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Density and diversity of aquatic avifauna and climate change in the wetland of hassan district, Karnataka, India

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ABSTRACT

The avifauna diversity and density in the wetland of Hassan district, Karnataka, India, was studied for a period of three years. Ponds of Hassan district inhabit several local and migratory bird species. Reduction in water retention in these ponds in summer, weed infestation; variations in food availability in different seasonal threat of predation on the breeding activity of birds affected the avifauna diversity in the study area. This habitat attracted 33 bird species belonging to 18 families, which are local and migratory aquatic birds, waders and others. Highest population was recorded in the family Ardeidae and Rallidae. Interestingly, the area was found congenial for certain resident migrant's viz. Storks, Ibises and Herons. Other prominent residents were Moorhens, Jacanas, and Cormorants. The visitors include Ringed plovers, Wagtails and Pintails. It was evident that Purple moorhen, White breasted water hen, Pond heron have developed high tolerance to this highly fluctuating habitat and human activity. I hope that this study would provide a preliminary database for further research.

KEYWORDS

Diversity;
Karnataka;
Wetland.

INTRODUCTION

Birds have fascinated human beings in various ways by their valuable services. They play a vital role in various wetland- ecosystems; their diversity is an indication of congenial habitat for survival[8]. The diversified vegetation of the wetlands of Malnad of Karnataka attracts large number of aquatic avifauna. However, in the recent past, the natural wetland patches and forest areas are depleting at a rapid rate due to the expansion of rice fields and urbanization[5, 8] and others have reported on various species of birds in different vegetation types. However, reports on aquatic birds occurring in Hassan district of central Karnataka is not available.

STUDY AREA

Physiographically, the study area of Hassan district occupies a entral position in the state of Karnataka, and lies between 12° 31' and 13°33'N and 75°33' and 76°38' E at an altitude of 913 m and its total geographycal area is about 6,850 sq km. The topography of the district is comprised of the hilly and plateau

regions. It begins at the base of the Western Ghats and continuous into the gently rolling Deccan plateau. The district has highest peak Jenkal betta with 1,389 m and the lowest peak with 150 m. The Ghat region is drained to the West by a number of rivers into the Arabian Sea at Mangalore and plateau is drained by Krishna and Cauvery into bay of bengal. The dam at Gorur near the confluence of the Yagachi and Hemavathy rivers will generate a reservoir. The District Shows a wide range of climatic conditions with a mean daily minimum of 14°C and mean daily maximum of 27°C. The plateau is dotted with numerous irrigation tanks often supporting an interesting aquatic flora and fauna. For the present study, the Hassan district was selected. The landscape consists of vast stretches of bushy vegetation and irrigated paddy fields and forest plants. The natural vegetation is typically that of scattered bushy scrub represented by *Acacia arabica, A. farmesiana, Eupatorium indica, Parthenum hysterophorus, Saccharum spontaneum, Ipomoea reptans, Lantana camara* and stray trees like *Eucalyptus citriodora, E. tereticorms, Pheonx vulgaris, Pongamia pinnata, Mangifera indica, Tamarindus indica, Cocos nucifera,Tectona grandis,Terminalia tomentosa, Eugenia jambolana* and other flora[4, 5, 9]. Four different sites were selected at random covering an area of 683 ha. They were: (i) Arasikere Doddakere dominated with rice fields; (ii) Janivara kere - with wet grassland,(iii)Kattebiluguli lake with wetlands and (iv)Kalasina kere with paddy and uncultivable grazing pasture. Avifauna of wetland-ecosystems of Malnad area of Karnataka located at the margins of sparsely distributed rice fields, a small seasonal canal; The study sites were differently located at 35 km each. In each site, observations were made fortnightly during 2009-10.

METHODOLOGY

The Variable Width Line Transect Method described by[6] was adopted. The transect covered 2km in all the four sites for the enumeration of water birds.

Altogether 96 line transects were laid and birds were observed using a binocular (10x30) and identified with the help of field guides[1-3, 13]. The flora of natural vegetation was identified as per[7]. The following formula was used for calculating Relative Dominance.

Relative Dominance = ni X 100/N; where, ni = number of Individuals of the species; N = the total number of individuals of all the species seen during the study period. To find out the diversity of birds the commonness index method of[8] was used. The Commonness Index is the average frequency of sighting of a species in one sampling at a site. Further, Percent Occurrence and Relative Abundance was calculated as follows.

$$\textbf{Percent Occurrence} = \frac{\textbf{No. of species of each family}}{\textbf{Total no. of different species seen}} \times 100$$

$$\textbf{Relative Abundance} = \frac{\textbf{No. of individuals of the species}}{\textbf{No. of individuals of all species}} \times 100$$

To determine the significant differences of water birds and relative composition of different families, the Kruskal Wallis One Way Analysis of Variance and the Friedman Two-Way Analysis of Variance tests were used.

RESULTS AND DISCUSSION

Details such as family, relative dominance and status of aquatic avifauna in the study area is as given in TABLE 1. thirty three species of water birds belonging to 18 families were recorded. Of all, family Ardeidae (5 species) was relatively dominant (15.15%). It represented 11.53% of the total number of water bird species surviving under wetland conditions of Malnad region of Karnataka. The most common and abundant species of Ardeidae family were the Cattle Egret (*Bubulcus ibis*) and Little Egret (*Egretta garzetta*) followed by Indian Pond Heron or Paddy bird (*Ardeola grayii*),Large egret(*Cosmerodius aubus*) Grey heron(*Ardea cinerea*)Little Grebe (*Tachybaptus ruficollis*), Purple Moorehen (*Porphyrio porphyrio*) (TABLE 1). Interestingly, the density of water birds varied significantly (X2= 12.86, P> 0.03) in different wetland-ecosystems of Malnad region of Karnataka. Six species of birds namely, Eurasian spoon bill (*Platalea leucorodia)*, Bar Headed Goose (*Anser Indicus*), Northern Pin tail (*Anas acuta*), Yellow wattled lapwing (*Vanellus malabaricus*), Yellow wattled lapwing (*Vanellus malabaricus*),Black-

TABLE 1 : Aquatic avifauna found in the wetland ecosystem of Hassan dist. of Karnataka

Sl. No	Family	Common Name	Scientific Name	Relative Abbundance	Status
1	Podicipedidae	Little Greb	Tachybaptus ruficollis	12.86	R
2	Phalacrocoracidae	Great cormorant	Phalacrocorax carbo	0.03	RM
		Little cormorant	Phalacrocorax niger	4.76	RM
3	Pelecanidae	Spot billed Pelican	Pelecana philippensis	4.61	RM
4	Ardiedae	Cattle Egret	Bubulcus ibis	2.09	RM
		Large egret	Casmerodius aubus	1.29	RM
		Little egret	Egretta garzetta	2.65	RM
		Grey Heron	Ardea cinerea	3.93	R
		Indian heron	Ardeola grayii	1.54	RM
5	Jacanidae	Bronze winged Jacana	Metopidius indicus	1.23	R
		Pheasant tailed Jacana	Hydrophasianus chirugus	1.36	R
6	Ciconidae	Painted stork	Mycteria leucocephala	3.31	R
7	Threskiornithidae	Eurasian spoon bill	Platalea leucorodia	6.67	RM
		Ori. White ibis	Threskiornis elanocephalus	2.43	M
8	Rallidae	Common Coot	Fulcia atra	23.67	R
		Purple Moorhen	Porphyrio Porphyrio	6.40	RM
		Water cock	Gallinula chloropus	0.33	R
		White breasted waterhen	Amaurornis phoenicurus	0.37	RM
9	Anatidae	Spot billed Duck	Anas poecilorhyncha	3.58	R
		Bar Headed Goose	Anser Indicus	1.70	RM
		Cotton teal	Nettapus coromandelianus	0.57	RM
		Northern Pin tail	Anas acuta	0.79	M
10	Charadridae	Red wattled lapwing	Vanellus indicus	0.90	M
		Yellow wattled lapwing	Vanellus malabaricus	1.15	R
		Black winged Stit	Himantopus himantopus	5.96	R
11	Laridae	River tern	Sterna aurantia	6.18	R
12	Alcedinidae	Small bule King fisher	Alcedo attihis	0.45	R
13	Dacelonidae	White breasted Kingfisher	Halcyon smymensis	0.19	R
14	Cerylidae	Lesser Pied king fisher	Halcyon pileata	0.12	R
15	Accepitridae	Brahmini Kite	Haliastur Indus	0.28	RM
16	Scolopacidae	Common Sand Piper	Actitis hypoleucos	1.62	R
17	Ploceidae	Streaked weaver bird	Ploceus manyar	2.06	R
18	Motacillidae	Large Pied wag tail	Motacilla maderaspatensis	0.75	R

winged Stilt (*Himantopus himantopus*and and River tern (*Sterna aurantia*) were uncommon (TABLE 1), Great Cormorant(*Phalacrocorax carbo*) Water Cock (*Gallinula chloropus*), White breasted waterhen (*Amouromis phoenicurus*), Lesser Pied Kingfisher (*Halcyon pileata*), Commons sand piper (*Actitis hypoleucos*) Large Pied Wagtail (*Motacilla maderaspatensis*), were rarely seen in this area. Thus, the relative composition of aquatic birds belonging to different families varied significantly ($X2 = 15.5$, $P > 0.12$). Habitats with varied vegetation influence the diversity of bird species[8]. It is presumed that the native flora (i.e., bushy scrub, stray trees and the paddy fields) might have extended comfortable shelter and foraging grounds for water birds. As these bird species are heterogeneous in their feeding habit[2, 3], the available fauna, *viz*., crabs, snails, calms, worms, insect larvae and pupae in the paddy fields and in water bodies may constitute their feed. Wetlands are potential sources for plankton life. They play an important role in the cycle of changes (i.e., elements of organic matter eaten by bacteria and protozoa and in turn consumed by the insect larvae, rotifers and crustaceans), which form the basis of food for water birds. By feeding on insect pests, their larvae and pupae, water birds control large amount of pest population in paddy fields.

TABLE 2 : Aquatic avifauna representation in families

Sl.No	Family	Percentage Occurrence	Relative Abundance	Status
1	Podicipedidae	3.03	12.86	R
2	Phalacrocoracidae	6.06	4.79	RM
3	Pelecanidae	3.03	4.60	RM
4	Ardiedae	15.5	11.53	RM
5	Jacanidae	6.06	2.60	R
6	Ciconidae	3.03	3.32	R
7	Threskiornithidae	6.06	3.11	RM
8	Rallidae	12.12	30.78	R
9	Anatidae	12.12	6.67	R
10	Charadridae	9.09	8.03	M
11	Laridae	3.03	6.18	R
12	Alcedinidae	3.03	0.45	R
13	Dacelonidae	3.03	0.19	R
14	Cerylidae	3.03	0.12	R
15	Accepitridae	3.03	0.29	RM
16	Scolopacidae	3.03	1.63	R
17	Ploceidae	3.03	2.06	R
18	Motacillidae	3.03	0.76	R

Further, they provide manure. Hence, the Ecological role played by water birds in wetland-ecosystems of Malnad area is unique of its kind. The resident migrant (i.e., birds that breed in one part of the area in one season and move to other parts within the state or country in a different season) birds such as Painted Stork (*Mycteria leucocephala*), Black Ibis (*Pseudibis papillosa*) Oriental White Ibis (*Threskiornis melanocephalus*), and Northern Pintail (*Anas acuta*) were winter migrants in this region. The breeding activities of Black Ibis and Oriental White Ibis were observed at different localities in the wetlands. Interestingly Streaked Weaver birds were observed in breeding activities on *Typha angustata.* The area is enriched by small water canals, streams, water bodies and sparsely distributed tall stray trees *viz. Cocos nucifera, Mangifera indica Pheonx ulgaris, Tamarindus indica, Eucalyptus citriodora* and *E. tereticorms*. The bushy scrub constituted by *Lantana camara,Saccharum spontaneum, Ipomoea reptans* and others in the vicinity of paddy fields might have attracted the Oriental White Ibis and Black Ibis. Moreover, they get good food i.e., insects, crabs, insect larvae, pupae and small fishes from this ecosystem. Perhaps, all these conditions might have influenced these resident migrants to breed. To support this, few nests of the Black Ibis and Oriental White Ibis were seen on a few stray coconut trees near paddy fields. Thus, the wetland ecosystems have provided suitable habitats for the survival of these birds. However, in the recent years, the uncultivable grazing fields, bushy scrub areas and wetland patches have been cleared and the stray trees removed for paddy cultivation[4, 5]. Weedicides and insecticides are ruthlessly used in paddy fields to control weeds and insect pests. Many birds associated with wetlands are forced to leave the habitat as villagers cut the emergent vegetation and the number of nests have declined in this area[4, 5]. The reason for decline of nests of other birds in general and water birds in particular is not known. This requires thorough scientific monitoring and documentation. Therefore, the preservation of wetland patches is essential to restore water birds.

CONCLUSION

The present study emphasizes the need to conduct a detailed study on the status of wetland ecosystems, and biology of water birds to have accurate information on the ecological role of birds associated with wetlands. The wetland-ecosystems of Karnataka are diversified with various aquatic birds and 33 species of wetland-associated birds survive in this area. However, in the recent past, the wetlands -ecosystems in this area are degraded or destroyed due to encroachment for the expansion of rice fields and urbanization. This would eventually alter the natural vegetation on the banks of water canals, streams and in the uncultivable wetland patches making it unsuitable for birds to roost and nest. Unaltered natural patchy vegetation is essential in wetland-ecosystems, which makes it very important to take steps to preserve wetlands flora and avifauna for the health of biodiversity of Malnad areas.

CONSERVATION MEASURES

Further, the involvement and participation of women working in self help group need to conserve the bird diversity through educating local people. Bird poachers are to be punished thro enforcing wild life act. Pro-

tection and improvement of habitat is urgently needed. High usage of pesticides are to be strictly banned.

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