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Status and distribution of aquatic birds in the Thol Lake environment, Gujarat

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Abstract

Wetlands are vital habitat for diverse kind of life forms, specifically for birds. Among the various habitat of birds, wetlands are the most preferred habitat for diverse species of birds. Thol Lake is one among the important destination of wetland birds of Gujarat which support large number and population of aquatic bird species. The present study was conducted to assess the status and habitat preference of aquatic birds found in the lake environment. The study was carried out using flock count and point centred method on monthly basis on each type of microhabitats of the lake. A total of 60 species of aquatic birds recorded during the study periods which are belonging 17 families and 9 orders. Among the recorded species, majority of them were resident birds (26 species) with 13 species were migratory. Out of the total bird species found within the lake environment, four species were Vulnerable, six (6) species were Near Threatened while rest of bird species were categorised as Least Concern as per the IUCN. The assessing the abundance of birds species, it was found that more than 70 per cent of species were common and fairly common to the lake environment. Among the various micro-habitat, open water, muddy shoreline and tree's were the most preferred habitat or substratum for the bird species in the lake.

Keywords: Aquatic bird, status, habitat preference, diversity, Thol Lake, Gujarat

1. Introduction

Wetlands are vital ecosystem provide wide varieties of ecosystem services to the countless biodiversity and mankind, ranging from freshwater supply, food and biodiversity, to flood control, groundwater recharge and climate change mitigation, etc. (Weller 1999) ^[19]. Wetlands are also important conservation sites due to the extensive food chain and rich biodiversity they support. Wetlands are the most preferred habitat for diversity of birds for feeding, breeding, nesting or roosting which are broadly known as water birds (Kumar and Gupta, 2013) ^[11]. This comprises bird groups are also commonly called waterfowl and waders. Birds are one of the integral components of wetland plays vital role in maintaining ecological services and maintaining ecological functions. They are also crucial component of wetlands as well as for recreation and ecotourism (Desgranges *et al.*, 2006) ^[3]. Like other regions of world, wetlands are crucial ecosystem of arid and semi-arid landscape due to the richness of avi-faunal species. Birds are one of the best ecological indicators and for the environmental health of an area. 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 habitat type and structural complexity are known to influence avian diversity and composition (MacArthur and MacArthur, 1961) ^[13].

It is important to highlight that the loss of natural habitat and its fragmentation is a major cause of species loss and changes in community structure. According to birds present in or near lake are affected by several factors such as pollution, disturbance by human activities and lack of maintenance of water bodies. Highlighted the urgent need of ecological studies to develop conservation programme for a habitat which are degrading in faster rate. Wetland birds are an important component of wildlife which acts as best indicators for health of an ecosystem.

The Thol Bird Sanctuary is an important water bodies of the semi-arid landscape of Gujarat state which supports diverse flora and dependent fauna. The Sanctuary is also an ecologically rich site for resident and migratory birds visiting across the globe which attracts large number tourist from various parts of the country (Modi *et al.*, 2013) ^[14]. The avi-faunal diversity of the Sanctuary was explored by notable authors viz. GEER (2002) ^[4], Patel and Dharaiya (2008) ^[16], Jathar and Hathi (2010) ^[7] and Karia (2012) ^[8]. The ecology and habitat utilization pattern of piscivorous birds were studies by Pathak (2011) ^[2] and Shah (2016) ^[17].

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Apart from these studies, the detailed studies on the status and habitat preference of aquatic birds in the lake environment are lacking. Thus, the present study was carried out to assess the status of water birds in this lake environment.

Materials and Method

Study Area

The Thol lake is geographically spread in 6.99 km² area in the Mehsana district of Gujarat (Figure 1). The extent of wetland within Gujarat state is about 34,350 sq. km (17.6% of the state’s geographical area and 22.9 % of the national wetlands area). The Lake was manmade, constructed in the year 1918 and now it is designated as Thol Lake Bird Sanctuary in the year 1988. The lake is fed by the runoff water from nearby agricultural landscape through seasonal water channels. The sanctuary is an important destination of large number of tourist from the state as well as of the country.

Methodology

The study was conducted through the regular surveys in and around the lake environment during January 2016 to April 2017. The surveys were systematically made in a fixed route and some time randomly within the lake environment due to fluctuation of water level between different seasons. Most of the surveys were made early morning and evening hours of

the day using 8×40 binoculars and recorded in systematically designed data sheet. The data recorded on the status of birds include species, number of individuals, location, micro-habitat type, substratum, number of flocks, flock size, activity, etc. Standard avi-faunal guides such as Grimmet *et al.*, (1999) ^[5] were referred for identification of species, nomenclature and taxonomic position. Feeding guilds were classified on the basis of direct observations and available literature. The conservation status of the bird species was assessed according to the Wildlife Protection Act, 1972, CITES (2002) and IUCN (2010). The population surveys were conducted using flock count method (Bibby *et al.*, 1992) in monthly basis.

Abundance of each species of aquatic bird was determined based using Kumar and Gupta (2009) ^[12]. The abundance of birds was measured as Common (C), recorded 17 - 20 times out of 20 visits. Fairly Common (FC), recorded 12 - 16 times out of 20 visits, Uncommon (U), recorded 6 - 11 times out of 20 visits and Rare (R) recorded 0 - 4 times out of 20 visits. The habitat preference of aquatic birds were assessed based on the presence of individuals of birds in different micro-habitat/substratum within the lake environment such as open water, muddy shoreline, shallow marshy area, on trees and bushes, reeds and grasslands near water and electric wire over the lake, etc.

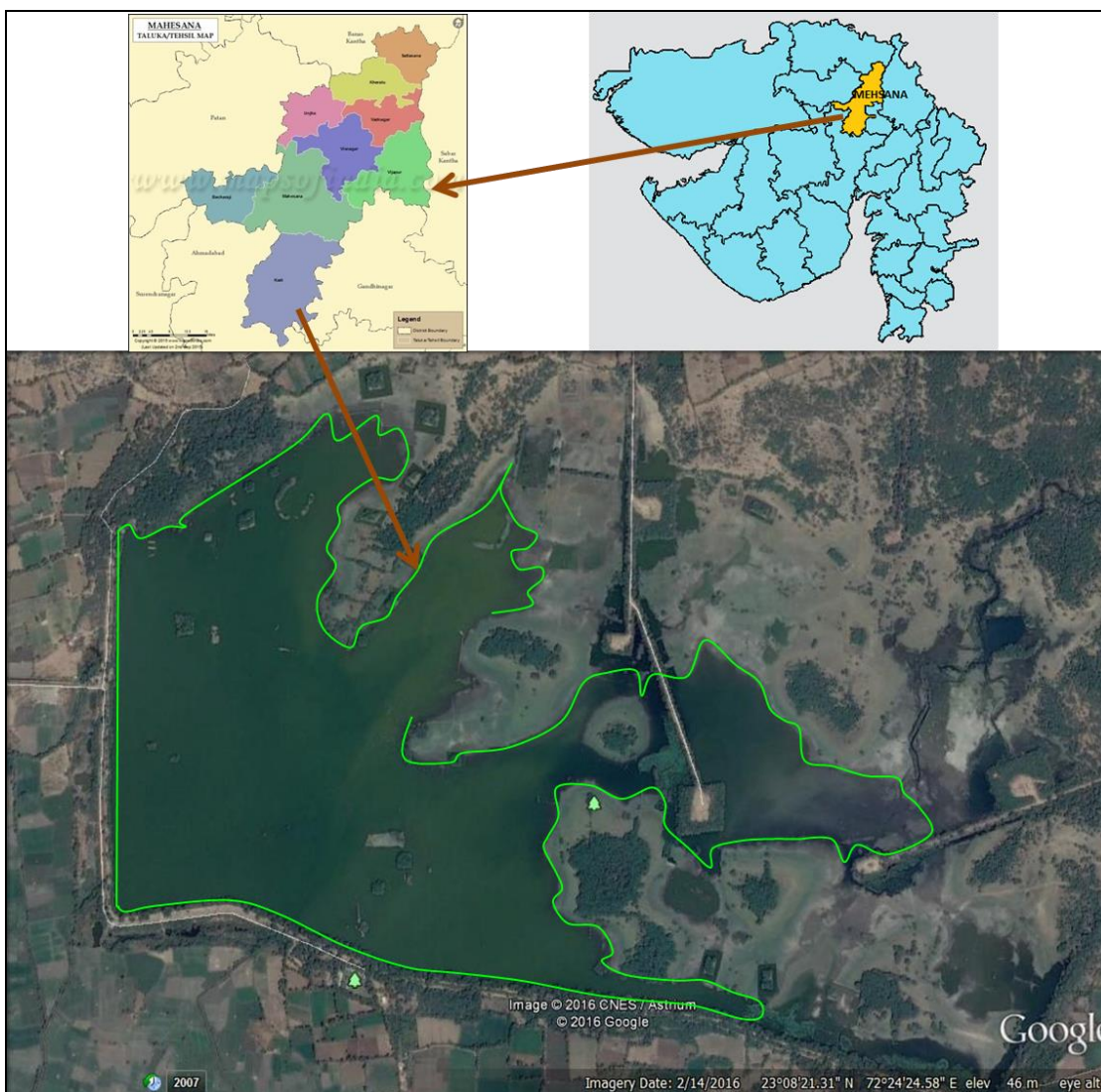


Fig 1: Thol lake and its location in Mehsana district of Gujarat state

Result and Discussion

A total of 60 species of birds which are belonging to fifteen (15) families and nine (9) order were recorded from the lake environment (Table 1). Among the nine orders, Pelecaniformes is the largest order based on the number of species recorded from the lake, followed by Anseriformes, Charadriiformes and two orders namely; Podicipediformes and Suliformes having only one species recorded from each orders. Similarly, Anatidae is the largest family of birds found in the lake, followed by Ardeidae and four families with only one species each. Among the six different types of feeding guilds of aquatic bird species recorded from the lake, carnivorous and omnivorous birds were recorded highest with 19 species each of the guilds (Figure 2). The earlier workers like Patel and Dharayia (2008) [16] reported 77 species of aquatic birds from the Thol Sanctuary;

Jathar and Hatti (2010) [7] reported 90 species of aquatic species from the Thol Bird Sanctuary; Pathak (2011) [2] reported 23 species of piscivorous birds from the lake while Karia (2012) [8] reported 76 species of aquatic bird from this sanctuary.

Among the bird species of the lake, majority of the species were resident, followed by resident migratory and only 19 species were migratory to the lake (Figure 3). On analysis of the abundance of the recorded aquatic bird species, 80 per cent were common and fairly common while only four species were rare (Figure 4). It was also found that majority of the species of the lake are categorised under Least Concern species (50 species) while 6 species are categorised as Near Threatened and rest of four species are Vulnerable category as per the IUCN (Table 1).

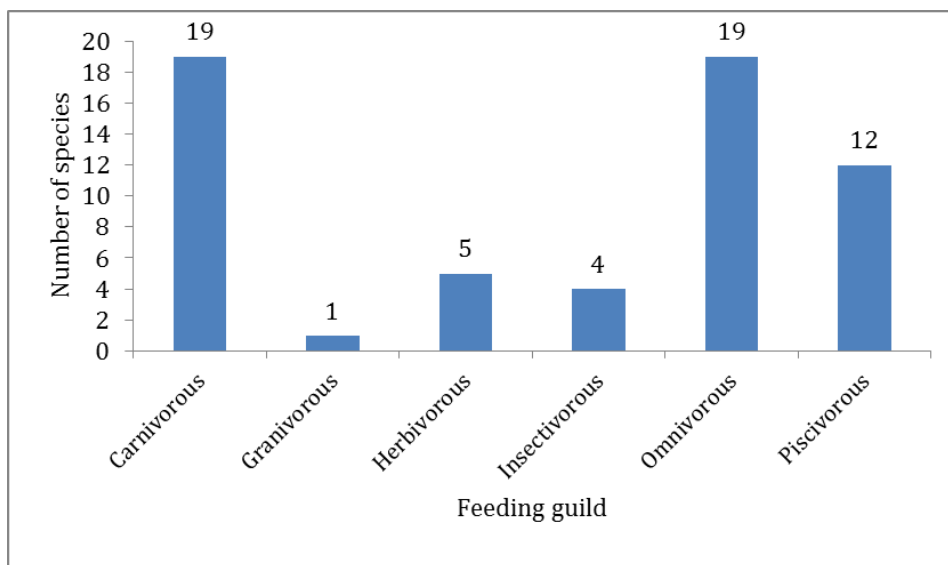


Fig 2: Feeding guilds of avi-fauna in Thol lake environment

The analysis on the habitat preference of the aquatic birds in different micro-habitat/ substratum within the lake environment for various basic activities like feeding, grooming, nesting, breeding, etc., it was found that out of total aquatic bird species, open water is most preferred habitat (61.67%), followed by muddy shoreline (38.33%), trees and bushes (28.33%) and electric wire (1.67%) are the least preferred substratum for the aquatic birds within the lake environment (Figure 5 & Table 2).

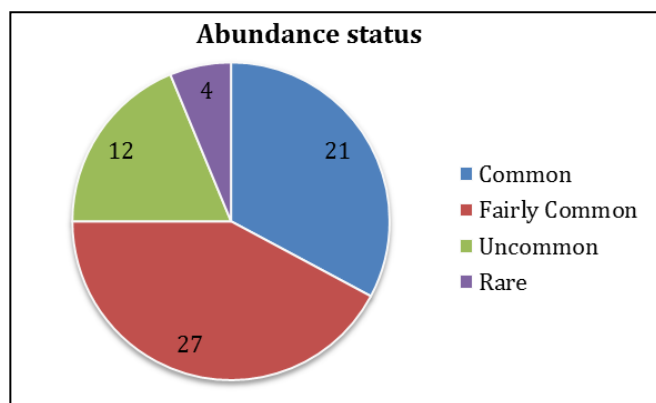


Fig 4: Abundance of avi-fauna recorded in Thol lake environment

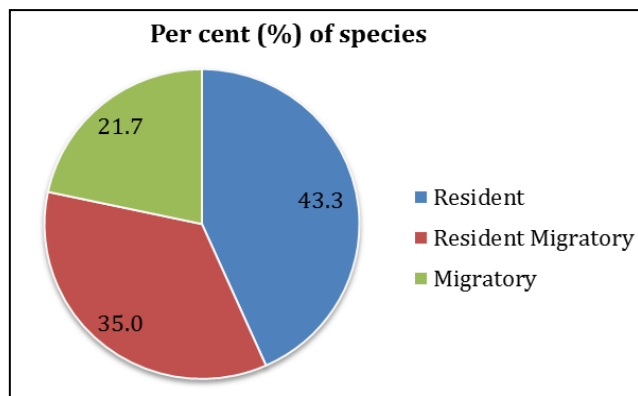


Fig 3: Migratory status of avi-fauna recorded in Thol lake environment

Shah (2016) [17] reported that shallow water micro-habitat is the most preferred while trees and bushes are the second most preferred microhabitat for the 12 selected bird species of this sanctuary, while the present study showed that open water is the most preferred micro-habitat for the aquatic birds of this lake. This is might be due to the different survey period, variation in number of tourist visiting the lake in different diurnal hours and selection of bird species.

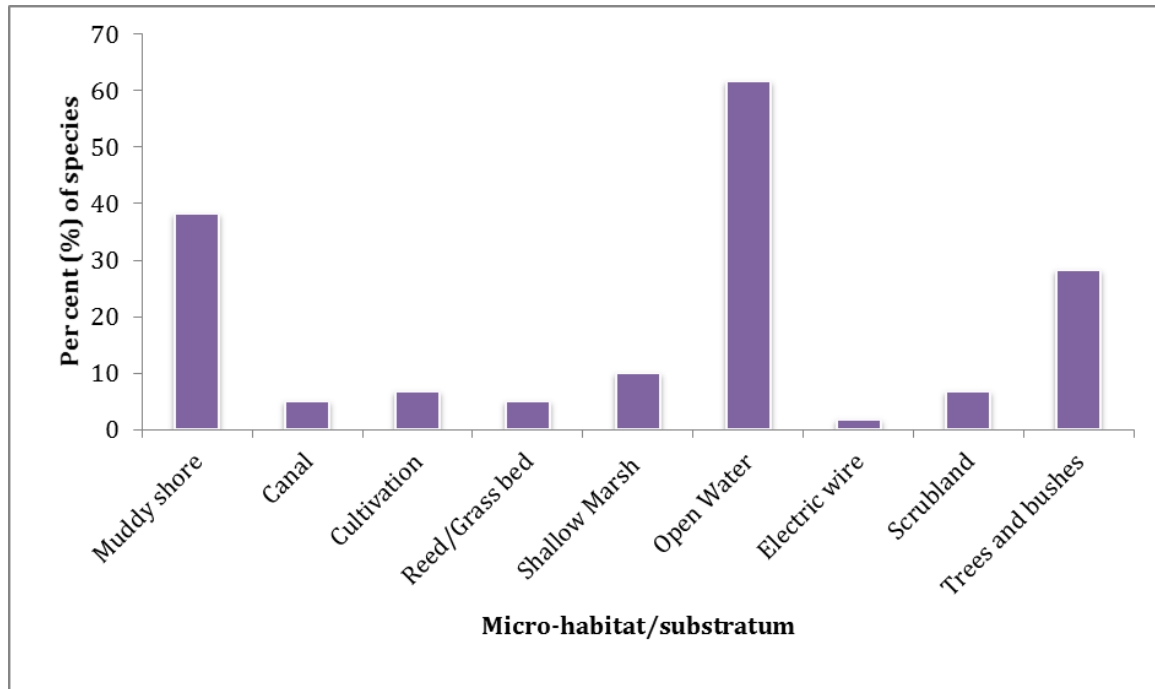


Fig 5: Habitat/substratum preference of avi-fauna recorded in Thol lake environment

Table 1: Checklist of aquatic bird species recorded from Thol Bird Sanctuary

Sl. No.	Order/Family/ Common name	Scientific Name	Migratory status	Feeding guild	Abundance	IUCN, 2018	IWPA, 1972
	Coraciiformes						
	Alcedinidae						
1	Common Kingfisher	<i>Alcedo atthis</i>	RM	P	FC	LC	Sch-IV
2	Pied King fisher	<i>Ceryle rudis</i>	R	P	R	LC	Sch-IV
3	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	R	P	FC	LC	Sch-IV
	Anseriformes						
	Anatidae						
4	Knob-billed Duck	<i>Sarkidiornis melanotos</i>	R	O	C	LC	Sch-IV
5	Greater Scaup	<i>Aythya marila</i>	M	P	UC	LC	Sch-IV
6	Common Pochard	<i>Aythya ferina</i>	M	O	FC	VU	Sch-IV
7	Tufted Duck	<i>Aythya fuligula</i>	R	O	UC	LC	Sch-IV
8	Northern Pintail	<i>Anas acuta</i>	M	O	FC	LC	Sch-IV
9	Common Teal	<i>Anas crecca</i>	M	G	C	LC	Sch-IV
10	Mallard	<i>Anas platyrhynchos</i>	M	O	UC	LC	Sch-IV
11	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	RM	H	C	LC	Sch-IV
12	Graylag Goose	<i>Anser anser</i>	M	H	C	LC	Sch-IV
13	Bar-headed Goose	<i>Anser indicus</i>	M	H	FC	LC	Sch-IV
14	Eurasian Wigeon	<i>Mareca penelope</i>	M	H	UC	LC	Sch-IV
15	Lesser Whistling-duck	<i>Dendrocygna javanica</i>	R	O	FC	LC	Sch-IV
16	Northern shoveler	<i>Spatula clypeata</i>	M	I	FC	LC	Sch-IV
17	Ruddy Shelduck	<i>Tadorna ferruginea</i>	RM	O	UC	LC	Sch-IV
	Suliformes						
	Anhingidae						
18	Oriental Darter	<i>Anhinga melanogaster</i>	RM	P	C	NT	Sch-IV
	Pelecaniformes						
	Ardeidae						
19	Cattle Egret	<i>Bubulcus ibis</i>	RM	C	FC	LC	Sch-IV
20	Great White Egret	<i>Ardea alba</i>	R	P	FC	LC	Sch-IV
21	Grey Heron	<i>Ardea cinerea</i>	RM	C	FC	LC	Sch-IV
22	Intermediate Egret	<i>Ardea intermedia</i>	RM	C	C	LC	Sch-IV
23	Purple Heron	<i>Ardea purpurea</i>	RM	C	FC	LC	Sch-IV
24	Indian Pond Heron	<i>Ardeola grayii</i>	R	C	FC	LC	Sch-IV
25	Little Egret	<i>Egretta garzetta</i>	R	C	C	LC	Sch-IV
26	Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	R	C	UC	LC	Sch-IV
27	Yellow Bittern	<i>Ixobrychus sinensis</i>	RM	C	R	LC	Sch-IV
	Pelecanidae						
28	Dalmatian Pelican	<i>Pelecanus crispus</i>	RM	C	FC	VU	Sch-IV
29	Great White Pelican	<i>Pelecanus onocrotalus</i>	RM	C	C	LC	Sch-IV

	Phalacrocoracidae						
30	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	RM	P	FC	LC	Sch-IV
31	Little Cormorant	<i>Microcarbo niger</i>	RM	P	C	LC	Sch-IV
	Threskiornithidae						
32	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	R	C	C	NT	Sch-IV
33	Eurasian Spoonbill	<i>Platalea leucorodia</i>	RM	C	C	LC	Sch-IV
34	Glossy Ibis	<i>Plegadis falcinellus</i>	RM	C	FC	LC	Sch-IV
35	Red-naped Ibis	<i>Pseudibis papillosa</i>	R	O	UC	LC	Sch-IV
	Charadriiformes						
	Charadriidae						
36	Red-wattled Lapwing	<i>Vanellus indicus</i>	R	I	FC	LC	Sch-IV
37	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	R	I	FC	LC	Sch-IV
	Jacaniidae						
38	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	R	I	R	LC	Sch-IV
	Laridae						
39	River Tern	<i>Sterna aurantia</i>	R	P	FC	LC	Sch-IV
40	Common Tern	<i>Sterna hirundo</i>	R	P	FC	LC	Sch-IV
41	Little Tern	<i>Sternula albifrons</i>	R	P	FC	LC	Sch-IV
42	Whiskered Tern	<i>Chlidonias hybrida</i>	RM	P	FC	LC	Sch-IV
	Recurvirostridae						
43	Black-winged Stilt	<i>Himantopus himantopus</i>	R	C	C	LC	Sch-IV
	Scolopacidae						
44	Bar-tailed Godwit	<i>Limosa lapponica</i>	M	O	UC	NT	Sch-IV
45	Black-tailed Godwit	<i>Limosa limosa</i>	M	C	UC	NT	Sch-IV
46	Green Sandpiper	<i>Tringa ochropus</i>	M	C	FC	LC	Sch-IV
47	Ruff	<i>Calidris pugnax</i>	R	O	FC	LC	Sch-IV
	Podicipediformes						
	Podicipedidae						
48	Little Grebe	<i>Tachybaptus ruficollis</i>	R	O	UC	LC	Sch-IV
	Ciconiiformes						
	Ciconiidae						
49	Asian openbill	<i>Anastomus oscitans</i>	R	C	C	LC	Sch-IV
50	Painted Stork	<i>Mycteria leucocephala</i>	RM	C	C	NT	Sch-IV
51	Woolly-naked Stork	<i>Ciconia episcopus</i>	R	C	R	VU	Sch-IV
	Gruiformes						
	Gruidae						
52	Common crane	<i>Grus grus</i>	M	O	C	LC	Sch-IV
53	Sarus Crane	<i>Antigone antigone</i>	R	O	UC	VU	Sch-IV
	Rallidae						
54	Common coot	<i>Fulica atra</i>	RM	O	C	LC	Sch-IV
55	Common Moorhen	<i>Gallinula chloropus</i>	RM	O	FC	LC	Sch-IV
56	Purple Swamphen	<i>Porphyrio porphyrio</i>	R	O	UC	LC	Sch-IV
57	Watercock	<i>Gallinula cinerea</i>	R	O	FC	LC	Sch-IV
58	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	R	O	FC	LC	Sch-IV
	Phoenicopteriformes						
	Phoenicopteridae						
59	Greater Flamingo	<i>Phoenicopterus roseus</i>	RM	O	C	LC	Sch-IV
60	Lesser Flamingo	<i>Phoeniconaias minor</i>	RM	H	FC	NT	Sch-IV

R: Resident, RM: Resident Migratory, M: Migratory, C: Carnivore, H: Herbivore, I: Insectivore, O: Omnivore, P: Piscivore, C: Common, FC: Fairly Common, UC: Uncommon, R: Rare, VU: Vulnerable, NT: Near Threatened, LC: Least Concern, Sch: Schedule

Table 2: Habitat preference of aquatic avi-fauna recorded from the Thol lake environment

Substratum	No. of species	Population	% Population	Frequency	% frequency
Muddy Shoreline	23	1528	16.10	192	24.97
Canal	3	29	0.31	7	0.91
Cultivation	4	198	2.09	16	2.08
Reed & Grass bed	3	86	0.91	13	1.69
Shallow & Marsh	6	571	6.02	19	2.47
Open Water	37	4728	49.83	363	47.20
Pole	1	2	0.02	2	0.26
Scrubland	4	468	4.93	28	3.64
Tree's & bushes	17	1878	19.79	129	16.78
Total	60	9488		769	

Conclusion

Wetland birds play a significant cultural and social role in local communities as well as being an important component

of wetland ecosystem (Kumar *et al.*, 2006)^[20]. In recent time, majority of the natural or manmade wetland are under threat due to natural as well as anthropogenic activities. The Thol

bird Sanctuary is an important destination for resident and migratory birds from last few decades. The variation in diversity of aquatic bird species and habitat preference of bird species in the lake environment highlighted that the lake required intensive conservation and management planning to enrich the diversity and population of aquatic bird species of this lake.

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