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Status, diversity and conservation threats of migratory wetland birds in Magadi Bird Sanctuary, Gadag district, Karnataka, India

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Abstract

The study revealed a total of 33 wetland bird species belonging to 11 families were recorded from Magadi Bird Sanctuary of Gadag District, Karnataka. Among the family, Scolopacidae dominated the list by the representation of 8 species, followed by the Anatidae with 7 species and least by Laridae, Gruidae, Rallidae, and Recurvirostridae with one species each. Of the total birds recorded based on the density and abundance, Bar-headed geese was found as the dominant species, followed by the Demoiselle Crane, Brahminy Shelduck, Lesser-whistling Duck, Black-headed Ibis, Spot-billed Duck, Black Ibis, and Common Coot, etc.,. The study also revealed that the lake is a vulnerable wetland harboring plenty of resident as well as few migratory birds. Four globally near threatened species were recorded like Black-headed Ibis (*Threskiornis melanocephalus*), Painted Stork (*Mycteria leucocephala*), Black-tailed Godwit (*Limosa limosa*) and River Tern (*Sterna aurantia*) have a protected status under the schedule IV of Indian Wildlife Protection Act, 1972. The present study location is also facing tremendous conservation challenges by the impact of anthropogenic alteration of the habitats in and around the lake.

Keywords: Bar-headed geese, demoiselle crane, wetland birds, Magadi bird sanctuary, threatened species

1. Introduction

Bird migration is a phenomenon it includes the regular, seasonal movement of populations from one geographic location to another, and is common among most varieties of birds that has long fascinated scientists and other observers. It is marked by the eventual return to the original place of departure and is most evident among certain bird species that usually follow a yearly cycle. An estimated 1,855 bird species (19% of extant species) are migratory, making regular cyclical movements beyond their breeding distribution, with predictable timing and destinations^[1].

Migratory waterfowls are one of the most remarkable components of global biodiversity^[2]. Water birds are not only the most prominent groups which attract people to wetlands, but also are good bio-indicators and useful models for studying a variety of environmental problems^[3]. Out of 310 species of wetland birds found in India^[4], almost half of these are migratory and visit India from their breeding grounds in China, Russia, central Asia, Tibet and from across the entire range of the Himalaya.

Monitoring of wetland birds provides valuable information on the ecological health and status of wetlands and can be a vital tool for developing awareness regarding the conservation value of the wetlands. The importance of local landscapes for conservation of avifauna can only be understood by knowing the structure of the bird community of that region^[5].

The availability of feeding and roosting habitats is very important for these migratory species, which in some cases migrate up to thousands of kilometers. As wetlands provide a wintering ground for many trans-equatorial species of migratory birds, several wetlands in the country have been identified as being internationally significant under the Ramsar Convention. However, wetlands in India, are facing tremendous anthropogenic pressures^[6], which can adversely influence the structure of bird communities^[7, 8, 9].

Knowledge of the arrival dates and breeding dates of bird is important for studying long term trends of changes in timing of breeding in the ongoing climate changes^[10]. Therefore, such information could be used as an indicator tool and impact assessment on the system.

There are no reports on avifauna from this habitat; hence the present study has been conducted to prepare a check list and to focus on the ecological status, diversity and conservation threats of wetland migratory birds in the Magadi Bird Sanctuary.

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2. Materials and Methods

2.1 Study area

The Magadi Bird Sanctuary is a manmade lake that is built on the out skirts of village in Shirahatti Taluk (8 kms from Shirahatti) of Gadag District around 26 kms from Gadag. Migratory birds from central Asia have been visiting frequently this place over 20 years. The tank spans about 134 acres of Land and has a catchment area of 900 hectares. The main water source is rain and is surrounded by agricultural crop lands which are the food source of many migratory birds. Hence it attracts many migratory birds from within the country and outside the country.

2.2 Methodology

Density and diversity are useful attributes and valuable indicators of habitat quality [11]. Water fowl population was enumerated by point count and direct counting methods [12]. The checklist is prepared based on the field work conducted for the period of 5 years i.e., during 2011-2016 across Magadi Lake of Karnataka, India by foot method i.e. road side count [13, 14]. Water fowl population was observed and documented every week end in the morning hours during the winter seasons where almost birds take part in migration. Birds were observed from 6 am to 11 am and identified using Olympus binoculars (10x50) and field guides of [15]. In the heronry, total counts were carried out by direct and point counting methods for the birds. The nomenclature used here which was given [16]. The status on the movement and seasonality of occurrence, the parameters are listed as; LM-Local migratory, WM-winter migratory and R-Resident depending on its movement and seasonality (Table-1).

3. Results and Discussion

3.1 Abundance and Density of wetland birds

During present investigation a total of 33 species of wetland birds belonging to 11 families were recorded. Based on the family wise contribution, the family Scolopacidae dominated the list by the representation of 8 species, followed by the Anatidae with 7 species, Threskiornithidae with 4 species, Ciconiidae and Motacillidae with 3 species each, whereas the family Charadriidae and Ardeidae contributed less with 2 species each. However, the family Laridae, Gruidae, Rallidae, and Recurvirostridae contributed very least i.e., 1 species each of total family wise frequency of occurrence of water birds community of the study area (Table 1).

This similar pattern of study was reported on wetland birds in Anekere wetland of Karkala, Udipi District [17]; Kundavada

Lake [18] and Bathi Lake [19] of Davanagere District and Nipani Reservoir of Belgaum District [20] of Karnataka state. These studies also recorded the seasonal change in density and diversity of migratory avifauna of which some are globally threatened and near threatened species.

Based on the residential status of wetland birds, winter migratory birds (WM) were found as the most of predominant with 18 species, which contribute 55%, followed by the local migratory (LM) with 8 species, contribute 24% and as less by resident migratory (RM) with 7 species, contribute 21% of the total wetland birds specie recorded from the study area (Table 1, Fig.1).

Year wise variation in the density and abundance was found to be high during the period of 2012-13 followed by the 2014-15 and 2013-14, i.e., 8377, 253.8±1194.0; 7094, 215.0±1039.2 and 5479, 166.0±814.5 respectively. However, it was relatively low during 2011-12 and least during 2015-16, i.e., 4601, 139.4±693.5 and 4538, 137.5±694.4 respectively (Table 2).

Of the total birds recorded (during 2011-016), based on the density and abundance, Bar-headed geese with 4000-6900; 5120.0±1287.2 was found as the predominant species, followed by the Demoiselle Crane with 100-200; 144.0±37.8, Brahminy Shelduck with 90-110; 100.0±7.07, Lesser whistling duck with 35-200; 94.2±72.9, Black-headed Ibis with 25-180; 78.4±59.9, Spot-billed Duck with 20-90; 50.8±26., Black Ibis 15-80; 37.2±23.6 Common Coot with 15-60; 34.0±60, Asian Openbill-Stork with 10-55; 32.4±16.5 and Black-winged Stilt with 10-60; 27.4±18.5, thereby formed as the top ten wetland birds recorded from the study area (Table 1).

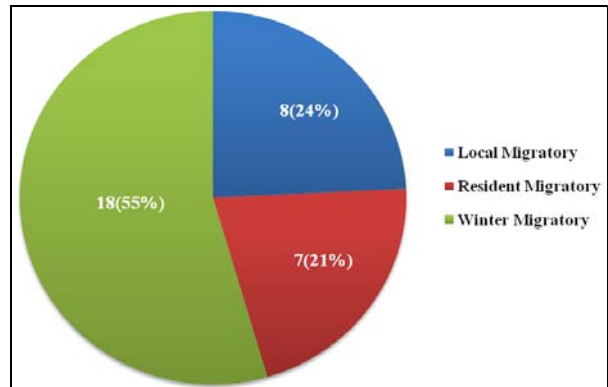


Fig 1: Status of wetland birds observed at Magadikere Lake, Shirahatti Taluk, Gadag District

Table 1: Year-wise species richness and diversity of wetland birds at Magadi Bird Sanctuary, Shirahatti Taluk, Gadag District

Sl. No.	Common Name ¹	Family/Scientific Name ²	S ³	IUCN 2014.3	2011-12	2012-13	2013-14	2014-15	2015-16	Abundance (Mn±Stdv)
Family: Ardeidae										
1	Purple Heron	<i>Ardea purpurea</i>	LM	LC	7	15	9	14	6	10.2±4.1
2	Grey Heron	<i>Ardea cinerea</i>	LM	LC	7	15	10	12	5	9.8±4.0
Family: Ciconiidae										
3	Painted Stork	<i>Mycteria leucocephala</i>	RM	NT	21	54	41	34	12	32.4±16.5
4	Asian Openbill-Stork	<i>Anastomus oscitans</i>	LM	LC	10	32	16	17	8	16.6±9.4
5	White-necked Stork	<i>Ciconia episcopus</i>	LM	LC	14	35	14	21	8	18.4±10.4
Family: Threskiornithidae										
6	Black Ibis	<i>Pseudibis papillosa</i>	RM	LC	31	78	32	28	17	37.2±23.6
7	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	RM	NT	51	178	51	87	25	78.4±59.9
8	Glossy Ibis	<i>Plegadis falcinellus</i>	WM	LC	0	18	10	15	0	8.6±8.4
9	Eurasian Spoonbill	<i>Platalea leucorodia</i>	RM	LC	8	32	10	18	6	14.8±10.6
Family: Anatidae										
10	Bar-headed Goose	<i>Anser indicus</i>	WM	LC	4000	6900	4700	6000	4000	5120.0±1287

										.2
11	Brahminy Shelduck	<i>Tadorna ferruginea</i>	WM	LC	100	100	90	110	100	100.0±7.07
12	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	LM	LC	36	197	64	143	31	94.2±72.9
13	Northern Shoveller	<i>Anas clypeata</i>	WM	LC	21	34	22	35	14	25.2±9.0
14	Cotton Teal	<i>Nettapus coromandelianus</i>	RM	LC	15	36	18	36	0	21.0±15.3
15	Spot-billed Duck	<i>Anas poecilorhyncha</i>	RM	LC	31	87	48	67	21	50.8±26.7
16	Garganey	<i>Anas querquedula</i>	WM	LC	18	38	21	32	12	24.2±10.6
Family: Gruidae										
17	Demoiselle Crane	<i>Grus virgo</i>	WM	LC	100	120	150	150	200	144.0±37.8
Family: Rallidae										
18	Common Coot	<i>Fulica atra</i>	WM	LC	24	58	29	42	17	34.0±16.2
Family: Charadriidae										
19	Little Ringed Plover	<i>Charadrius dubius</i>	RM	LC	4	18	6	12	2	8.4±6.5
20	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	LM	LC	0	16	10	16	2	8.8±7.6
Family: Scolopacidae										
21	Black-tailed Godwit	<i>Limosa limosa</i>	WM	NT	0	14	0	6	0	4.0±6.2
22	Common Greenshank	<i>Tringa nebularia</i>	WM	LC	15	36	21	28	8	21.6±10.9
23	Common Sandpiper	<i>Actitis hypoleucos</i>	WM	LC	17	38	18	25	8	21.2±11.2
24	Marsh Sandpiper	<i>Tringa stagnatilis</i>	WM	LC	15	32	17	27	8	19.8±9.6
25	Green Sandpiper	<i>Tringa ochropus</i>	WM	LC	13	34	15	21	8	18.2±10.0
26	Wood Sandpiper	<i>Tringa glareola</i>	WM	LC	10	28	12	16	0	13.2±10.2
27	Common Snipe	<i>Gallinago gallinago</i>	WM	LC	0	6	0	6	0	2.4±3.3
28	Little Stint	<i>Calidris minuta</i>	WM	LC	0	12	0	8	0	4.0±5.7
Family: Recurvirostridae										
29	Black-winged Stilt	<i>Himantopus himantopus</i>	LM	LC	15	56	21	35	10	27.4±18.5
Family: Laridae										
30	River Tern	<i>Sterna aurantia</i>	LM	NT	8	24	12	17	4	13.0±7.8
Family: Motacillidae										
31	White Wagtail	<i>Motacilla alba</i>	WM	LC	2	12	4	0	2	4.0±4.7
32	Yellow Wagtail	<i>Motacilla flava</i>	WM	LC	4	12	4	8	2	6.0±4.0
33	Grey Wagtail	<i>Motacilla cinerea</i>	WM	LC	4	12	4	8	2	6.0±4.0

¹Common names after Manakadan *et al.*, 1998.

²Scientific names after Inskipp *et al.*, 1996.

S³ –Residential Status of the birds observed as Resident (R), Winter Migratory (WM), Local Migratory (LM), Summer Migratory (SM) and Resident Migratory (RM)

Mn-mean, Stdv-Standard Deviation, LC-Least Concern, NT- Near Threatened

3.2 Species diversity index

Diversity indexes indicate the species richness and abundance in an area. Higher values of diversity indexes indicate the higher species richness and abundance. On the basis of which it was found to be high during the study period of 2012-13, followed by the 2014-15 and 2013-14, i.e., 33; 1.01, 32; 0.90 and 30; 0.83 respectively. However, this was found to be less during 2011-12 and least during 2015-16, i.e., 28; 0.76 and 27; 0.64 respectively (Table 2).

In the present study, highest bird density and diversity was recorded during winter months, when the anthropogenic activities are minimum, also because of availability of varied sources of feed as well as foraging and safety ^[21], almost all of them leave the wetland by March-end or early April. The wetland birds are in general being heterogeneous in their feeding habits ^[22]. In the present study, the habitat by supporting different food sources like fish, crustaceans, invertebrates, water plants and planktons as the primary feed and also surrounding irrigated agriculture fields provided foraging grounds for the resident as well as few migratory birds, which further add to the diversity of wetland birds ^[19, 23]. This indicates that the habitat is more suitable and supports all the visitor birds as well as resident birds by providing immense food and little space to breed.

From the study it has been found that the lake is a vulnerable wetland harboring plenty of winter migratory, resident and few local migratory birds. These winter birds migrate from Central Asia and Mangolia have been frequently visiting this place for over 20 years. Among them Bar-headed Goose, Brahminy

Shelduck, Northern Shoveller, Garganey, Demoiselle Crane, Common Coot, Black-tailed Godwit, Common Greenshank, Common Sandpiper, Marsh Sandpiper, Green Sandpiper, Wood Sandpiper, Common Snipe, Little Stint, White Wagtail, Yellow Wagtail, Glossy Ibis and Grey Wagtail are important wetland migratory birds species. These winter migratory avifauna exhibit a distinct species specific pattern for arrival at and departure from the wetland.

Among the migratory species, Bar-headed geese arrive from Mangolia during winter was the most predominant to occupy this wetland in large number, arrival of this further adds to increase of abundance and diversity of total avifaunal population in the study area. Since 1995, visiting of Bar-headed geese has been observed by the local people but no record has been maintained or available up to 1999. From 2008-09 onwards, the forest dept. has deputed an employee to monitor the lake and birds. Since then recording of migratory birds to Magadi Lake is practiced by the employee of Forest dept and amateur local photographers and bird watchers.

The Bar-headed geese start arrival to Magadi Lake from 1st week of November to 1st of December and then stay up to 2nd week of March. The current global population of the bar-headed geese is estimated at around 52,000-60,000 mature individuals and range (breeding and winter) of 2,370,000 sq km ^[24]. During the study, approximately 4,000-7,000 individuals of bar headed geese were being visited Magadi Lake every year, which contributed 7%-10% to total global population.

Four globally near threatened species were recorded, such as

Black-headed Ibis (*Threskiornis melanocephalus*), Black-tailed godwit (*Limosa limosa*), Painted Stork (*Mycteria leucocephala*) and River Tern (*Sterna aurantia*) have a protected status under the schedule IV of Indian Wildlife Protection Act, 1972 [25]. The spotting of these threatened bird species highlights the importance of Magadi Bird Sanctuary as an important staging and wintering ground for wetland birds. The other most commonly sighted resident aquatic birds but not included in the present investigation include, Little grebes, Cormorants, Herons, Egrets, Ducks, Waders, King Fisher, etc., From the study, though the Magadi Lake is a small wetland it provides winter home for many diversified avifauna. But, the avian heritage of this landscape is under threat due to increased anthropogenic activities resulting in habitat destruction and fragmentation. It is an alarming sign for conservation of the avian diversity of this landscape. Direct observations as well as personal interviews with local people during surveys revealed that anthropogenic activities like livestock grazing, extensive utilization of water for domestic purposes, soil digging, siltation, encroachment, utilization of its marshy vegetation for grazing of live stock, decrease in rainfall and water pollution due to agriculture run off [19, 26] are some of the major threats to the biodiversity of this landscape.

Table 2: Year wise species abundance, density, richness and diversity of wetland birds at Magadi Bird Sanctuary, Shirahatti Taluk, Gadag District

Years	2011-12	2012-13	2013-14	2014-15	2015-16
Species Richness 'S'	28	33	30	32	27
Total no. of individuals or Density	4601	8377	5479	7094	4538
Shannon's Diversity Index H'	0.76	1.01	0.83	0.90	0.64
Abundance (Mn±Stdv)	139.4±693.5	253.8±1194.0	166.0±814.5	215.0±1039.2	137.5±694.4

Mn= Mean; Stdv= Standard Deviation

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