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Status of Wetland birds at associated lakes of Ujjani Reservoir, Maharashtra, India

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Abstract

The present study was an attempt to assess the status of wetland birds and their distribution at and *Bhadalwadi* and *Palasdeo* Lake. These are satellite wetlands located adjacent to the Ujjani reservoir which is a potential Ramsar Site in Maharashtra but is in greater neglect.

The study was conducted at *Bhadalwadi* and *Palasdeo* Lake during April 2014 - March 2016. Total 72 wetland bird species recorded; out of which 37.5% were migrant and 62.5% species were resident. During this assessment 43 aquatic bird species at *Bhadalwadi* and 70 bird's species were recorded at *Palasdeo* Lake. The similarity among the birds observed at both the associated wetlands and was analyzed using similarity Index which is 0.58. Both the associated lakes were observed to be supporting the species like *Eurasian Curlew, Darter, Black tailed Godwit, Black headed Ibis, Painted Stork, River Tern, Great Thick Knee.* It was observed that these are the species of importance and are in near threatened (NT) category whereas *Asian Wollyneck* is a vulnerable (VU) as per IUCN Red list of threatened species 2016.

This study showed that *Bhadalwadi* Lake is dominant with *Acacia* and *Ipomea* the site was observed to be utilized for nesting, roosting and breeding by aquatic birds. Whereas, *Palasdeo* Lake is an open expanse dominated by agriculture fields with meager vegetation around which was observed to be utilized as feeding and roosting site by the wetland birds. Both these satellite wetlands are under tremendous pressure of manmade as well as natural threats and it is expected that creating awareness among the local communities and preparation of the implementable conservation action plan would surely provide protection to this niche habitat.

Keywords: Bird communities, Ujjani Reservoir, Wetland, Threatened species, Ramsar site.

INTRODUCTION

Wetlands are "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters" (Ramsar, 2004). These are the lands transitional between terrestrial and aquatic ecosystem where the water table is usually at or near the surface or the land is covered by shallow water (Narayanan & Vijayan, 2007). Wetlands are commonly associated with lakes or can occur as isolated features of the landscape.

Wetlands are vital for human survival. They are among the world's most productive environments; rich in biodiversity that provide the water and productivity upon which countless species of plants and animals depend for their survival (Kumar et al 2005). Wetlands are indispensable for the countless benefits or ecosystem services that they provide ranging from freshwater supply, food and biodiversity, to flood control, groundwater recharge and climate change mitigation, etc. (Weller 1999). Ecosystem services are the benefits that people, society and the economy receive from nature, some of these services are water availabity and purification, flood and storm control, carbon storage and climate regulation, food and materials provision, scientific knowledge, recreation and tourism (Prasad eta al 2002, Tak et al 2010).

Fulfilling the food and habitat requirements of various water birds is one of the most important ecological functions performed by wetlands as it helps to maintain biodiversity globally. Apart from their beauty, birds are excellent indicators of water quality. There are two categories of water birds; wetland specialists and generalists. Specialists are those that nest, feed and roost in and around wetlands. Wetland specialists are wholly dependent on aquatic habitats, and cannot survive in other habitats (Bhupathy et al 1998).

Satellite wetlands are many small wetlands associated with streams. Seepage from main reservoir can support associated wetlands during dry period. They are relatively lesser in capacity and may be manmade or natural. Even though, these are smaller wetlands and lesser in capacities, they are found to be providing substantial services to the wetland birds communities during their life-span. (USGS, 1996) They provide feeding, roosting as well as breeding grounds for many species. They are also responsible to increase and check the ground water seepage and upsurge the ground water table (Edwards 1999).

Presently in India there are 26 sites designated as Wetlands of International Importance, according to Ramsar convention with a surface area of 689,131 ha. As far as Maharashtra state has concern, it has total 21,675 ha area under natural wetlands and 2,79,025 ha under man-made reservoirs. But not a single wetland from Maharashtra is designated as Ramsar site.

STUDY AREA:

Ujjani wetland is a part of Upper Bhima Basin located on the western side of South Indian peninsula. River Bhima is a tributary of river Krishna and it originates in the ranges of Western Ghats. The wetland lies at Latitude-18° 04' 23" N, Longitude - 75° 07' 15" E with an altitude (above mean sea level) of 544m. The Ujjani dam was constructed in year 1980 as a Major Dam and irrigation project. It is a hydroelectric project which generates 12 MW of electricity. The gross storage capacity is 1517.2 MCM. Ujjani wetland is the terminal reservoir of Upper Bhima Basin. The catchment of Ujjani reservoir is spread over 14,712 sq km and is fed by about 10 significant tributaries with a total length of about 1140 km. The major tributaries are Ambi, Mutha, Mula, Pawana, Indrayani, Andhra, Bhima, Ghod, Meena and Kukadi. Ujjani reservoir is surrounded by small wetlands adjacent to it. Out of them *Bhadalwadi* and *Palasdeo* Lake was focused for the said study (Fig. 1).

Figure 1. Study area location – Ujjani Reservoir, Bhadalwadi and Palasdev Lakes.

Bhadalwadi Lake

Bhadalwadi lake was built during British period as a balancing reservoir for storing water that comes from Khadakwasla lake. *Bhadalwadi* minor irrigation project was then constructed in 1966 with maximum dam height 13.2 m. The gross storage capacity of the said dam is 4.56 MCM and the dam has length 496 m. Water is released from *Khadakwasla* Dam, which is located in Upper Bhima Basin at around 150 km upstream from *Bhadalwadi* Lake in to small streams that feed the lake. The water is used for irrigation.

Palasdeo Lake

Palsdeo dam is a minor irrigation project, constructed in the year 1953. The maximum dam height is 15.55 m. Length of the dam is 518 m. The said dam has a gross storage capacity of 2.67 MCM. Water from this dam is mainly used for irrigation purpose.

MATERIALS AND METHODS

This study was carried out from April 2014–March 2016. Regular field surveys were carried out systematically on fixed points throughout the study area. The birds were observed during the peak hours of their activity from 0600–1000 hr and from 1600–1800 hr using Olympus (7x 40mm) binoculars. Identification of birds was done using field guides (Ali & Ripley 1987; Grimmett et al. 1999), and only those species with confirmed identity was reported. The checklist was prepared using standard common and scientific names of the birds. Residential status of the birds as resident and migrants has been assigned strictly with reference to the study area on the basis of presence or absence method. Feeding guilds were classified based on direct observations and available literature (Ali & Ripley 1987). According to the feeding habits, birds were divided as aquatic herbivores, aquatic insectivore, aquatic omnivores, piscivores, carnivores, insectivores, omnivores. (Urfi 2005, Kumar & Gupta 2013).

Birds' species were observed and recorded along with habitat type, season and frequency of sightings of a particular species. Presence of bird species in particular microhabitat viz. open water, marshy area, mudflats, shallow water and dry bank was observed and recorded. The status of the recorded bird species was established on the basis of frequency of sightings (Kumar & Gupta 2009) as common recorded 9–10 times out of 10 visits, fairly common recorded 6–8 times out of 10 visits, uncommon recorded 3–5 times out of 10 visits, rare recorded 0–2 times out of 10 visits. The results were then compared and analyzed using cluster analysis and Jaccard's similarity Index (Washington 1984, Narayanan et al 2011). The conservation status of the bird species was assessed according to IUCN (2016).

RESULTS

Total 72 aquatic species of birds belonging to 9 orders and 18 families (Fig. 2) were identified and recorded from two adjacent lakes near Ujjani reservoir (Table 1). Among these 72 species of birds observed during the study, 43 were found at *Bhadalwadi* Lake (Table 2) and 70 species were found at *Palasdeo* Lake (Table 3).

Table 1: Checklist of the bird's communities at *Bhadalwadi* and *Palasdeo* Lake

S. No.	Common Name	*Scientific*	Family	Order
1	Common Kingfisher	*Alcedo atthis*	Alcedinidae	Coraciiformes

S. No.	Common Name	*Scientific*	Family	Order
2	Pied Kingfisher	*Ceryle rudis*	Alcedinidae	Coraciiformes
3	White throated Kingfisher	*Halcyon gularis*	Alcedinidae	Coraciiformes
4	Indian spot billed Duck	*Anas poecilorhyncha*	Anatidae	Anseriformes
5	Knob billed Duck	*Sarkidiornis melanotos*	Anatidae	Anseriformes
6	Lesser whistling Duck	*Dendrocygna javanica*	Anatidae	Anseriformes
7	Tufted Duck	*Aythya fuligula*	Anatidae	Anseriformes
8	Eurasian Wigeon	*Anas Penelope*	Anatidae	Anseriformes
9	Gadwall	*Mareca strepera*	Anatidae	Anseriformes
10	Garganey	*Anas querquedula*	Anatidae	Anseriformes
11	Cotton Pygmy Goose	*Nettapus coromandelianus*	Anatidae	Anseriformes
12	Bar headed Goose	*Anser indicus*	Anatidae	Anseriformes
13	Northern Pintail	*Anas acuta*	Anatidae	Anseriformes
14	Northern Shoveler	*Spatula clypeata*	Anatidae	Anseriformes
15	Ruddy Shelduck	*Tadorna ferruginea*	Anatidae	Anseriformes
16	Common Teal	*Anas crecca*	Anatidae	Anseriformes
17	Darter	*Anhinga melanogaster*	Anhingidae	Suliformes
18	Cattle Egret	*Bubulcus ibis*	Ardeidae	Pelecaniformes
19	Great Egret	*Ardea alba*	Ardeidae	Pelecaniformes
20	Intermediate Egret	*Ardea intermedia*	Ardeidae	Pelecaniformes
21	Little Egret	*Egretta garzetta*	Ardeidae	Pelecaniformes
22	Black crowned Night Heron	*Nycticorax nycticorax*	Ardeidae	Pelecaniformes
23	Grey Heron	*Ardea cinerea*	Ardeidae	Pelecaniformes
24	Indian Pond Heron	*Ardeola grayii*	Ardeidae	Pelecaniformes
25	Striated Heron	*Butorides striata*	Ardeidae	Pelecaniformes
26	Purple Heron	*Ardea purpurea*	Ardeidae	Pelecaniformes
27	Eurasian Thick Knee	*Burhinus oedicnemus*	Burhinidae	Charadriiformes
28	Great Thick Knee	*Esacus recurvirostris*	Burhinidae	Charadriiformes
29	Red wattled Lapwing	*Vanellus indicus*	Charadriidae	Charadriiformes
30	Little Ringed Plover	*Charadrius dubius*	Charadriidae	Charadriiformes
31	Asian Openbill	*Anastomus oscitans*	Ciconiidae	Ciconiiformes
32	Painted Stork	*Mycteria leucocephala*	Ciconiidae	Ciconiiformes
33	Asian Woolly neck	*Ciconia episcopus*	Ciconiidae	Ciconiiformes
34	Little Pratincole	*Glareola lacteal*	Glareolidae	Charadriiformes
35	Pheasant tailed Jacana	*Hydrophasianus chirurgus*	Jacanidae	Charadriiformes
36	Black headed Gull	*Larus ridibundus*	Laridae	Charadriiformes
37	Brown headed Gull	*Larus brunnicephalus*	Laridae	Charadriiformes
38	Caspian Tern	*Hydroprogne caspia*	Laridae	Charadriiformes
39	Gull billed Tern	*Gelochelidon nilotica*	Laridae	Charadriiformes
40	River Tern	*Sterna aurantia*	Laridae	Charadriiformes
41	Whiskered Tern	*Chlidonias hybrid*	Laridae	Charadriiformes
42	Grey Wagtail	*Motacilla cinerea*	Motacillidae	Passeriformes
43	Yellow Wagtail	*Motacilla flava*	Motacillidae	Passeriformes
44	white browed Wagtail	*Motacilla maderaspatensis*	Motacillidae	Passeriformes
45	Great Cormorant	*Phalacrocorax carbo*	Phalacrocoracidae	Suliformes
46	Indian Cormorant	*Phalacrocorax fuscicollis*	Phalacrocoracidae	Suliformes
47	Little Cormorant	*Microcarbo niger*	Phalacrocoracidae	Suliformes
48	Little Grebe	*Tachybaptus ruficollis*	Podicipedidae	Podicipediformes

S. No.	Common Name	*Scientific*	Family	Order
49	Eurasian Coot	*Fulica atra*	Rallidae	Gruiformes
50	Common Moorhen	*Gallinula chloropus*	Rallidae	Gruiformes
51	Purple Swamp hen	*Porphyrio porphyrio*	Rallidae	Gruiformes
52	White Breasted Water Hen	*Amaurornis phoenicurus*	Rallidae	Gruiformes
53	Black winged Stilt	*Himantopus himantopus*	Recurvirostridae	Charadriiformes
54	Greater painted snipe	*Rostratula benghalensis*	Rostratulidae	Charadriiformes
55	Eurasian Curlew	*Numenius arquata*	Scolopacidae	Charadriiformes
56	Black tailed Godwit	*Limosa limosa*	Scolopacidae	Charadriiformes
57	Common Greenshank	*Tringa nebularia*	Scolopacidae	Charadriiformes
58	Common Redshank	*Tringa totanus*	Scolopacidae	Charadriiformes
59	Spotted Redshank	*Tringa erythropus*	Scolopacidae	Charadriiformes
60	Ruff	*Calidris pugnax*	Scolopacidae	Charadriiformes
61	Common Sandpiper	*Actitis hypoleucos*	Scolopacidae	Charadriiformes
62	Green Sandpiper	*Tringa ochropus*	Scolopacidae	Charadriiformes
63	Marsh Sandpiper	*Tringa stagnatilis*	Scolopacidae	Charadriiformes
64	Wood Sandpiper	*Tringa glareola*	Scolopacidae	Charadriiformes
65	Common Snipe	*Gallinago gallinago*	Scolopacidae	Charadriiformes
66	Pin tailed Snipe	*Gallinago stenura*	Scolopacidae	Charadriiformes
67	Little Stint	*Calidris minuta*	Scolopacidae	Charadriiformes
68	Temminck's Stint	*Calidris temminckii*	Scolopacidae	Charadriiformes
69	Black headed Ibis	*Threskiornis melanocephalus*	Threskiornithidae	Pelecaniformes
70	Glossy Ibis	*Plegadis falcinellus*	Threskiornithidae	Pelecaniformes
71	Red- naped Ibis	*Pseudibis papillosa*	Threskiornithidae	Pelecaniformes
72	Eurasian Spoonbill	*Platalea leucorodia*	Threskiornithidae	Pelecaniformes

Table 2. Wetland birds recorded at *Bhadalwadi* Lake

Common Name	Open Water	Marshy	Shallow water fringe area	Mudflat	Dry sandy bank	Feeding Guild	Abundance	IUCN status (2016)
Eurasian Coot	+	-	-	-	-	O	C	LC
Great Cormorant	+	-	+	-	-	CV	FC	LC
Indian Cormorant	+	-	+	-	-	CV	FC	LC
Little Cormorant	+	-	+	-	-	CV	C	LC
Eurasian Curlew		-	+	-	+	I	UC	NT
Darter	+	-	+	-		P	RA	NT
Indian spot billed Duck	+	-	+	-	-	H	FC	LC
Lesser whistling Duck	+	+	-	-	-	O	FC	LC
Tufted Duck	+	-	+	-	-	H	UC	LC
Cattle Egret	+	-	-	+	+	CV	C	LC
Great Egret	-	-	-	+	-	CV	UC	LC
Intermediate Egret	-	-	+	+	-	CV	UC	LC
Little Egret	-	-	-	+	-	CV	C	LC
Eurasian Wigeon	-	-	+	-	-	H	C	LC
Gadwall	-	-	+	-	-	H	C	LC

Common Name	Open Water	Marshy	Shallow water fringe area	Mudflat	Dry sandy bank	Feeding Guild	Abundance	IUCN status (2016)
Garganey	+	-	-	-	-	H	FC	LC
Cotton Pygmy Goose	+	+	-	-	-	O	UC	LC
Black crowned Night Heron	-	+	-	+	-	CV	UC	LC
Grey Heron	-	+	-	+	-	CV	C	LC
Indian Pond Heron	-	+	-	+	-	CV	C	LC
Striated Heron	-	+	-	+	-	CV	UC	LC
Purple Heron	-	+	-	+	-	CV	UC	LC
Black headed Ibis	-	+	+	+	-	I	FC	NT
Glossy Ibis	-	+	-	+	-	I	FC	LC
Red napped Ibis	-	+	-	+	-	I	FC	LC
Pheasant tailed Jacana	-	+	-	-	-	H	RA	LC
Common Kingfisher	-	+	+	-	-	P	C	LC
Pied Kingfisher	-	-	+	-	-	P	RA	LC
White throated Kingfisher	-	+	+	-	-	CV	FC	LC
Little Grebe	+	-	-	-	-	I	FC	LC
Common Moorhen	-	+	+	-	-	O	FC	LC
Northern Pintail	-	+	+	-	-	O	C	LC
Northern Shoveler	-	-	+	-	-	O	C	LC
Asian Openbill	-	-	+	+	-	P	C	LC
Ruddy Shelduck	-	-	+		+	H	FC	LC
Eurasian Spoonbill	-	+	-	+	-	O	C	LC
Temminck's Stint	-	+	-	+	-	I	FC	LC
Painted Stork	-	+	-	+	-	O	C	NT
Asian Woollyneck	-	+	-	+	-	O	UC	VU
Purple Swamphen	-	+	+	-	-	O	FC	LC
Common Teal	+	-	-	-	-	O	UN	LC
Great Thick Knee	-	-	-	-	+	I	FC	NT
White Breasted Water Hen	-	+	+	-	-	O	C	LC

(Abundance: C - Common, FC - Fairly common, UC - Uncommon, RA – Rare;
Feeding, I - Insectivore, O - Omnivore, CV - Carnivore, H - Herbivore, P-Piscivore,
IUCN Status: LC- Least concern, NT- Near threatened, VU-Vulnerable)

Table 3: Wetland birds recorded at *Palasdeo* Lake

Common Name	Open Water	Marshy	Shallow water	Mudflat	Dry sandy bank	Feeding Guild	Abundance	IUCN status (2016)
Eurasian Coot	+	-	-	-	-	O	C	LC
Great Cormorant	+	-	+	-	-	CV	FC	LC

Common Name	Open Water	Marshy	Shallow water	Mudflat	Dry sandy bank	Feeding Guild	Abundance	IUCN status (2016)
Indian Cormorant	+	-	+	-	-	CV	FC	LC
Little Cormorant	+	-	+	-	-	CV	C	LC
Darter	+	-	+	-	-	P	RA	NT
Indian spot billed Duck	+	-	+	-	-	H	FC	LC
Knob billed Duck	-	-	+	+	-	O	RA	LC
Lesser whistling Duck	+	+	-	-	-	O	FC	LC
Tufted Duck	+	-	+	-	-	H	UC	LC
Cattle Egret	+	-	-	+	+	CV	C	LC
Great Egret	-	-	-	+	-	CV	UC	LC
Intermediate Egret	-	-	+	+	-	CV	UC	LC
Little Egret	-	-	-	+	-	CV	C	LC
Eurasian Wigeon	-	-	+	-	-	H	C	LC
Gadwall	-	-	+	-	-	H	C	LC
Garganey	+	-	-	-	-	H	FC	LC
cotton Pygmy Goose	+	+	-	-	-	O	UC	LC
Black tailed Godwit	+	-	+	-	-	I	UN	NT
Bar headed Goose	-	+	-	+	-	O	FC	LC
Common Greenshank	-	+	-	+	-	I	FC	LC
Black headed Gull	+	-	-	-	+	P	C	LC
Brown headed Gull	+	-	-	-	+	P	C	LC
Black crowned Night Heron	-	+	-	+	-	CV	UC	LC
Grey Heron	-	+	-	+	-	CV	C	LC
Indian Pond Heron	-	+	-	+	-	CV	C	LC
Striated Heron	-	+	-	+	-	CV	UC	LC
Purple Heron	-	+	-	+	-	CV	UC	LC

Common Name	**Open Water**	**Marshy**	**Shallow water**	**Mudflat**	**Dry sandy bank**	**Feeding Guild**	**Abundance**	**IUCN status (2016)**
Black headed Ibis	-	+	+	+	-	I	FC	NT
Glossy Ibis	-	+	-	+	-	I	FC	LC
Red napped Ibis	-	+	-	+	-	I	FC	LC
Common Kingfisher	-	+	+	-	-	P	C	LC
Pied Kingfisher	-	-	+	-	-	P	RA	LC
White throated Kingfisher	-	+	+	-	-	CV	FC	LC
Red-wattled Lapwing	-	-	-	+	+	I	C	LC
Little Grebe	+	-	-	-	-	I	FC	LC
Common Moorhen	-	+	+	-	-	O	FC	LC
Northern Pintail	-	+	+	-	-	O	C	LC
Northern Shoveler	-	-	+	-	-	O	C	LC
Asian Openbill	-	-	+	+	-	P	C	LC
Little Ringed Plover	-	-	-	-	+	I	C	LC
Little Pratincole	-	-	-	-	+	I	C	LC
Common Redshank	-	+	-	+	-	I	FC	LC
Spotted Redshank	-	+	-	+	-	I	FC	LC
Ruff	-	+	-	+	-	I	RA	LC
Common Sandpiper	-	+	-	+	-	I	FC	LC
Green Sandpiper	-	+	-	+	-	I	UC	LC
Marsh Sandpiper	-	+	-	+	-	I	UC	LC
Wood Sandpiper	-	+	-	+	-	I	FC	LC
Ruddy Shelduck	-	-	+	-	+	H	FC	LC
Common Snipe	-	+	-	-	-	I	FC	LC
Greater painted Snipe	-	+	-	+	-	I	UC	LC
Pin tailed Snipe	-	+	-	-	-	I	UC	LC

Common Name	Open Water	Marshy	Shallow water	Mudflat	Dry sandy bank	Feeding Guild	Abundance	IUCN status (2016)
Eurasian Spoonbill	-	+	-	+	-	O	C	LC
Black winged Stilt	-	+	+	-	-	CV	C	LC
Little Stint	-	-	-	+	-	I	FC	LC
Temminck's Stint	-	+	-	+	-	I	FC	LC
Painted Stork	-	+	-	+	-	O	C	NT
Asian Woolly necked	-	+	-	+	-	O	UC	VU
Purple Swamp hen	-	+	+	-	-	O	FC	LC
Common Teal	+	-	-	-	-	O	UC	LC
Caspian Tern	+	-	-	-	+	P	C	LC
Gull billed Tern	+	-	-	-	+	P	C	LC
River Tern	+	-	-	-	+	P	C	NT
Whiskered Tern	+	-	-	-	+	P	C	LC
Eurasian Thick Knee	-	-	-	-	+	I	FC	LC
Great Thick Knee	-	-	-	-	+	I	UC	NT
Grey Wagtail	-	-	-	-	+	I	FC	LC
Yellow Wagtail	-	-	-	+	+	I	UC	LC
White browed Wagtail	-	-	-	-	+	I	FC	LC
White Breasted Water Hen	-	+	+	-	-	O	C	LC

(Abundance: C - Common, FC - Fairly common, UC - Uncommon, RA – Rare;
Feeding, I - Insectivore, O - Omnivore, CV - Carnivore, H - Herbivore, P-Piscivore,
IUCN Status: LC- Least concern, NT- Near threatened, VU-Vulnerable) (IUCN, 2016)

Order Charadrriformes possess most diversified families and species which is 8 and 28 respectively (Fig. 3). Maximum number of species was observed from the families Scolopacidae and Anatidae respectively.

Among the aquatic birds recorded during the study; 37.5% constitute migrants and 62.5% residents (Fig.4). Wetland and wetland dependent birds formed major portion of these migrants. Based on the frequency of sightings, 5 species were found to be rare, 17 were uncommon, 25 were fairly common and 25 aquatic birds' species

observed to be common. The first and foremost requirements of migratory birds at their wintering grounds are adequate food supply which is fulfilled by this wetland as it was situated amidst fertile agricultural fields.

The composition of birds in major feeding guilds in the *Palasdeo* lake showed that the insectivore guild was the most common with 37.14% species (Fig.5), followed by carnivore (20%), omnivore (20%), piscivore (14%), and herbivore (8.57%).

At *Bhadalwadi* lake composition of birds for major feeding guilds was Carnivorous (30.23%), followed by omnivorous 27.9% species, herbivore 16.27% species, insectivore 16.2% species and piscivore 9.30% species. The diversity of the wetland birds documented during the present study may be due to the presence of a wide spectrum of feeding niches.

Wetland birds exploit a variety of habitats and depend upon a mosaic of microhabitats for their survival. *Bhadalwadi* lake supports 43 wetland bird species out of which 22 species which prefer shallow water fringe area followed by 21 species preferring Marshy, 20 species preferring mudflat region, 13 species preferring open water and 4 species which prefer dry sandy bank.

However, 70 Bird species recorded at *Palasdeo* lake out of which 33 species prefer marshy area followed by preference of 31 species to mudflats, 23 species use shallow water fringe area, 20 species prefer open water and 17 species were observed to utilize dry sandy bank area (Fig 6).

In the present study, irrigated agricultural fields surrounding wetlands, with scattered trees probably provides shelter and suitable foraging grounds for the wetland birds. The said habitats are supporting different food sources like fish, crustaceans, invertebrates, water plants and plankton which further adds to the diversity of wetland birds.

Six near threatened and a vulnerable species were recorded during the study. Among these Eurasian Curlew-*Numenius arquata*, Darter-*Anhinga melanogaster*, Black tailed Godwit- *Limosa limosa*, Black headed Ibis-*Threskiornis melanocephalus*, Painted Stork-*Mycteria leucocephala*, River Tern -*Sterna aurantia*, Great Thick Knee-*Esacus recurvirostris* are in near threatened (NT) category however, Asian Woolly neck - *Ciconia episcopus* is a vulnerable as per IUCN Red List of threatened species 2016 (Fig 7).

The Cluster analysis was also done to understand the similarity among both the wetlands. Jaccard's similarity value was 0.58. A dendrogram shows groupings based on the species assemblage and abundance at *Bhadalwadi* and *Palasdeo* wetlands

(Fig. 8).

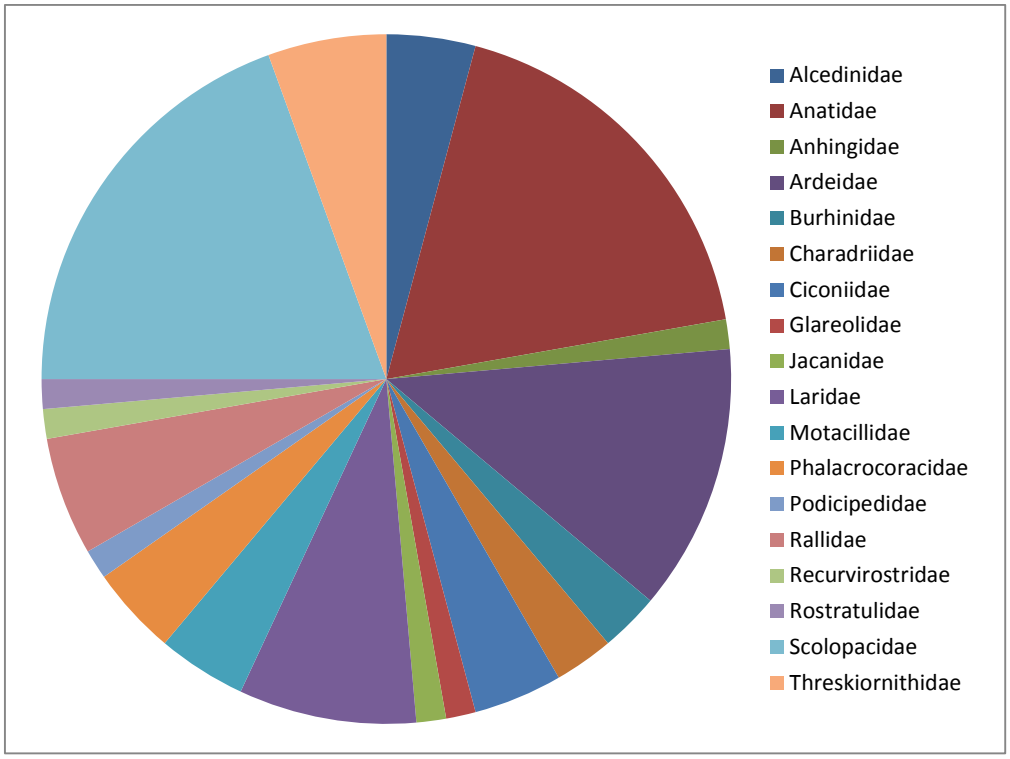

Figure 2. Family wise distribution of wetland birds

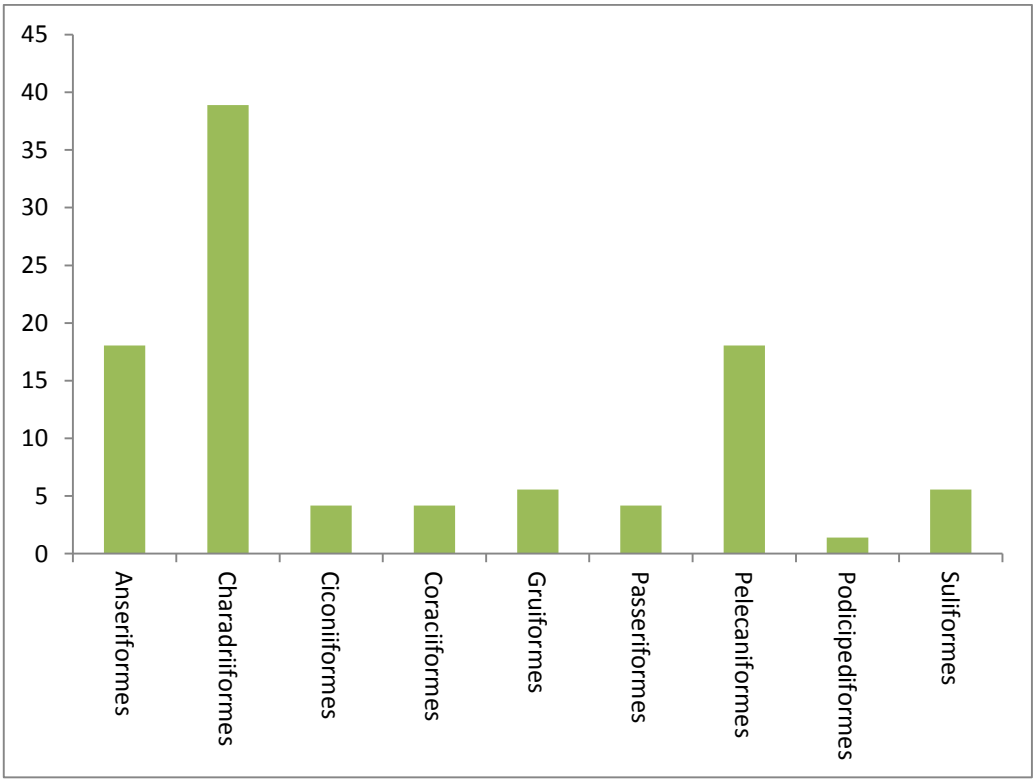

Figure 3. Order wise distribution of wetland birds

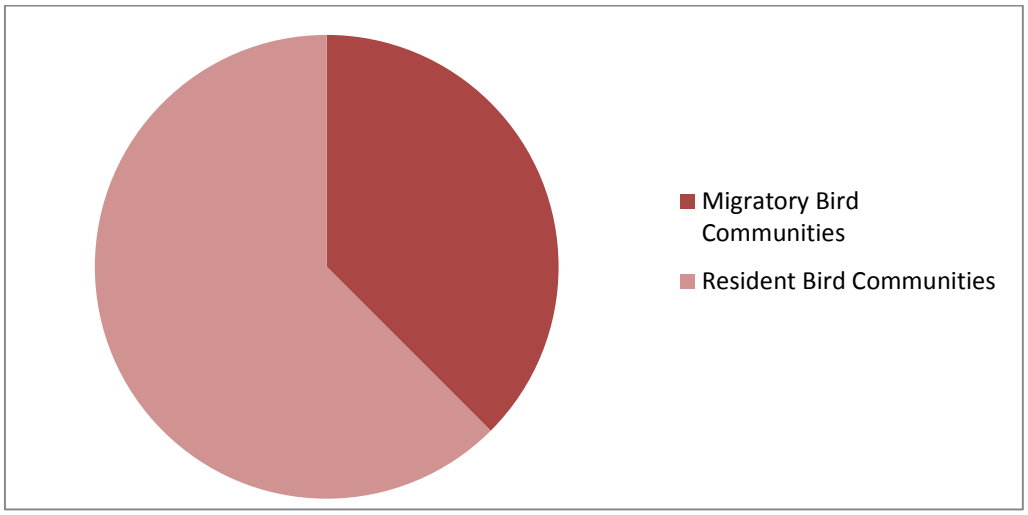

Figure 4. Status of wetland bird from *Bhadalwadi* and *Palasdeo* Lake

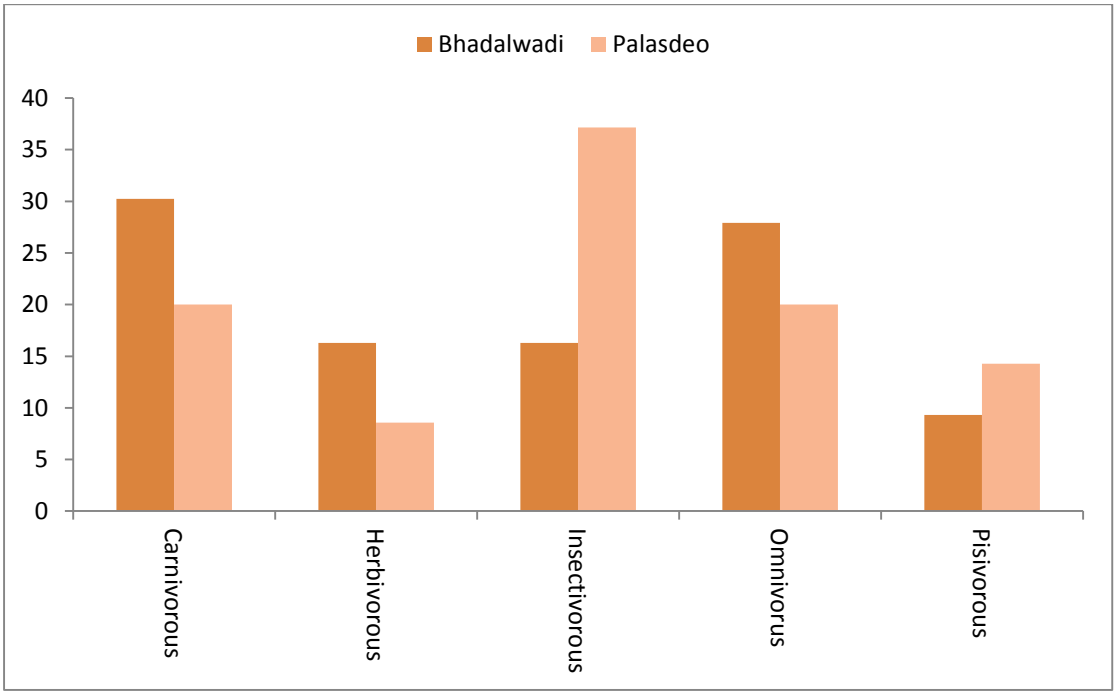

Figure 5. Percentage feeding guild composition

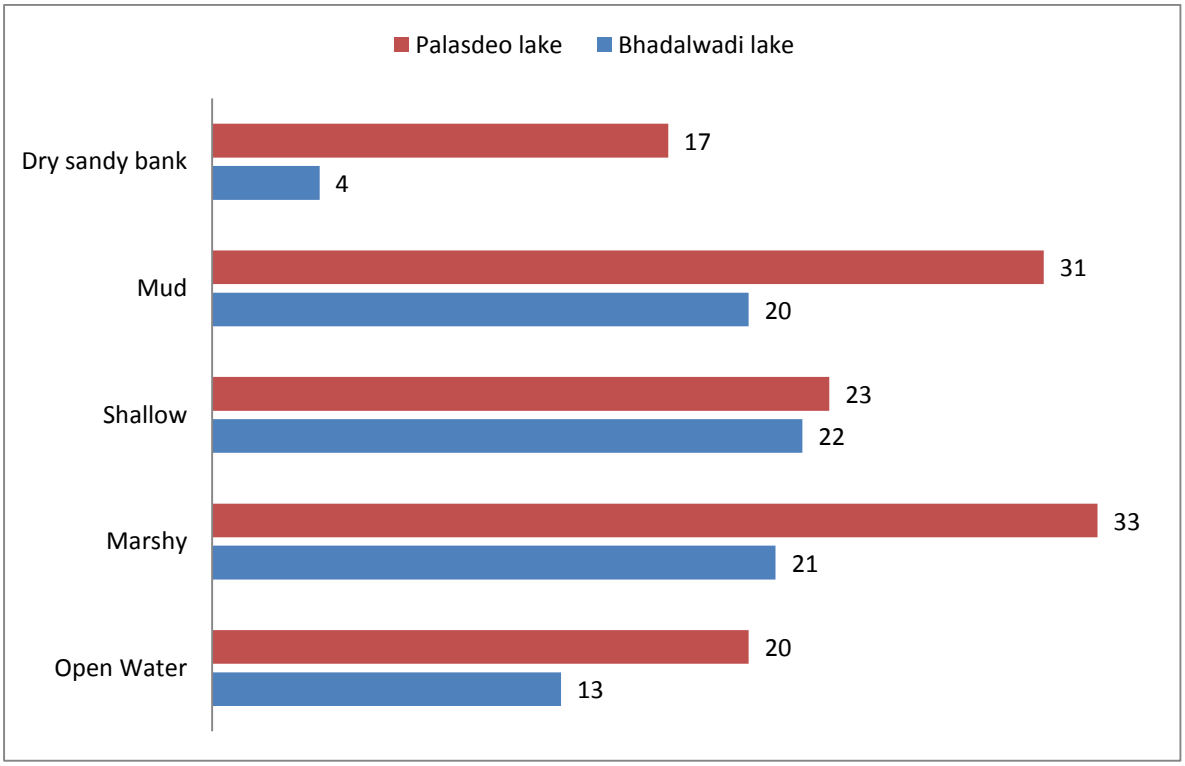

Figure 6. Habitat use by wetland bird communities at *Bhadalwadi* and *Palasdeo* Lake

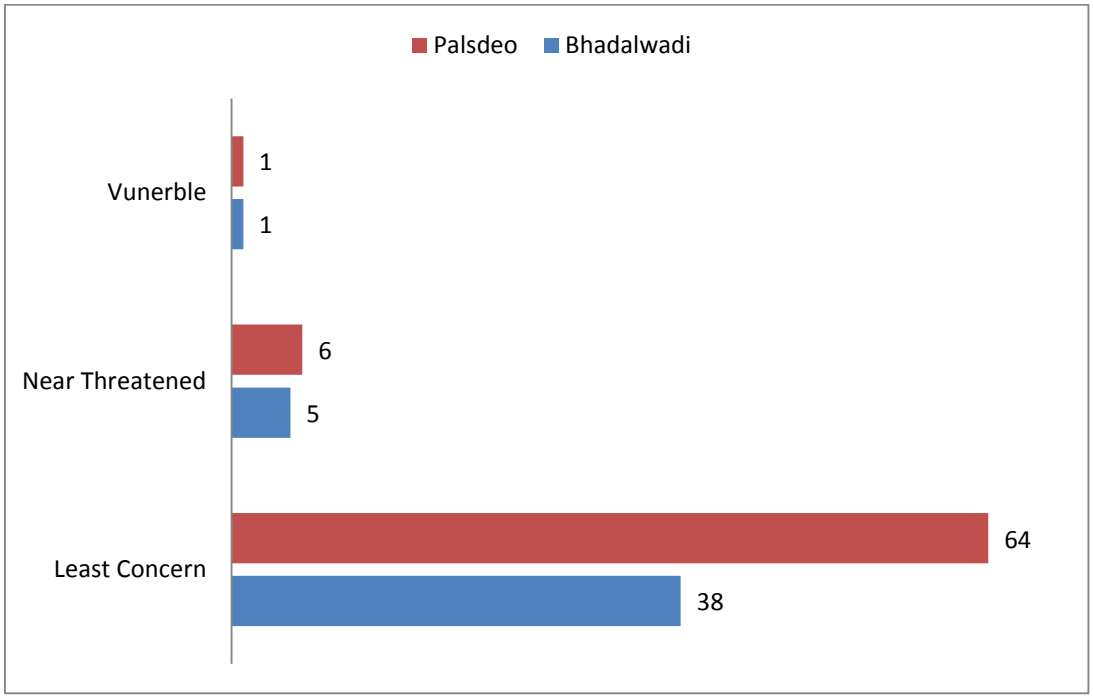

Figure 7. Number of Endangered category bird species

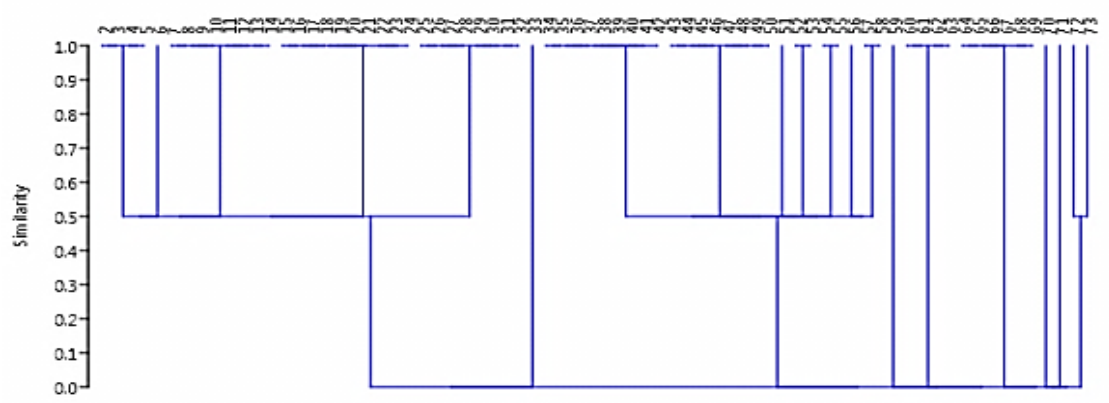

Figure 8. Wetland bird similarity based on Jaccard's index (Paired group UPGMA).

CONCLUSION

It was observed that both the lakes ecologically support various birds' communities with a meager difference. The bird's communities were observed to exploit a variety of microhabitats in both lakes. 51.16 % species of *Bhadalwadi* lake prefer shallow water fringe area followed by 48.83% species preferring Marshy land, 46.51% species preferring mudflat region, 30.23% species preferring open water and 9.30% species prefer dry sandy bank. At *Palasdeo* lake 47.14 % species prefer marshy area, followed by 44.28% species use mudflats region, 32.85% species prefer shallow water fringe area, 28.57 % species utilize open water and 24.28 % species prefer dry sandy bank area.

Commonly these two wetlands are supporting around six bird species which are in IUCN Red list of threatened species. Hence, conservation of these niche habitats becomes imperative for the conservation of these birds species. Common major threats found to be affecting the wetlands were sand mining, pumping, fishing, poaching and pollution. Local communities are unaware of the fact that the birds of international importance are residing near their vicinity. Education and awareness among the local communities and promotion of tourism and nature interpretation activities will add to the employment as well as conservation of the birds at the same time. In addition to that, a detailed management action plan may be prepared for the protection of these lakes from poachers and hunters, in which guidelines about the sustainable fishing may also be highlighted. Further studies in this regard are advised to be conducted in order to achieve the community based conservation efforts.

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