



Diversity of Wetland Birds at Bikli Lake near Nagbhid, Maharashtra (India)

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ABSTRACT

The present study was undertaken to explore water bird diversity, and their residential status in and around the study area. Bikli lake (20°65'70.07"N and 79 °61'12.74"E) is located within newly approved Ghodazari Sanctuary by Government of Maharashtra., spreads over an area of about 90 Acres. The shallow water reservoir dispersed with shrubby islands and surrounding dense semi-deciduous tropical forest on one and paddyfields on another, presents unique agro-forest ecosystem which provides suitable feeding ground for wetland avifauna. During study period, spanning from, May, 2015 to April. 2017, in total 5022 specimens of 52 species, belongs to 35 genuses, were recorded. They belong to 14 families and 7 orders. Maximum abundance recorded from Ord - Charadiformes with 28.57 % (n=16) of abundance followed by ord-Anseriformes and Peliconiformes 21% (n=12) among the observed community of water birds, fam- Anatidae recorded maximum abundance with 23% (n=12) followed by Fam-Ardeidae 17.30 % (n=9) and Fam - Scolopacidae 15.38% (n=8). The results obtained in the present investigation of bird indicates that, agro-forest ecosystem of Tukuim pond impacted the composition of bird community, as 64% of total birds are residents or residents showing local migration (R and R/LM) is in conformity with other studies on avian diversity in area having agricultural landscape. Painted stork (*Mycteria leucocephala*), Black Headed Ibis (*Threskiornis melanocephalus*) and Darter (*Anhinga melanogaster*) included in the Near Threatened (NT) category. The present study suggested that, as study site has been visited by the numerous migratory during winter season, due to anthropogenic disturbances like intensification of agricultural activities, poaching and intensified fishing activity, there is urgent need to chalk out conservation measures in near future.

Keywords: Peliconiformes, Anatidae, Charadiformes, Darter.

INTRODUCTION

Birds play many important functions to maintain the health of ecosystems through their actions as pollinators, seed dispersers, predators, scavengers, and as prey for other species. (Gregary, et al., 2003). Wetland

birds are an important component of wetland ecosystem, as they form vital links in the food webs. (Ramsar Convention, 2016). Wetlands are under great pressure in the Asiatic region, as 20% of threatened bird species found in such habitats, including freshwater lakes, rivers, marshes, coastal lagoons and intertidal flats. (Arunkumar, et al., 2005). The birds inhabiting in and around water reservoir and dependent on wetland directly or indirectly for feeding, breeding, nesting or roosting are commonly called water birds or wetland birds (Kumar & Gupta 2013; Ramsar Convention, 2016;). Loss of natural wetlands is a global phenomenon that has severe consequences for waterbird populations and their ecosystem services. Waterbirds includes, waders like dabbling ducks, goose, shanks, herons, egrets, plovers, sandpipers, and waterfowls, like waterhens, watercocks cormorants etc which are water body associated birds (Boere, et, al. 2006; Ramsar Convention, 2016). Many conservation studies highlighted an importance of agro-forest ecosystem in reducing the impact of natural habitat loss, and its major role in the conservation of waterbirds. (Boere, et, al. 2006; Wilson, et al., 2007).

Birds travel to their non-breeding wintering grounds in Indian subcontinent and on their way back to their breeding areas in northern Eurasia, Russia and Arctic region. (Bamford, et al., 2008; Galbraith, et al., 2014). These journeys on predetermined flyways are repeated every year requiring precise orientation and high energy consumption, as an ecological adaptation to different environmental conditions to exploit food resources at different times of the year. (Delany, et, al., 2009; Galbraith, et al., 2014). 20% of all known species, make regular seasonal movements. (Delany et al, 2009). Many travel thousands of miles between their breeding places and their wintering grounds. But more than 40% of these migratory species are declining, and nearly 200 are now classified as globally threatened. (Delany et al, 2009). Many of these declining species were once common, and their arrivals and departures are significant cultural events throughout much of the world. (Delany, et, al. 2009). Conservation strategies for waterbird population revolves around the flyways of individual biogeographical populations, geographical limits of breeding and non-breeding population, information about number of individuals of species, number of species, ecological processes at their wintering grounds. (Boere, et, al. 2006).

Most of the study pertaining to diversity of avifauna in this eastern part of the Vidarbha (Maharashtra) carried out in protected forests like Tadoba-Andhari Tiger Reserve. The study area, Bikli, located within the newly declared Ghodazari Sanctuary in Maharashtra and on the transit area of wild life between Tadoba-Andhari Tiger Reserve and Karhandla Wildlife Sanctuary. . The study area has been in media during past few years due to man-wild conflict due to casualties inflicted by wild animals like tiger, leopard and wild boar on human life. Hence this study has been undertaken to explore rich avifauna of this unexplored habitat in order to chalk out strategies for conservation of water birds.

MATERIALS AND METHODS

Study area

The study was conducted in Bikli Lake (20°65'70.07"N and 79 °61'12.74"E) located within the Chandrapur district administration of Maharashtra, spreads over an area of about 90 Acres. (Fig.1). It is surrounded on one side by large expanse of rocky plateau having mixed vegetation of tropical dry and moist deciduous vegetation while on another side by paddy fields. The shallow water reservoir with surrounding deep semi-deciduous tropical forest presents unique agro-forest ecosystem which provides suitable feeding ground for wetland avifauna. Rainfall varies from 800 mm to 1400 mm annually and begins from May-June and continues till the end of September. Average temperature drops to 9-15 °C in winter (Nov. to Feb.) and rises to 42-45 °C in summer (April-June).



Fig.1. Study area of Bikli lake showing eight line transects

Bird Sampling

Field observations of waders and waterfowls were recorded by random visits to the study area, during May, 2015 to April, 2017. For the census of water birds

line transect count method was used to estimate water bird population (Sutherland, et al., 2004). Accordingly eight point transects with a distance of about 800m were randomly selected in the study area by taking into consideration suitability of location. (Fig.1). Average 9 sightings per year were carried out with 6 sighting from Oct. to Mar while 3 sightings during rest of the year. Observation of birds was done by 10x50 DPSI Wide-Angle Binocular (Olympus make) and wherever possible photographed by Canon EOS 200D digital camera. Species identification of observed birds was done with the help of standard identification keys (Ali and Ripley, 2001; Kumar, et al., 2005; Grimmett *et. al.*, 2011). Qualitative data on foraging guild, migratory status, breeding biology and behavior of birds and threats to vegetation were gathered throughout the study period. Permanent sampling points were established in each transect maintaining a minimum of 100 m distance between the points. Sampling was conducted mostly during morning (06 30 to 09 30 hrs) and during afternoon (15 30 to 18.30 hrs) covering three major seasons, namely summer (March-May), monsoon (June-August).

Data Analysis

The information on order, family and species composition, residential status, foraging guild, and IUCN status of observed birds were tabulated.

Waterbirds observed were categorized into groups based on their relative numbers of sightings as, Very Common (Vcom) > 28 - 36, Common (Com) 22- 27, Uncommon (UnCom) 14 - 21, Rare (Ra) 8 - 13, Very Rare (VRa) 1-7. The density pattern was calculated by the formula -

$$D = \frac{I}{L} \times 100$$

Where, D is the density, I is number of specimens of each species, L is the number of all specimens.

RESULT AND DISCUSSION:

During study period, spanning from, May, 2015 to April, 2017, in total 5022 specimens of 52 species of water birds, belongs to 36 genus, were recorded. They belong to 14 families and 7 orders. (Table.1).

Maximum abundance recorded from Ord - Charadiformes with 28.57 % (n=16) of abundance followed by ord-Anseriformes and Peliconiformes 21% (n=12). (Fig.2) among the observed community of waterbird, fam- Anatidae recorded maximum abundance with 23% (n=12) followed by Fam- Ardeidae 17.30 % (n=9) and Fam - Scolopacidae 15.38% (n=8).

Table.1. Checklist of birds observed at Bikli Lake showing Total count, Density, total sightings, Residential status, foraging guild, IUCN conservation status, and Abundance.

Sr. N.	Common Name	Zoological Name	Tot. Count	Tot Sig.	Density Pattern (%)	Res. Status	For. Guild	IUCN	Abundance
Ord - Ciconiformes									
Fam -Ciconidae									
1	Painted stork	<i>Mycteria leucocephala</i>	102	9	2.031	R/LM/SM	P	NT	UnCom
2	Asian Openbill Stork	<i>Anastomus oscitans</i>	82	14	1.632	R/LM/SM	P,C	LC	Com
Ord - Peliconiformes									
Fam- Ardeidae									
3	Purple Heron	<i>Ardea pupurea</i>	25	10	0.497	R/LM/WM	P,I	LC	UnCom
4	Indian Pond Heron	<i>Ardea grayii</i>	146	18	2.907	R	P	LC	VCom
5	Grey Heron	<i>Ardea cinerea</i>	40	10	0.796	R/LM	P,C,I	LC	UnCom
6	Intermediate Egret	<i>Ardea intermedia</i>	99	11	1.971	R/LM/SM	P	LC	Com
7	Little Green Heron	<i>Butorides striatus</i>	12	8	0.238	R	P,C,I	LC	UnCom
8	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	96	8	1.911	R/LM/WM	P	LC	UnCom
9	Cattle Egret	<i>Bubulcus ibis</i>	480	18	9.557	R	I	LC	VCom
10	Little Egret	<i>Egretta garzetta</i>	209	18	4.161	R/LM	P	LC	VCom
11	Large Egret	<i>Casmerodius albus</i>	76	10	1.513	R/LM/SM	P,C	LC	Com

Fam - Threskiornithidae									
12	Black Headed Ibis	<i>Threskiornis melanocephalus</i>	70	10	1.393	R/WM/SM	P	NT	Com
13	Eurasian Spoonbill	<i>Platalea leucorodia</i>	14	8	0.278	WM	C	LC	Ra
14	Red Naped Ibis	<i>Pseudibis papilosa</i>	108	16	2.150	R/LM	P	LC	VCom
Ord - Sulliformes									
Fam - Phalacrocoracidae									
15	Little Cormorant	<i>Phalacrocorax niger</i>	269	16	5.356	R/LM	P	LC	VCom
16	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	71	16	1.413	R/LM	P	LC	VCom
17	Great Cormorant	<i>Phalacrocorax corbo</i>	31	7	0.617	R/LM/WM	P	LC	Ra
Fam - Anhingidae									
18	Darter	<i>Anhinga melanogaster</i>	62	14	1.234	R/WM/SM	P	NT	Com
Ord - Gruiformes									
Fam - Raliidae									
19	White breasted Waterhen	<i>Amaurornis phoenicurus</i>	62	16	0.686	R	O	LC	UnCom
20	Eurasian Coot	<i>Fulica atra</i>	277	17	3.064	WM	O	LC	UnCom
21	Watercock	<i>Gallicrex cineria</i>	70	12	0.774	WM	O	LC	Ra
22	Common Moorhen	<i>Gallinula chloropus</i>	172	24	1.902	R	O	LC	Com
23	Grey Headed Swampen	<i>Porphyrio poliocephalus</i>	173	28	1.913	R/LM	O	LC	Com
Ord - Charadriiformes									
Fam - Charadriidae									
24	Little Ringed Plover	<i>Charadrius dubios</i>	77	14	1.533	R/LM	I	LC	Com
25	Red Wattled Lapwing	<i>Vanellus indicus</i>	73	18	1.453	R	C	LC	Vcom
26	Yellow Wattled Lapwing	<i>Vanellus malabaricus</i>	79	10	1.573	R/LM/WM	C	LC	UnCom
Fam - Scolopacidae									
27	Temminck's Stint	<i>Calidris temminckii</i>	35	10	0.696	WM	I	LC	UnCom
28	Common Snipe	<i>Gallinago gallinago</i>	19	6	0.378	R/WM/SM	I	LC	Ra
29	Spotted Redshank	<i>Tringa erythropus</i>	143	8	2.847	WM	C,I	LC	UnCom
30	Common Redshank	<i>Tringa totanus</i>	171	5	3.405	WM	C,I	LC	Ra
31	Common Greenshank	<i>Tringa nebularia</i>	80	8	1.592	WM	C,I	LC	Ra
32	Green Sandpiper	<i>Tringa ochropus</i>	87	8	1.732	WM	C,I	LC	Ra
33	Wood Sandpiper	<i>Tringa glareola</i>	97	10	1.931	R/LM/WM	C	LC	Com
34	Common Sandpiper	<i>Actitis hypoleucos</i>	56	6	1.115	WM	C	LC	Ra
Fam - Jacanidae									
35	Bronze Winged Jacana	<i>Metopodius indicus</i>	77	14	1.533	R/LM	O	LC	Com
36	Pheasant Tailed Jacana	<i>Hydrophasianus chirugus</i>	63	12	1.254	R/LM	H	LC	Com
Fam - Rostratulidae									
37	Greater Painted Snipe	<i>Rostratula benghalensis</i>	37	6	0.736	R/WM/SM	C	LC	Ra
Fam - Laridae									
38	River Tern	<i>Sterna aurantia</i>	57	12	1.135	R/LM	P,C	LC	Com
Fam - Recurvirostridae									
39	Black Winged Stilt	<i>Himantopus himantopus</i>	61	20	1.214	WM	C	LC	UnCom
Ord - Anseriformes									
Fam - Anatidae									
40	Lesser Whistling duck	<i>Dedrocygna javanica</i>	195	14	3.882	R/LM/WM	H	LC	Vcom
41	Eurasian Wigeon	<i>Mareca penelope</i>	101	8	2.011	WM	H	LC	UnCom
42	Gadwall	<i>Mareca strepera</i>	143	8	2.847	WM	H	LC	UCom
43	Red Crested Pochard	<i>Netta rufina</i>	39	4	0.776	WM	H	LC	VRa
44	Grelag Goose	<i>Anser anser</i>	53	5	1.055	WM	H	LC	UnCom
45	Bar-headed goose	<i>Anser indicus</i>	86	8	1.712	WM	H	LC	UnCom
46	Indian spot billed	<i>Anas poecillorhyncha</i>	104	14	2.070	R/LM/WM	H	LC	Com

	duck								
47	Northern pintail	<i>Anas acuta</i>	233	8	4.639	WM	H	LC	UnCom
48	Garganey	<i>Anas querquedula</i>	119	8	2.369	WM	O	LC	UnCom
49	Common Teal	<i>Anas crecca</i>	50	6	0.995	WM	H	LC	Ra
50	Knob-billed duck	<i>Sarkidiornis melanotos</i>	56	6	1.115	WM	H	LC	Ra
51	Cotton Pygmy Goose	<i>Nettapus coromandianus</i>	113	14	2.250	R/LM/WM	H	LC	Com
Ord - Podicepediformes									
Fam - Podicepedidae									
52	Little Grebe	<i>Tachybaptus ruficolis</i>	181	6	1.612	R/LM	C	LC	Ra

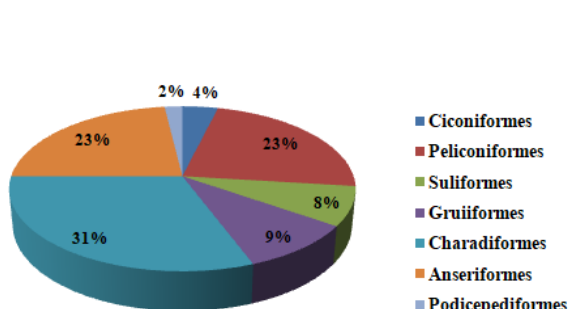


Fig.2. Graph showing abundance of water bird orders

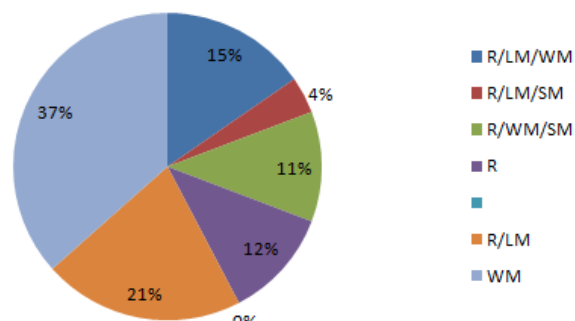


Fig.3. Graph showing residential status of water bird community

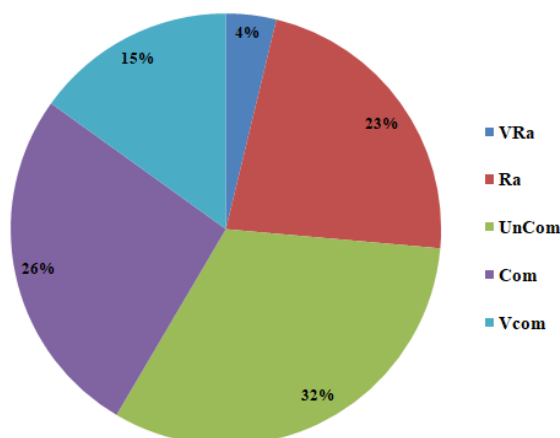


Fig. 4. Graph showing abundance water bird community

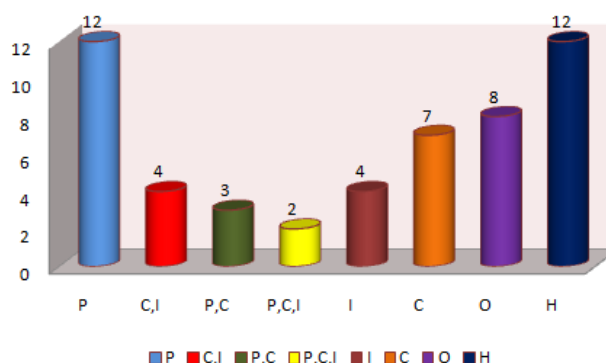


Fig.5. Foraging guild of waterbird community of study area

Water bird community of Bikli Lake, categorized on the basis of overall sightings throughout study period of four years. (Fig.3). It reveals that, maximum abundance 32.69% (n=17) recorded from uncommon (UCom) water bird species followed by 26.92% (n=14) each from common (Com) and rare (Ra) birds. Uncommon (UCom) and rare (Ra) contributes to the richness of water bird diversity of study area. Residential status of water bird species observed during study period includes, 37% (n=19) winter migrants (WM), followed by 21% (n=11) residents with local migration (R/LM) and 16% (n=8) residents with winter influx as well as showing local migration (R/LM/WM) (Fig.3), while birds showing Resident with summer influx (R/LM/SM) and Resident with

winter influx as well as summer movements (R/WM/SM) show least abundance. Foraging guild of water bird community of study area reveals that, maximum abundance 23% (n=12) recorded of herbivorous (H) and piscivorous (P) dabbling ducks, followed by 15.38% (n=8) omnivorous (O) birds. (Fig.4),

Distribution status of birds recorded in study area indicates, substantial number of bird species showing wide distribution range, included under least concern (LC) category 94% (n=49), while only three species of waterbirds enlisted in the Red Data list of IUCN. Painted stork (*Mycteria leucocephala*), Black Headed Ibis (*Threskiornis melanocephalus*) and Darter

(*Anhinga melanogaster*) included in the Near Threatened (NT). (Table. 1)

DISCUSSION

In the present study, water bird diversity of Bikli Lake was analyzed to assess, diversity of water bird species and abundance, diet guild, residential status, and IUCN status in relation to trend in Indian subcontinent as well as global trend during past 2 years study period. Ecosystem of local area impacted composition of bird community and their foraging guild (Gregory, *et al.*, 2003; Bhagvat, *et al.*, 2008; Karanth, *et al.*, 2016). It reflects in the results obtained in the present investigation of waterbird indicates that, agro-forest ecosystem of Bikli Lake impacted the composition of water bird community. Among the water bird species recorded during study period of four years, substantial abundance (63%; n=33) of winter migrants (WM, R/LM/WM and R/WM/SM), highlighted the importance of Bikli Lake from the conservation point of view, as trend in global as well as in Indian Subcontinent, is towards sharp decline in the diversity of water birds. (UNEP/CMS, 2014; Sackl and Ferger, 2016). Moreover, winter migratory (WM) water birds having breeding grounds in Northern Eurasia, Balkan region and Arctic region make absolute abundance (38%) among the total recorded water bird species, witnesses steep decline with few exceptions of Northern Pintail, Gadwall, Cotton Pygmy Goose and Spotted Redshank (Bamford, *et al.*, 2008; Galbraith, *et al.*, 2014).

During present study, among the recorded water bird species, fam-Anatidae shows maximum abundance. Individuals of these populations depend upon optimum utilization of network of wetland habitat sites to complete their annual life cycle. (Scott and Rose, 1996) Population dynamics of water birds species observed in the study area indicates, maximum abundance of uncommon birds (UCom), out of which 64.70% were winter migratory (WM) bird species. These winter migratory water birds migrate from breeding grounds in Europe, North Asia and Arctic region. They follows, East Asia-Australasia Flyway which connects North-East Asian breeding grounds with winter feeding grounds in South-East Asia and Australia (Boere, *et al.*, 2006, Delany, *et al.*, 2009).

Drastic decline in the density pattern of dabbling ducks of Anatidae family during present investigation

is in coherence global trend as witnessed in their breeding ground in Europe and North Asia, (Pittie, 2004). Abundance of winter migratory water birds having either herbivorous or omnivorous as compared to piscivorous and herbivorous diet guild in the study area clearly underlies an importance of surrounding agro-forest ecosystem with flooded paddy fields having stubbles from 'monsoon' harvest provide nocturnal roosting habitat for population of waterbirds like Northern Pintail (*Anas acuta*). (Kloskowski, 2009).

An occurrence of Rare (Ra) and very rare (VRa) which make up about 29% of total waterbird community like dabbling ducks such as Red-Crested Pochards, Order-Charadiform waders such as Common Sandpiper, Green Sandpiper, Common Redshank, Common Greenshank, while uncommon waterbirds enriches diversity of water birds. Painted stork (*Mycteria leucocephala*), Black Headed Ibis (*Threskiornis melanocephalus*) and Darter (*Anhinga melanogaster*) included in the Near Threatened (NT) all having piscivorous (P) diet guild, decline in abundance may be attributed to intensified fishing activity during last three years of study period, previously fishing was not carried out there. The prevailing physico-chemical conditions of wetlands, depth of water body and harboured vegetation and associated biota provide ample diet guild base for foraging waterbirds. (Datta, 2016., Chatterjee, *et al.*, 2017).

In the present investigation of waterbird, Grellag goose, *Anser anser* was not listed in Abdulali's (1981) checklist and Ali & Ripley's Checklist of Maharashtra. Rasmussen & Anderton (2012) also did not show its distribution in Maharashtra, Grimmet, *et al.*, (2011) reported it from Thane, Rao, *et al.* (2019) reported it from coastal region of Sindudurg district of Maharashtra, but for eastern part of Vidarbha, it is the first record. The present study suggested that, as study site has been visited by the numerous migratory during winter season, due to anthropogenic disturbances like intensification of agricultural activities, poaching and intensified fishing activity, there is urgent need to chalk out conservation measures in near future.

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Conflict of interest

The author declares that there is no conflict of interest.

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