found to have

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dense human population, multiple buildings, nearby roads and continuous motor-vehicular movements and undisrupted human disturbances. On the other hand, the village based Dakshin Barasat area was found to harbor a comparatively less dense human population, small number of buildings, less vehicular movement and very little anthropogenic disturbances as it was a remote rural area. Hence, we were able to compare the number of different avian species between the two different areas (area I and II) with similar primary ecological setups but with almost opposite environmental parameters. The size of the selected study area of both area I and II were 110 square meter (including the pond). The observation and recording of avian fauna in the present study was carried out for a period of 15 days (from 3rd January, 2015 to 17th January, 2015) and the observations were made with the aid of Olympus binocular (10X50). Two separate groups for the two separate study areas were formed respectively for the identification process. Some of the interested local people were also included for locating the birds. Birds were mostly observed during the most active period of the day, i.e., from 6:00 to 9:00 hr and from 16:00 to 18:00 hr [9]. Most of the birds were photographed specially which were not identified immediately. Identification process was critically carried out with the help of guide books [10,11]. In the following study, bird species with a definite identity has been reported. The categories of birds were marked as Resident [R], Seasonal Local Migrant [LM] and Winter Migrant [WM][10].

3. Result
The results of this study showed that there were less number of bird varieties in area I (9 species) than that in area II (18 species). Among the birds present in area I, one species was found to be migrant, one was local migrant and the rest were resident. Among the birds of area II, one species was found to be migrant and the rest were resident. A comparative analysis of the number of birds along with their categories (resident/migrant/local migrant)in area I and II are given in a checklist presented in table 1.

Sl Number	Name of the bird	Scientific Name	Availability of birds	
			AreaI	AreaII
1	Pond Heron	*Ardeola grayii*	P(R)	P(R)
2	Little Cormorant	*Microcarbo niger*	P(R)	P(R)
3	Greater Cormorant	*Phalacrocoraxfuscicollis*	A	P(R)
4	White throated kingfisher	*Halcyon smyrnensis*	P(R)	P(R)
5	Green bee eater	*Merops orientalis*	A	P(R)
6	Black drongo	*Dicrurus macrocercus*	A	P(R)
7	Common crow	*Corvus splendens*	P(R)	P(R)
8	Spotted dove	*Strepopelia chinensis*	A	P(R)
9	Black rumped flame- backed Woodpecker	*Dinopium benghalense*	A	P(R)
10	Pied wagtail	*Motacilla alba yarrelli*	A	P(R)
11	Common myna	*Acridotheres tristis*	P(R)	A
12	Common Hoopoe	*Upupa epops*	A	P(R)
13	Brahminy myna	*Temenuchuspagodarum*	A	P(M)
14	Red vented bulbul	*Pycnonotuscafer*	P(R)	P(R)
15	Purple sunbird	*Cinnyrisasiaticus*	P(R)	P(R)
16	Common house sparrow	*Passer domesticus*	A	P(R)
17	Lesser pied kingfisher	*Ceryle rudis*	A(R)	P(R)
18	Black hooded oriole	*Oriolux xanthornus*	A	P(R)
19	Oriental Magpie Robin	*Copsychus saularis*	P(LM)	P(LM)

Table 1: Table showing the checklist of birds found in area I and area II. 'A' indicates absence of the bird, 'P' indicates presence of the bird, 'R' indicates resident, 'M' indicates migrant, 'LM' indicates local migrant
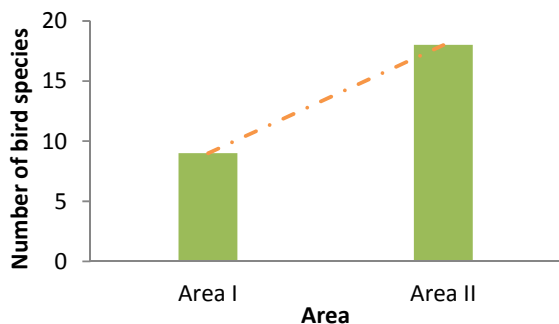

Fig 1:Number of species of birds in area I and area II.

4. Discussion
Birds are regarded as an advanced group of animals among vertebrate species with a remarkable diversity. Birds reside in almost all types of environments and they are often regarded as good indicators of an overall diversity of a given area [12]. Birds are considered as good bioindicators as they notably respond to any kind of changes in their surrounding environment[13]. In this study we have seen that the number of bird species in area I is strikingly lower than the number of bird species in area II. The reason may be the exposure of area I to a considerably more polluted environment as it is an urban area subjected to continuous motor-vehicular movement. This kind of environment can reduce the survival of adult and juvenile birds [3]. This may also result from emigration of birds from an unproductive habitat to a more suitable area in order to save themselves from heavy metal poisoning [3]. A study has mentioned that sparrows living in the more polluted urban sites have considerably lower haemoglobin concentrations and reduced anti-oxidant capacities and prefer not to stay in a polluted environment[3]. Likewise, in the present study, it was found that sparrows were absent in area I, as it was found to have high levels of pollution than area II. Another study showed that the bird species within Washington DC had the lowest species richness of all commercial areas, a pattern that was also

found in our study [14].

A recent study has shown that Kolkata is the most polluted city with regard to the distribution of persistent organic pollutants (POPs) among eight tropical Asian countries [15]. According to WHO, POPs cause eggshell thinning, gonad and embryo alterations in birds [16].So it is quite evident that this city is not a safe site for avian species as far as pollution level is concerned.

Studies suggest that the noise pollution caused by traffic as well as humans can also disturb many avian species [17]. In this regard, area II being a rural area and hence free from threats of noise pollutions a much more suitable habitat for birds. The present study also shows that an urban area with an aquatic body harbors less number of avian fauna than that of a rural area of with the similar ecological setup. Additionally, in our study, we found that greater cormorants were absent in area I though this area includes a large water body. This might be because considerably large water birds require a cluster of land platforms within the water bodies in order to sit there for basking specially during winter [9]. The bird diversity today is threatened by the increasing human interference, direct or indirect, resulting in habitat destruction and fragmentation [9]. With increasing urbanization birds are gradually losing their resting and nesting places. A recent study conducted by Vasant et.al showed that sparrows,that used to make nests in the crevices and holes of roofs and ventilators in urban areas, are suddenly finding nesting a challenge due to the gradual elimination of conventional tiled roofs [7]. Lack of human interference and non polluted environment are the basic needs for birds to get settled in a particular habitat [9]. This might be one of the reasons why the present study showed no migrant species in area I.

The present study does not include any physiochemical testing of pollutants but it is quite evident from the present study that area I is more susceptible to air pollution, sound pollution and human disturbances than area II. Notably, less number of birds are found in area I while area II harbors a greater number of birds species. All the above findings indicate that an urban area is less suitable as a habitat for avian species than a rural area.

5. Conclusion

It can be concluded from the present study that birds are excellent bioindicators which indicate the environmental and ecological condition of an area. With increasing urbanization, human life is getting more comfortable but the avian diversity is losing its sustainability and thus escaping urban area to avoid pollution and human disturbances for better nesting, resting, feeding, breeding and above all for better survival. Several initiatives, avian fauna protection laws have been implemented for conservation of wild avian fauna but minimum initiatives are taken till date to maintain equilibrium of avian population in urban area. So, it is imperative for the national and international conservation authorities to frame proper planning for conservation and sustenance avian species in urban area.

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