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Seasonal Monitoring of Waterbirds of Chhari Dhandh wetland in Kachchh District, Gujarat, India

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***Abstract*-** A study was conducted by Gujarat Ecological Education and Research (GEER) Foundation on waterbirds of Chhari Dhandh during the year 2016-17 covering all the major seasons. A total of 66 waterbird species were recorded that belonged to 14 families. Among all the families, maximum number of species were represented by Anatidae family (i.e., the family of ducks, geese and swans) and Ardidae family (i.e., the family of herons, egrets and bitterns) with 13 species belonging to each family. Chhari Dhandh supported maximum population of waterbirds (n=4,162) in winter. On the contrary, minimum waterbird population (n=362) occurred in this wetland during summer. The study has indicated that Chhari Dhandh has highest utility as waterbird habitat during winter season and therefore maximum management practices should be focused during this period. The study has also indicated that open water and shoreland area support a large number of waterbird species and many of them are gregarious (occurring in congregation) calling for the need of focusing management efforts on these two habitats.

***Keywords*:** Avifauna, Chhari Dhandh, Habitat, Seasonal variation, Waterbirds, Wetland

I. INTRODUCTION

Wetlands are the areas of marsh, fens, peatland 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 exceeds six meters [1]. Wetlands differ inhabitat characteristics and productivity due to difference in their topography, soil, hydrology, water quality, plant species composition. They provide diverse habitats for many avifaunal species including waterbirds. Waterbirds are ubiquitous component of wetland ecosystem swhich may affect distribution and richness of fish and other fauna. Regular assessment and monitoring of waterbird species and their population is essential at least for important wetlands because abundance, distribution and behavioural activities of the waterbirds indicate quality and status of such wetlands [2].

The western most part of the Gujarat state is recognized as the gateway of migratory waterfowl that come into the Indian subcontinent. In spite of being arid, Kachchh district covers large area under wetland [3]. Chhari Dhandh contributes to the wetland area of Kachchh. It is a seasonal inland freshwater wetland in India's largest grassland area of Banni and also near the southern fringe of Great Rann of Kachchh. Like several other wetlands in Kachchh, Chhari Dhandh too is located on the pathway of wintering migratory birds. Due to this reason, very rich birdlife occurs here in winter and that has rendered great fame to this wetland as "Nal Sarovar of Kachchh [4].

II. STUDY AREA

Chhari Dhandh ($23^0$34'42.54''N, $69^0$18'58.08" E) is located in western Kachchh (Fig.1) at a distance of 80 km south-west of Bhuj city and about 25 km north of Nakhtrana town in Kachchh district. It is situated in "NaniBanni" area and near the southern fringe of Great Rann of Kachchh [5]. Fulay is the nearest village that is well-connected to Nakhatrana by road. Chhari Dhandh is the only Conservation Reserve in Gujarat state. As per the SACON's inland wetland prioritization, it is a "Rank-1 Prioritized Site" and also an Important Bird and Biodiversity Area (IBA) in Gujarat [6]. It is also considered as a potential Ramsar Site. Chhari Dhandh is a freshwater-cum-brackish/salty water natural shallow lake with associated marshy emergent vegetation. Under the perpetual water conditions in rainy season, the area of this wetland swells up to 80 sq. km [7]. The maximum water-depth of 2m is recorded in the central portion and in water channels during good rainfall year [8]. Like several other wetlands in Kachchh, Chhari Dhandh is located on the migration route of wintering migratory birds

that use Central Asian Flyway. Due to this reason, very rich birdlife occurs here in winter [4,5].

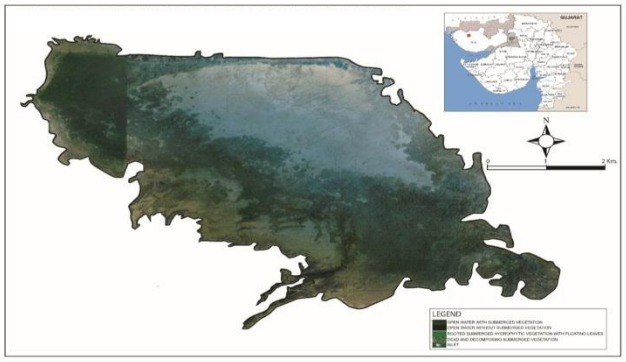

Fig. 1. Chhari Dhandh wetland, Kachchh District, Gujarat, India

Chhari Dhandh is a seasonal lake with huge sheet of open water fringed with extensive growth of tall emergent aquatic vegetation. The major habitat components are open water, flat open shore and emergent vegetation cover. Open water habitat is the most dominant habitat component followed by emergent vegetation, and flat open shore. At Chhari Dhandh, following edges exist- (a) edge between flat open shoreland and open water; and (b) edge between emergent vegetation and open water. The most dominant edge is the edge between open water and emergent vegetation cover followed by edge between open water and flat open shore-land [5]. Chhari Dhandh has good growth of *Salvadora persica* in some portion of its shoreland and environs.

III. MATERIAL AND METHODS

The present study on avifaunal community in Chhari Dhandh wetland included avifauna assessment from qualitative (species inventory) and quantitative (abundance) view-points. The sampling during the study was conducted using grid-based stratified random sampling method (Fig.2). Thus, though sampling sites/points were randomly selected and marked for the entire study period, care was taken that they would represent all the major habitat components of the wetland falling in various portions of the grid.

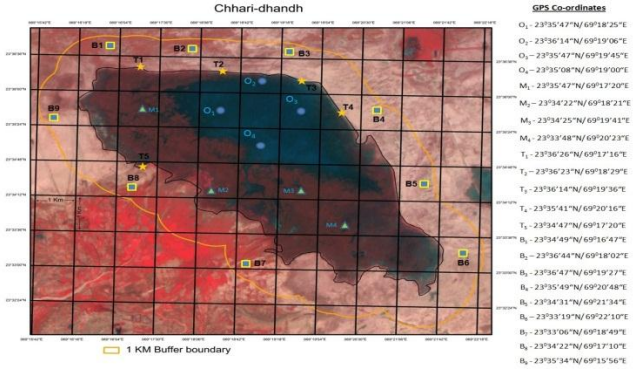

Fig. 2. Sampling grid of Chhari Dhandh wetland

Emphasis was laid on assessment of aquatic avifaunal community as Chhari Dhandh is well-known for its waterbird richness. Inventorying of species, population estimation and understanding habitat utilization were the three objectives of the avifaunal monitoring. Bird observations were made mainly through point count method [9]. Locations of the observation points for point counts were decided in such a way that on one hand they would represent main habitats of the wetland and on the other hand they would fall in one or the other cell of the sampling grid (Fig. 2). The observations were made between 6:30 hrs to 11:00 hrs in the morning with the help of a pair of binoculars (10X50), a spotting scope (16-48 X60mm) a digital camera, and GPS along with datasheets. Photographs were taken for identification and documentation. Recognized bird guides [10,11] were used for the identification of waterbirds occurring in the wetlands and terrestrial birds occurring in the upland area surrounding the wetland. Apart from the seasonal bird enumeration from/at the grid-based selected points for accomplishing the task of comprehensive bird species inventorying and bird habitat utilization study, birds seen in any portion of the wetland area were recorded but their records were separately maintained. Efforts were made for searching the species in various habitats and microhabitats.

IV. RESULTS AND DISCUSSION

Chhari Dhandh is known to support a good diversity of ducks, coots and grebes and due to its unique geographical location, it plays an important role as a wintering or stop-over wetland site for migratory waterbirds [12].

Species richness

In any community study regarding avifauna, it is usually a first step todetermine species richness ofan area or a habitat. Species richness is the measurement of diversity of species in a community. In the present study, a total 146 species of birds have been recorded. They belonged to 45 families. Of all the species recorded, 66 species were waterbirds that belonged to 14 families. Among all the families, maximum number of species belonged to Anatidae family (i.e., the family of ducks, geese and swans) and Ardidae family (i.e., the family of herons, egrets and bitterns) with 13 species belonging to each family.

Habitatwise species composition

Table 1 indicates cluster analysis for habitat wise species composition. The analysis was done using Jaccard's Similarity Index (JSI). The JSI describes similarity in habitat from the view-point of species composition with an index value of 1 indicating identical habitat and a value of 0 meaning no similarity in species composition of habitats.

Table 1: Habitat similarity on the basis of species composition

Habitat	Open_water	Shoreland	Emergent_Vegetation
Open_water	1	0.24	0.04
Shoreland		1	0.40909
Emergent_Vegetation			1

Table 1 indicates that shoreland and emergent vegetation have the highest similarity (i.e., 40%) from the view-point of species composition followed by open water and shoreland habitats (24%) and open water and emergent vegetation (4%). The least similarity between open water and emergent vegetation cover means highest need of focusing on them separately from the view point of habitat management. Irrespective of the degree of similarity between different habitats, the edges between these habitats should always be in management focus as they provide "best of both worlds" for various waterbird species for fulfilling foraging, resting, roosting and nesting life requisites.

Species population

In community study of avifauna, to estimate population of each species in a given area or habitat is an important task. [13].

During the present study, population of waterbirds found to vary considerably across the seasons. The combined seasonwise population of some important waterbirds is shown in Fig.3.

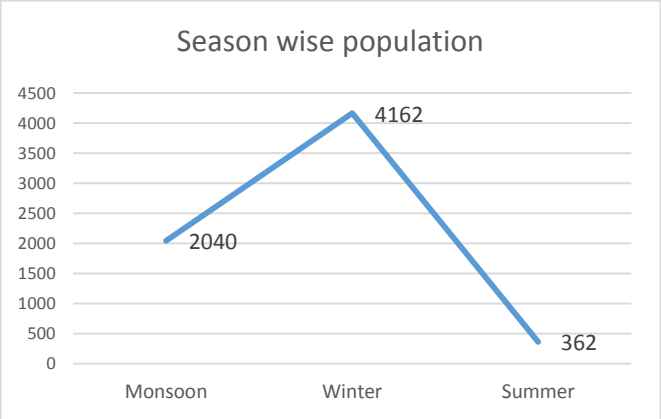

Fig. 3. Seasonal population variation of waterbirds

It is revealed from Fig.3 that Chhari Dhandh supports maximum population of waterbirds (n=4,162) in winter. On the contrary, minimum waterbird population (n=362) occurred in this wetland during summer during the study period. This indicates the maximum need of wetland management during winter season at Chhari Dhandh. This also indicates Chhari Dhandh's highest utility from the view-point of eco-tourism during winter. Moderately good population of waterbirds at Chhari Dhandh during monsoon might be due to migratory Eurasian Cranes that occur at Chhari Dhandh (and surrounding landscape of Banni) every year in very large numbers. It may be noted that though they are winter migrants to Gujarat, they arrive quite early, usually in the month of September (a monsoon month).

Relative Abundance of Important Species

As it is not adequate for any avian study to determine overall population variation, in the present study, species wise relative abundance based on populations of various species has been worked out. The Relative Abundance for some important waterbirds in winter, summer and monsoon seasons is given in Table 2.

Table 2: Season wise Relative Abundance of selected waterbird species

Name of Species	Relative abundance in different seasons		
	Winter	Summer	Monsoon
Dalmatian Pelican	0.55	-	0.21
Great White Pelican	0.88		-
Little Grebe	1.1	5.96	4.95
Great-crested Grebe	1.74	-	2.14
Indian Spot-billed Duck	0.93	18.23	1.36
Lesser Whistling-duck	1.28	3.96	1.69
Northern Pintail	7.25	-	1.23
Northern Shoveler	4.63	-	4.02
Eurasian Coot	24.98	3.41	27.3
Gadwall	1.42	-	-
Garganey	1.69	-	-
Black-tailed Godwit	4.23	-	1.63
Black-winged Stilt	2.69	16.89	4.02
Eurasian Curlew	2.56	-	4.23
Little Ringed Plover	2.56	-	1.69
Ruff	2.38	1.39	0.49
Pied Avocet	0.37	-	-
Marsh Sandpiper	0.21	-	-
Green Sandpiper	0.28	-	1.93
Greater Flamingo	5.66	-	0.28
Lesser Flamingo	6.23	-	6.89
Painted Stork	2.11		0.37
Black-necked Stork	2.74	-	-
Glossy Ibis	2.78	-	0.06
Red-naped Ibis	2.74	14.69	4.49
Black-headed White Ibis	1.69	3.19	1.1
Eurasian Spoonbill	0.25	5.48	8.95
Purple Swamphen	5.69	4.58	9.43
Indian Pond Heron	4.11	6.93	-
Grey Heron	2.74	8.33	4.65
Little Egret	1.53	6.96	6.89

Table 3 indicates that highest relative abundance of ducks and other swimmers (i.e. coots) was recorded in Winter season. This indicates importance of Chhari Dhandh as wintering habitat. Relative abundance of various waterbird species has remained typically low in other seasons with exceptions of some resident species of India likeIndian Spot-billed Duck, Eurasian Spoonbill, Black-winged Stilt and Purple Swamphen in summer and some resident and resident-migratory species in monsoon like Eurasian Coot, Lesser Flamingo and Purple Swamphen.

Due to their congregative behavior, duck species were observed to be abundant than other aquatic species of birds in open water habitat in winter season at Chhari Dhandh. One of the likely reasons why ducks and coots concentrate at Chhari Dhandh is the abundant food resources provided by the large number of fishes and submerged vegetation. Moreover, the disturbance free location of wetland also plays a vital role in attracting large number of ducks.

Table 4: Habitatwise occurrence of warerbird species

Name of bird Species	Habitatwise occurrence		
	Open water	Emergent vegetation	Shoreland
Dalmatian Pelican	P	A	A
Great White Pelican	P	A	A
Little Grebe	P	A	A
Great-crested Grebe	P	A	P
Indian Spot-billed Duck	P	P	P
Lesser Whistling-duck	P	A	P
Northern Pintail	P	A	P
Northern Shoveler	P	A	P
Eurasian Coot	P	A	P
Gadwall	P	A	A
Garganey	P	A	A
Black-tailed Godwit	A	A	P
Black-winged Stilt	A	P	P
Eurasian Curlew	A	A	P
Little Ringed Plover	A	A	P
Ruff	A	A	P
Pied Avocet	P	A	P
Marsh Sandpiper	A	A	P
Green Sandpiper	A	A	P
Greater Flamingo	P	A	P
Lesser Flamingo	P	A	P
Painted Stork	P	A	P
Black-necked Stork	A	A	P
Glossy Ibis	A	P	A
Red-naped Ibis	A	P	A
Eurasian Spoonbill	P	A	P
Purple Swamphen	A	P	P
Indian Pond Heron	A	P	A
Grey Heron	A	P	A
Little Egret	A	P	P

Note: P-Present, A-Absent

Table 4 indicates that open water and shoreland are the two habitats that can be considered most useful for the waterbirds at Chhari Dhandh. It is revealed from Table 4 that 21 species of waterbirds used shoreland habitat and 16 species of waterbirds occurred in open water habitat as against only 8 species in emergent vegetation. Thus, management practices should emphasize taking care of open water and shoreland area. Emergent vegetation cover, if not regulated may expand at the cost of these two habitats despite its low utility for the waterbirds. Of course, emergent vegetation cover is essential for secretive birds like bitterns, crakes and rails. But, these birds are typically solitary and therefore they never occur in great numbers and in turn they would not require large areas of emergent vegetation. On the other hand, open water and shoreland areas support many gregarious species that typically occur in large numbers and need greater expanse of their respective habitats for being sufficiently accommodated.

V. CONCLUSION AND RECOMMENDATIONS

The study has indicated that Chhari Dhandh has highest utility during winter season. So, maximum management practices should be focused during this period. The study has also indicated that open water and shoreland area support a large number of waterbird species and many of them are gregarious (occurring in congregation). So, management efforts should be focused on these two habitats.

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Author's Profile

Kinjal Joshi is a researcher at GEER Foundation, Gandhinagar, Gujarat, India. She has completed Masters in Life science. She has done research in the field of wildlife science with emphasis on birds and mammals in various mangrove and freshwater wetland dominated Protected Areas. She also has work experience in laboratory research. She has been contributing to environmental education and awareness programme through radio talks and Nature Education camps.

Dr. Ketan Tatu is the Senior Scientist, Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar. He has earned a Ph.D. in Environment Science from Gujarat University, India and a Ph.D. in Forest Resources Science, West Virginia University, USA. He is a Member of State Wetland Authority of Gujarat State and a Member of SACON Society. Dr. Tatu is the Founding Editor of "*Jalaplavit*" (ISSN 2321-1881)- an e-Periodical to enhance the knowledge about wetland biodiversity among people and sensitize them for its conservation. He is also a writer of an on-going column "Lap of Nature" in a newspaper "Daily News & Analysis" (DNA) that is aimed at inculcating interest in Nature and appreciation for it among laymen. He has authored/co-authored many scientific papers, Technical Reports, books and book chapters in the field of wetlands and birds. Dr. Ketan Tatu is a Life Member of Bombay Natural History Society (BNHS) and Bird Conservation Society, Gujarat (BCSG).

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