



Original Article

Avian and Plant Species Diversity and their Inter-relationship in Tilyar Lake, Rohtak (Haryana)

Ajit Singh, Jitender Singh Laura*

Department of Environmental Sciences, M.D. University Rohtak, Haryana

*Corresponding Author Email: jslmdu@rediffmail.com

ABSTRACT

Plant and bird diversity composition of Tilyar Lake (28° 52' 52.77" N and 76° 38' 12.05" E), Rohtak, Haryana (India) were investigated to ascertain the ecological status of the lake. The study identified 103 plants belonging to 46 families. The plant species composition was dominated by herbs constituting 48 plants, followed by major tree having 29 plants, shrub with 11 plants, Grasses & Sedges with 9 plants, hydrophytes with 5 plants and parasites having only one plant. In relation with diverse plant species, the lake was found to attract 34 bird species belonging to 22 families of native and migratory birds. Twenty nine bird species fall in native bird's category while 5 bird species in migratory bird's category. Spot-billed Duck, Cattle egret, Little egret and Little cormorant were observed dominant throughout the year. Migratory birds White wagtail and Long-billed Pipit visit the lake in winter season in search of feeding grounds and to escape northern winter while Asian Koel, Black-crowned Night Heron and Blue-tailed Bee-eater were found to visit the lake in summer season for breeding purpose. The lake is associated with a tourist resort and zoo thus attracting a large number of visitors throughout the year due to which the bird population is confined to the islands present in the lake providing a limited space and habitat for the birds. The excess anthropogenic disturbances are a threat to the very existence of the bird populations in this wetland.

Keywords: Migratory bird, Native Birds, Riparian area, Tilyar Lake.

INTRODUCTION

A direct link occurs between biological diversity, ecosystem function, and sustainability of natural and managed ecosystems. Lakes are highly complex, land interactive, most productive and fertile ecosystems in the world, constituting a treasury of biodiversity [1]. Due to inadequate attention and ignorance, these ecosystems are referred as wastelands which lead to their disappearance by the process of urbanization and development. The Ramsar convention, which came into force in December 1973, demands an urgent need to develop the conservation strategies and management plan by inventorying, monitoring and documenting the diversity and density of biodiversity with special reference to water fowl. Water bodies serve as stop-over sites for winged visitors like the migratory water fowls from central Asia and some parts of India [2].

Both plant and bird diversity has an important role in maintaining the ecological balance and these are the indicator of health of the ecosystem. Bird diversity has a direct relationship with plant diversity. Plant diversity provides a space to birds for nesting, feeding and breeding. Birds cannot tolerate even slight ecological disturbance because of their highly specific habitat requirements [3]. The birds are very sensitive towards human disturbances. There is a close relationship between the distances to human built structure and bird habitats. Closer the human structures to bird habitats, fewer will be the abundance of different bird species [4]. It cause a negative effect on biodiversity, especially in term of irrecoverable habitat fragmentation and loss, extermination of native and migratory bird species [5]. Bird species play a significant role in many food webs of aquatic system nutrient cycles. But the increase of human disturbances towards these ecosystems causes threats to bird diversity. An assessment of abundance and diversity of bird species in any ecosystem serve as a good indication of the health of the environment in and around the ecosystem [6].

Tilyar Lake is situated 5 km away from Rohtak city, on Rohtak-Delhi road. Geographically it is located at the latitude of 28° 52' 52.77" N and longitude of 76° 38' 12.05" E. Tilyar Lake conserves a very wide range of biodiversity and has a crucial importance from the point of native and immigrant bird species. It harbors a large number of (1) bird (2) animal and (3) plant species. It has 53.42 hectare of area and three small islands with high plant density which act as attraction point for bird species and tourists. It is visited by a very large number of tourists which is

detrimental for the lake. The lake maintains an ecological balance of flora and fauna interrelationship. The study was carried out to obtain some preliminary checklist of bird community and their relation with plant diversity of Tilyar Lake. These informations are required for proper planning of management towards sustainability of the ecosystem as a whole.

MATERIALS AND METHODS

The lake was surveyed for the period of one year (July 2009 to June 2010). The survey was conducted at the lake between 7 am to 10 am. Bird species were observed through naked eyes and with the aid of a binocular. Their photographs were taken using a digital camera. The birds were identified by referring the classical literatures and text books authored by [7, 8, 9]. Plants Taxa were identified in the field and photographs were taken for further identification and closer examination.

RESULTS

Tilyar Lake was found to attract 34 bird species belonging to 22 families (Table 1). Twenty nine birds fall in residential bird's category (Table 2). Spot-billed Duck, Little cormorant, Cattle egret and Little egret were observed throughout the year. However Spot billed duck and Little cormorant were the dominant species in all the seasons.

Table (1): Bird Diversity on Tilyar Lake

Category	No. of Species	No. of Families
Residential Birds	29	22
Migratory Birds	2	1
	3	2
Total	34	

Table (2): List of various residential birds during the study

Common Name	Scientific Name	Family
Common hoopoe	<i>Upupa epops</i>	Upupidae
Paddyfield Pipit	<i>Anthus rufulus</i>	Motacillidae
Little cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae
Euracian thick knee	<i>Burhinus oedicnemus</i>	Burhinidae
Grey francolin	<i>Francolinus pondicerianus</i>	Phasianidae
Indian Peafowl (Male)	<i>Pavo cristatus</i>	Phasianidae
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Halcyonidae
Spot billed duck	<i>Anas poecilorhyncha</i>	Anatidae
Swan Goose	<i>Anser cygnoides</i>	Anatidae
White Ibis	<i>Eudocimus albus</i>	Threskiornithidae
Black headed ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae
Little egret	<i>Egretta garzetta</i>	Ardeidae
Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae
Red-vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae
Rose-ringed Parakeet	<i>Psittacula krameri</i>	Psittacidae
Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae
Eurasian Collared Dove	<i>Streptopelia decaocto</i>	Columbidae
Laughing Dove	<i>Spilopelia senegalensis</i>	Columbidae
Rock Pigeon	<i>Columba livia</i>	Columbidae
Magpie Robin	<i>Copsychus saularis</i>	Muscicapidae
Crow Pheasant	<i>Centropus sinensis</i>	Cuculidae
Bank Myna	<i>Acridotheres ginginianus</i>	Sturnidae
Common Myna	<i>Acridotheres tristis</i>	Sturnidae
House Sparrow	<i>Passer domesticus</i>	Passeridae
Common Coot	<i>Fulica atra</i>	Rallidae
Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae
Ashy Prinia	<i>Prinia socialis</i>	Cisticolidae

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Five migratory birds belonging to 4 families were found to visit the lake during the study (Table 3). The migratory birds have been further categorized into winter and summer migratory types. In winter season two migratory bird species White Wagtail and Long-billed Pipit were recorded. These birds migrate from Europe and hilly areas of Asia to pass the winter and search the food. They were observed to inhabit the lake nearly five months from November to mid March. In summer season 3 migratory birds were recorded including Asian Koel, Black crowned Night Heron and Blue-tailed Bee-eater. They migrate from South India, Sri Lanka and North Africa for the purpose of breeding and food. They arrive in the month of May and inhabit the lake till the month of August.

Table (3): List of various migratory birds recorded in both winter and summer seasons during the study.

Seasons	Common Name	Scientific Name	Family
Winter	White Wagtail	<i>Motacilla alba</i>	Motacillidae
	Long-billed Pipit	<i>Anthus similis</i>	Motacillidae
Summer	Asian Koel	<i>Eudynamys scolopaceus</i>	Cuculidae
	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Ardeidae
	Blue-tailed Bee-eater	<i>Merops philippinus</i>	Meropidae

The composition of plant diversity indigenous to the Tilyar Lake is presented in (Table 4). Plant species composition was found dominated by herbs constituting 48 plant species, followed by major trees having 29 plant species, shrub with 11 plant species, Grasses and Sedges with 9 plant species, hydrophytes with 5 plant species and a single species of parasite.

Table (4): Plant diversity composition in the lake

Habits	Trees	Shrub	Herb	Grasses and Sedges	Aquatic	Parasites
Floral Species	29	11	48	9	5	1

Among the tree species *Albizia lebbeck*, *Callistemon viminalis* and *Cassia fistula* had the highest distribution frequency and density. They showed uniform occurrence in almost all the sampling sites, while *Azadirachta indica*, *Prosopis juliflora*, *Acacia nilotica* was observed to have low distribution frequency and uneven distribution.

As regard the composition of herbs, *Amarnthus viridis*, *Biden pilosa* and *Cassia tora* were recorded as the dominant herbs having the highest density as well as frequency of occurrence, while *Argemone mexicana* and *Cnicus arvensis* were recorded with low occurrence frequency. *Bougainvillia glabra*, *Lantana camara* and *Nerium indicum* were the dominant shrub while *Ipomoea carnea* and *Hibiscus rosa* were less frequent.

Among the grasses, *Cynodon dactylon* showed the highest density and frequency of occurrence at all the habitats. It is followed by *Saccharum spontaneum* and *Saccharum bengalense*. *Phragmites karka* was found to have lower distribution frequency. Macrophytes had very less frequency. *Typha angustata* could be seen only in some places of litoral zone of the lake.

DISCUSSION

Maximum number of bird species was observed in winter season as compare to the summer and monsoon. This may be due to availability of food and favourable climatic conditions for nesting, roosting and boosting for most of the bird species in winter season. Similar observation was also made by [10].

The bird species diversity might be related to the availability of food, habitat condition and breeding season of the species. The distinct seasonality of rainfall and seasonal variation in the abundance of food resources result in seasonal changes in the species abundance of birds [11, 12]. Some invasive species such as house crows and common mynas were observed in very high abundance due to conversion of nearby land into residential areas, hotels and restaurants and observed to affect other species such as little egret, night heron by predation and competition [13].

This leads to homogenization of species diversity of Lake Ecosystem. The lake may lose its resilience in the face of a changing environment due to loss in the species richness and species homogenization. The distribution and abundance of many bird species are determined by the composition of the vegetation that forms a major element of their habitats. As vegetation changes along complex geographical and environmental gradients, a particular bird species may appear, increase or decrease in number, and disappear as the habitat changes [14]. Due to the rocky shore of the lake there is less sediment to support the plant roots. So there is very less frequent plant diversity at the shore of the lake. This is the most productive zone of the lake, where fish spawn and birds nest.

A very large density of tourists visits the lake everyday. They cause disturbances in the ecological system which affects the bird's activity in the lake area. Clearing and removal of native vegetation and introduction of exotic plant species also affect the lake ecology because it causes adaptation problems for the birds. This also requires the additional management activities. These activities not only reduce native vegetation biodiversity, but also reduce avian biodiversity due to loss of breeding, nesting, and feeding space and increased competition for existing habitat areas.

CONCLUSION

The lake is undergoing unwanted change in biodiversity composition due to unplanned management strategies of lake authorities. The riparian area of the lake is re-established by cultivated landscape of exotic plant species. High tourist density cause harm to the lake biodiversity. Construction processes in the lake riparian area are also destroying the plant diversity which is a home for the bird species. The lake water is completely changed after a fix period which causes a detrimental effect on biodiversity. These processes badly affect the bird species both in water and riparian area. The lake management authorities should be aware to maintain the ecological balance in the lake. The riparian area should be provided with native plant species except lawn and gardens. There should be strict management rules for the tourists in relation to the biodiversity conservation in lake area. An alternate measure should adopt to clean the lake water except completely change, because this process destroys all the aquatic biodiversity which cause a major effect on bird diversity. The ecological health of the lake and habitat quality for birds can be improved by zonation of the lake (wildlife and tourist's zone etc.), initiation of vegetation control program, strict check on land encroachment, regulated tourism practices, regular wildlife research and monitoring programs and formulation of species recovery plan for threatened species of the area.

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