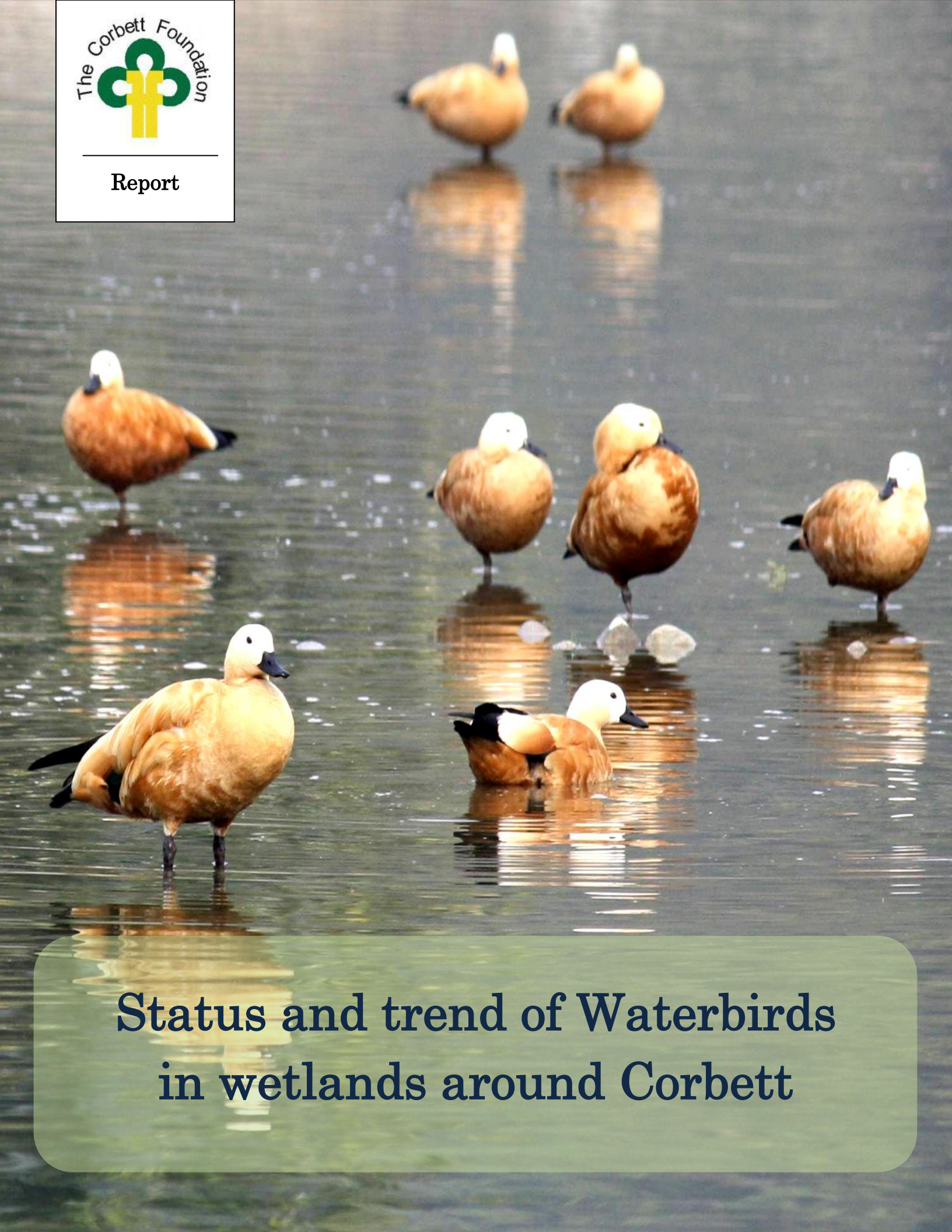
The Corbett Foundation

Report



Status and trend of Waterbirds in wetlands around Corbett

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Status and trend of Waterbirds in wetlands around Corbett

Anushree Bhattacharjee

and

Harendra Singh Bargali

Flock of Great Cormorants © Anushree Bhattacharjee

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Chairman's Foreword

I have always been fascinated by the Corbett Landscape and its rich biodiversity. The landscape, the wildlife, the crystal clear Ramganga River, the hills, every aspect of this beautiful forest mesmerized me way back in 1960, when I first came here, and it still does 60 years later! The Corbett Landscape with its associated wetlands provides excellent habitat for the birds. The area is inhabited and visited by around 580 species of resident and migratory birds, respectively.

The Corbett Foundation (TCF), a non-profit charitable organisation, was established by me in 1994 to tackle some of the conservation issues of Corbett Tiger Reserve and its surrounding forest divisions, including the wetlands. Through TCF, we have undertaken several conservation-oriented programmes to ensure harmonious co-existence between human beings and wildlife.

Birds, especially those seen around wetlands, are good indicators of the surrounding ecosystem. Any adverse changes in the ecosystem functioning affects the birdlife associated with the wetland. Tumariya, Baur and Haripura wetlands near Corbett are good habitats for birds and also provide livelihood to the local communities. It is therefore necessary to preserve these water bodies for the benefit of both – wildlife and mankind.

TCF has been observing and monitoring the birdlife, especially those of the migratory species, around these wetlands for the past three years. Our dedicated team members regularly conducted census of the birds seen at these wetlands during the migratory season. This report is a compilation of our observations, assessment and suggested conservation measures for the long-term survival of these wetlands. I congratulate my team for their hard work, dedication and excellent presentation of this report.

I hope you all will enjoy reading this report.

Best wishes,

Dilip Khatau

Acknowledgements

A study like this spanning several years could not have been possible without the whole-hearted support of several individuals and departments. We have tried our best to thank all those who have contributed in one way or the other, to make this report possible.

We are very grateful to the Irrigation Departments of Rudrapur and Kashipur for letting us carry out our annual waterbird survey in the concerned wetlands. We are grateful to the Terai West forest division and Terai Central forest division under whose jurisdiction the concerned wetlands are located. We thank the ground staff of the concerned Irrigation and Forest departments for their support and cooperation to our survey teams.

We would like to take this opportunity to thank and mention all the individuals who contributed some amount of their valuable time towards the waterbird survey: Mr. Kedar Gore, Dr. H.S. Bargali, Mr. Sanjay Chhimwal, Mr. Devi Dutt, Mr. Bhuwan Chhimwal, Dr. Sharad Kumar, Mr. H.S. Bhandari, Mr. Satya Pal, Mr. Ashok, Ms. Anushree Bhattacharjee, Ms. Zaara Kidwai, Mr. Jagdish, Mr. Kuber Singh Mehra, Mr. Idrish Hussain and Md. Yaseen.

Sincere thanks to Mr. Dilip Khatau, Chairman, The Corbett Foundation (TCF), and Ms. Rina Khatau, Co-Chairperson, TCF for funding our annual waterbird survey. We are grateful to both for their unstinted support of all our wildlife programmes.

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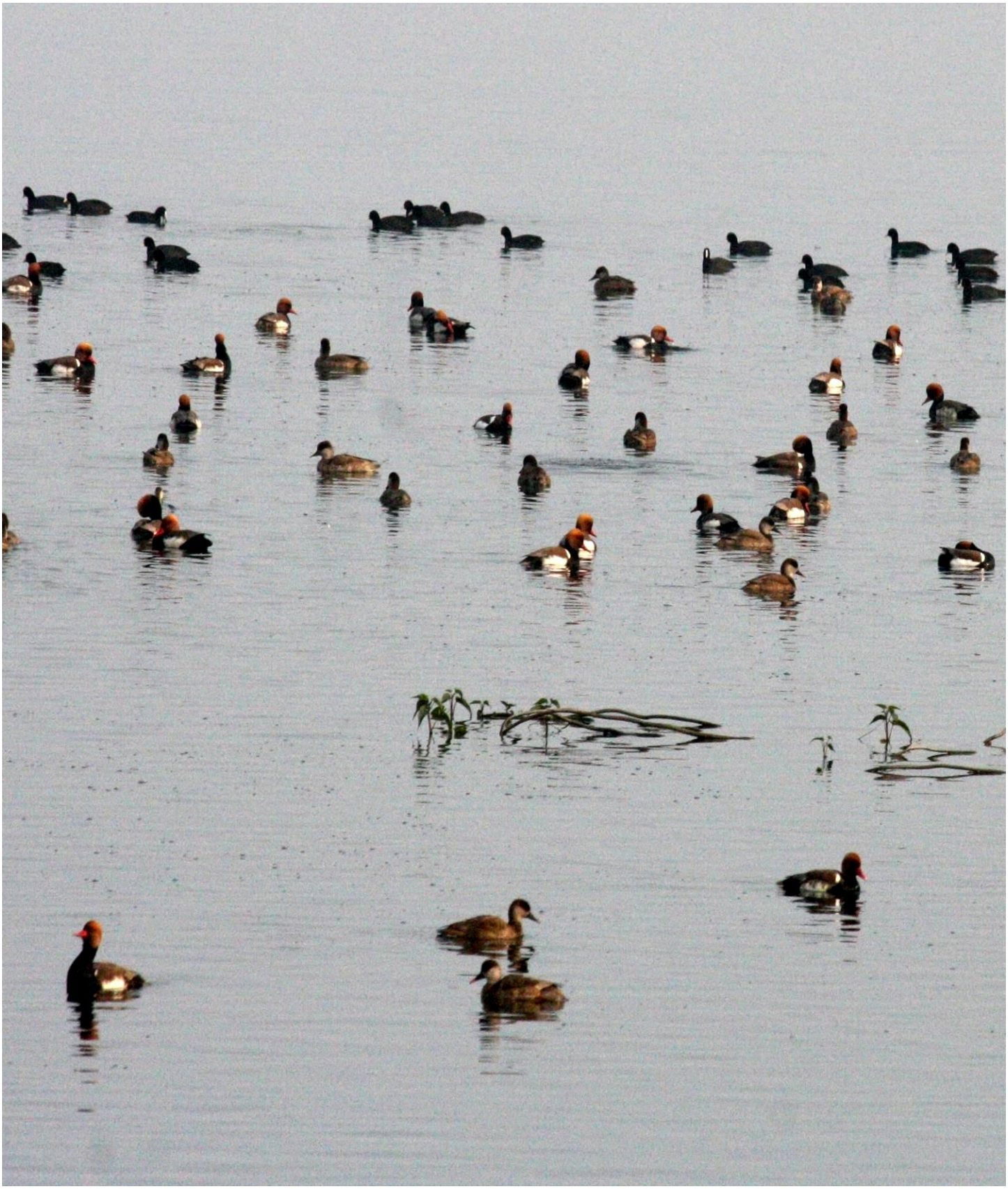

Mixed flock of Red-crested Pochards and Common Coot © Anushree Bhattacharjee

Executive Summary

Corbett is said to be a haven for bird-watchers with a great diversity of bird species recorded in the area. The Corbett Tiger Reserve is listed as an Important Bird Area (IBA) by BirdLife International. Of the approximate 1300 species of birds found in the Indian subcontinent, more than 40% have been recorded in the Corbett landscape. The area also provides safe refuge to a number of migratory birds during winter. Forty nine percent of the wetland dependant bird species found in India have been recorded in this landscape.

The Corbett division of The Corbett Foundation has been carrying out an annual waterbird survey programme in three wetlands located in the Corbett landscape. The survey has been conducted on a fortnightly basis from the year 2009-10. The observations of this three year survey has been analyzed and presented in this report.

Seventy eight species of waterbirds and wetland dependant birds belonging to seventeen families were recorded from the three wetlands over the entire duration of the study. Among these, two species are classified as Globally Threatened and six as Near Threatened. Only three species are listed under Schedule I of the Wildlife (Protection) Act, 1972. They rest are all relegated to Schedule IV. Only two of the recorded species are listed under CITES. None of the recorded Globally Threatened species have been listed under CITES. Thus, there is a lacuna in the present protection status of such important species which needs to be addressed immediately.

Tumariya wetland had the highest species richness and mean abundance even though it had the smallest area of the three wetlands. Baur being the largest wetland had the lowest species richness and lowest mean abundance. However, bird diversity at Baur was the most evenly distributed. There was a degree of overlap of species recorded at all

three wetlands, with Tumariya and Haripura recording the most number of common bird species. Both mean species richness and mean abundance had increased over the years in all three wetlands.

The study found that the major threats to these wetlands and their waterbirds were habitat encroachment by local villagers, hunting, excessive grazing pressure and infestation by algae and other invasive species. Immediate measures need to be taken to address these issues. The concerned Irrigation Department needs to work in tandem with the concerned Forest Departments. The cooperation of the Police Department and Fisheries Department should be sought wherever necessary. Awareness regarding the importance of wetland conservation should be imparted to the local communities settled alongside these wetlands. NGOs could play a role in developing such modules and coordinating multi-stakeholder workshops to discuss the general and specific issues and their possible solutions. More intensive studies need to be carried out at the sites.

Most importantly, better protection status should be afforded to these wetlands. Migratory waterbirds pass through several wetlands en route to their breeding and wintering grounds. Therefore, even though the number of birds present at any one time may never exceed 20,000 birds (Criterion 5 of Ramsar Convention for identifying Wetlands of International Importance) or 1% of a population (Criterion 6 of Ramsar Convention for identifying Wetlands of International Importance), the wetland may still be supporting internationally important numbers of birds. Criterion 2 of the Ramsar Convention for identifying Wetlands of International Importance states “A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.” The wetlands of the Corbett landscape harbor a number of threatened bird species and must be protected.

Introduction

Birds which are ecologically dependant on wetlands are broadly defined as waterbirds (Kumar et al. 2003). These include groups such as waterfowl, seabirds and waders.

There are several other birds such as kingfishers, raptors, and some passerines which are also dependant on wetlands. These are called wetland dependant birds (Kumar et al. 2003). Waterbirds and wetland dependant birds are often collectively referred to as wetland birds (Kumar et al. 2005). Such birds form vital links in the food webs and nutrient cycles, making them important components of most wetland ecosystems. They play significant roles in the lives of humans culturally, socially, scientifically and as a food resource (Kumar et al. 2003). Birds also play an important role in attracting tourists to wetlands.

Many waterbirds are migratory, moving annually along various flyways to traverse between their breeding and non-breeding grounds. The concept of flyway is essentially an operational concept linked to waterfowl whose populations one wishes to manage over their entire migration space (Boere and Stroud 2006). These flyways often span across considerable distances and cross several international boundaries. Thus, monitoring and conservation of such waterbirds and therefore the wetlands has to be a collective responsibility of all nations (Li et al. 2009). The Convention on Wetlands of International Importance, better known as the Ramsar Convention (Wetlands International 2002), deals with this. The member nations are bound to ensure the holistic conservation of their wetlands. India has been a signatory to this convention since 1981.

India lies along the Central Asian Flyway (CAF). The CAF covers a large continental area of Eurasia between the Arctic Ocean and the Indian Ocean and associated island chains. The flyway comprises several important migration routes of waterbirds, most of which extend from the northernmost breeding grounds in Siberia to the southernmost non-

breeding wintering grounds in West Asia, South Asia, the Maldives and the British Indian Ocean Territory (Convention on the Conservation of Migratory Species 2006). This Central Asian Flyway is largely responsible for the significant number of migrant species to the Indian subcontinent.

Waterbirds are valuable indicators for the ecological health and productivity of wetlands (Li et al. 2009). They may also hold the key to generating awareness among people regarding the importance of wetland conservation. A major threat towards the viability of all wildlife populations is the fragmentation of their habitats (Wiens 1995), and the same is true of waterbirds and their habitats, the wetlands. Baseline information is prerequisite for planning and monitoring management actions for waterbirds as well as their habitats (Kumar et al. 2003, Kumar et al. 2005).

Background

Corbett Tiger Reserve (CTR) is situated along the Himalayan foothills, in the newly formed state of Uttarakhand. CTR was the first tiger reserve of the country and the launch pad of Project Tiger in 1973. It includes two protected areas viz. Corbett National Park and Sonanadi Wildlife Sanctuary. Corbett National Park has the esteemed honour of being the oldest national park of India, established in 1936. CTR supports a sizeable variety of floral and faunal diversity (Bhartari 1999).

Corbett is a haven for bird-watchers. The bird diversity exhibits very interesting characters due to the variation in the gradient of the area, ranging from the high altitudes to the plains. More than 40% of the approximate 1300 species of birds found in the Indian subcontinent (Kumar et al. 2003), have been recorded in the Corbett landscape (Sharma et al. 2003). Similarly, of the 310 wetland dependant bird species found in India (Kumar et al. 2005), 49% (n = 149) are found in the CTR landscape (Dhakate et al. 2008). Corbett Tiger Reserve is listed as an Important Bird Area (IBA)

by BirdLife International in the A1 criteria (Islam and Rahmani 2004), meaning the site has population of species listed in the IUCN Red List as Critically Endangered, Endangered or Vulnerable.

The Corbett Foundation (TCF) has been carrying out an annual waterbird census at several wetlands located in the Corbett landscape for nearly a decade. This data is shared with Bombay Natural History Society and Wetlands International as part of the Asian Waterfowl Census. Earlier the census was conducted only once a year, but since 2009-10 it is being conducted on a fortnightly basis from the time migratory species start arriving till they start leaving the sites. These wetlands are quite fragile ecosystems as they have a high degree of anthropogenic pressure, and are under several threats. The objective of this report was to study the census data of the three years, from 2009-10 to 2011-12 and observe the changing trend in the population of these waterbirds. The threats to the specific wetlands were identified and possible recommendations have been suggested.

Tumariya wetland © Anushree Bhattacharjee

Study Area & Methodology

The study was conducted in three wetlands viz. Tumariya, Haripura and Baur located in the larger Corbett landscape, in the state of Uttarakhand. All the wetlands are man-made reservoirs. During the months of winter, they attract a large number of migratory birds. Each of the wetlands is described in detail below.

Tumariya Wetland

Figure 1. Map of Tumariya wetland (Courtesy: Google Earth)

Tumariya wetland (29° 18' N 78° 57' E), is a man-made reservoir located approximately 2 Km from Jaspur, the nearest biggest town. The reservoir is fed by the Rivers Dhela and Feeka. It lies across the Nainital and Udham Singh Nagar districts of Uttarakhand.

Tumariya comes under the jurisdiction of the Terai West Forest Division, a territorial forest division adjacent to Corbett Tiger Reserve. Tumariya Reservoir was established in the year 1962. With increasing demand, the Tumariya Extension Reservoir was completed in the year 1969. The two reservoirs are contiguous and are collectively referred to as Tumariya. The wetland spans over an area of 111 sq km. The average water level in the reservoir from the months of October to May is approximately 842.5 ft. There are approximately 22 villages located around the periphery of this reservoir. There are also two *Gujjar* settlements in the near proximity of the wetland.

Baur Wetland

Figure 2. Map of Baur wetland (Courtesy: Google Earth)

Baur wetland (29° 07' N 79° 13' E), is a man-made reservoir located approximately 15 Km from Bajpur, the nearest biggest town. The reservoir is fed by the River Baur. It lies in the Udham Singh Nagar district of Uttarakhand. The reservoir was established in the year 1967. Baur comes under the jurisdiction of the Terai Central Forest Division, a territorial forest division lying in the Corbett landscape. The wetland spans over an area of 307.20 sq km. The average water level in the reservoir from the months of October to May is approximately 786.5 ft. There are approximately nine villages located around the periphery of this reservoir.

Haripura Wetland

Figure 3. Map of Haripura wetland (Courtesy: Google Earth)

Haripura wetland (29° 06' N 79° 19' E), is a man-made reservoir located approximately 15 Km from Bajpur, the nearest biggest town. The reservoir is fed by the River Bhakra. It lies in the Udham Singh Nagar district of Uttarakhand. Haripura Reservoir was established in the year 1974, with the main purpose of supplying the Baur Reservoir. Haripura too comes under the jurisdiction of the Terai Central Forest Division, a territorial forest division lying in the Corbett landscape. The wetland spans over an area of 294.4 sq km. The average water level in the reservoir from the months of October to May is approximately 786.8 ft. There are approximately ten villages located around the periphery of this reservoir.

Methodology

The survey was carried out over three years 2009-10, 2010-11 and 2011-12. All three wetlands were surveyed fortnightly during the migratory season, and waterbirds and wetland dependant birds observed at the sites noted. The standardized common and scientific names of the birds of the Indian subcontinent by Manakadan and Pittie (2001) were followed in the present study. The total count method was used for noting the species and number of birds observed. Large bird congregations were approached to the closest possible distance without causing disturbance for counting. Conspicuous species present in relatively small numbers or dispersed widely were counted singly. Observations were taken from 0600 hr to 1300 hr. Bushnell 8x42 and Olympus 10x50 binoculars were used to make the observations and the species were identified using recognized field guides such as Grimmett et al. (1999) and Kazmierczak (2000).

The survey was started when migratory birds started arriving at the sites, and continued till they started to leave with the advent of summer. In the year 2009-10, the survey was started in November 2009 and carried out till February 2010. Tumariya, Haripura and Baur Reservoirs were each surveyed six times in total, twice a month except for the months of January and February. In the year 2010-11, Tumariya, Haripura and Baur reservoirs were surveyed nine times on a fortnightly basis from November 2010 to

March 2011. The census was conducted twice a month except in January. In the year 2011-12, Tumariya Reservoir was surveyed eight times from mid-November 2011 to mid-April 2012. The census could be conducted twice a month in the months of January and February only. Haripura and Baur reservoirs were surveyed nine times on a fortnightly basis from mid-November 2011 to mid-April 2012. The census was conducted twice a month during December, January and February. The reason for cancelling some of the fortnightly surveys was excessive fog over the wetlands causing low visibility conditions.

Wetland dependant birds such as swallows and wagtails had been noted only in 2011-12. Hence, these species were left out of the analysis. Data analysis was done to obtain species richness, diversity, and relative abundance of species for the three years of the survey. Both parametric as well as non-parametric tests have been used.

TCF team carrying out waterbird survey at the wetlands

Flock of Painted Storks © Anushree Bhattacharjee

Results & Discussion

A total of 78 species of waterbirds and wetland dependant birds belonging to 17 families were recorded from the three wetlands over the entire duration of the study. Of these, two species are categorized as 'Vulnerable' and six species are categorized as 'Near Threatened' in the IUCN red list of threatened species (Table 1). Further, none of the above mentioned Vulnerable and Near Threatened species are listed under Schedule I of the Wildlife (Protection) Act, 1972 but are all relegated to Schedule IV. Eurasian Spoonbill *Platalea leucorodia*, Brahminy Kite *Haliastur Indus* and Western Marsh-Harrier *Circus aeruginosus* are the only three species listed under Schedule I of the Wildlife (Protection) Act, 1972. Only Eurasian Spoonbill *Platalea leucorodia* and Comb Duck *Sarkidiornis melanotos* are listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2002) in Appendix I and II respectively. None of the Vulnerable and Near Threatened species, including globally threatened species such as the Lesser Adjutant-Stork *Leptoptilos javanicus* and Sarus Crane *Grus antigone,* are listed under CITES, and thus there are no restriction on their trade. Greater Painted-Snipe *Rostratula benghalensis* is not listed under the Wildlife (Protection) Act, 1972 at all. Thus, analysis of the conservation status of the recorded waterbirds at the study area revealed a lacuna in the protection afforded at present to these species. This lacuna needs to be addressed immediately and the protection status of the waterbirds enhanced accordingly.

Table 1. List of waterbirds and wetland dependant birds recorded during the study period and their conservation status

S.No.	Common Name	Scientific Name	Conservation Status		
			IUCN Status	WL(P)A (1972)	CITES
1	**Family: Podicipedidae**				
1	Little Grebe	*Tachybaptus ruficollis*	LC	Sch. IV	-
2	Great Crested Grebe	*Podiceps cristatus*	LC	Sch. IV	-
2	**Family: Phalacrocoracidae**				

3	Great Cormorant	*Phalacrocorax carbo*	LC	Sch. IV	-
4	Indian Shag	*P. fuscicollis*	LC	Sch. IV	-
5	Little Cormorant	*P. niger*	LC	Sch. IV	-
3	**Family: Anhingidae**				
6	Darter	*Anhinga melanogaster*	NT	Sch. IV	-
4	**Family: Ardeidae**				
7	Indian Pond-Heron	*Ardeola grayii*	LC	Sch. IV	-
8	Purple Heron	*Ardea purpurea*	LC	Sch. IV	-
9	Grey Heron	*A. cinerea*	LC	Sch. IV	-
10	Cattle Egret	*Bubulcus ibis*	LC	Sch. IV	-
11	Little Egret	*Egretta garzetta*	LC	Sch. IV	-
12	Median Egret	*Mesophoyx intermedia*	LC	Sch. IV	-
13	Large Egret	*Casmerodius albus*	LC	Sch. IV	-
14	Yellow Bittern	*Ixobrychus sinensis*	LC	Sch. IV	-
5	**Family: Ciconiidae**				
15	Painted Stork	*Mycteria leucocephala*	NT	Sch. IV	-
16	Asian Openbill-Stork	*Anastomus oscitans*	LC	Sch. IV	-
17	White-necked Stork	*Ciconia episcopus*	LC	Sch. IV	-
18	Black-necked Stork	*Ephippiorhynchus asiaticus*	NT	Sch. IV	-
19	Lesser Adjutant-Stork	*Leptoptilos javanicus*	Vu	Sch. IV	-
6	**Family:Threskiornithidae**				
20	Black Ibis	*Pseudibis papillosa*	LC	Sch. IV	-
21	Glossy Ibis	*Plegadis falcinellus*	LC	Sch. IV	-
22	Eurasian Spoonbill	*Platalea leucorodia*	LC	Sch. I	Appendix I
7	**Family: Anatidae**				
23	Lesser Whistling-Duck	*Dendrocygna javanica*	LC	Sch. IV	-
24	Greylag Goose	*Anser anser*	LC	Sch. IV	-
25	Bar-headed Goose	*A. indicus*	LC	Sch. IV	-
26	Bean Goose	*A. fabalis*	LC	Sch. IV	-
27	Brahminy Shelduck	*Tadorna ferruginea*	LC	Sch. IV	-
28	Comb Duck	*Sarkidiornis melanotos*	LC	Sch. IV	Appendix II
29	Cotton Teal	*Nettapus coromandelianus*	LC	Sch. IV	-
30	Eurasian Wigeon	*Anas Penelope*	LC	Sch. IV	-
31	Gadwall	*A. strepera*	LC	Sch. IV	-
32	Common Teal	*A. crecca*	LC	Sch. IV	-
33	Mallard	*A. platyrhynchos*	LC	Sch. IV	-
34	Spot-billed Duck	*A. poecilorhyncha*	LC	Sch. IV	-
35	Northern Pintail	*A. acuta*	LC	Sch. IV	-
36	Garganey	*A. querquedula*	LC	Sch. IV	-
37	Northern Shoveller	*A. clypeata*	LC	Sch. IV	-

38	Red-crested Pochard	*Rhodonessa rufina*	LC	Sch. IV	-
39	Common Pochard	*Aythya ferina*	LC	Sch. IV	-
40	Ferruginous Pochard	*A. nyroca*	NT	Sch. IV	-
41	Tufted Pochard	*A. fuligula*	LC	Sch. IV	-
8	**Family: Gruidae**				
42	Sarus Crane	*Grus antigone*	Vu	Sch. IV	-
9	**Family: Rallidae**				
43	Baillon's Crake	*Porzana pusilla*	LC	Sch. IV	-
44	Little Crake	*P. parva*	LC	Sch. IV	-
45	White-breasted Waterhen	*Amaurornis phoenicurus*	LC	Sch. IV	-
46	Common Moorhen	*Gallinula chloropus*	LC	Sch. IV	-
47	Purple Moorhen	*Porphyrio porphyrio*	LC	Sch. IV	-
48	Common Coot	*Fulica atra*	LC	Sch. IV	-
10	**Family: Jacanidae**				
49	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	Sch. IV	-
50	Bronze-winged Jacana	*Metopidius indicus*	LC	Sch. IV	-
11	**Family: Rostratulidae**				
51	Greater Painted-Snipe	*Rostratula benghalensis*	LC		-
12	**Family: Recurvirostridae**				
52	Black-winged Stilt	*Himantopus himantopus*	LC	Sch. IV	-
53	Pied Avocet	*Recurvirostra avosetta*	LC	Sch. IV	-
13	**Family: Charadriidae**				
54	Northern Lapwing	*Vanellus vanellus*	LC	Sch. IV	-
55	River Lapwing	*V. duvaucelii*	LC	Sch. IV	-
56	White-tailed Lapwing	*V. leucurus*	LC	Sch. IV	-
57	Grey-headed Lapwing	*V. cinereus*	LC	Sch. IV	-
58	Red-wattled Lapwing	*V. indicus*	LC	Sch. IV	-
59	Little ringed plover	*Charadrius dubius*	LC	Sch. IV	-
14	**Family: Scolopacidae**				
60	Black-tailed Godwit	*Limosa limosa*	NT	Sch. IV	-
61	Pintail Snipe	*Gallinago stenura*	LC	Sch. IV	-
62	Common Snipe	*G. gallinago*	LC	Sch. IV	-
63	Common Redshank	*Tringa tetanus*	LC	Sch. IV	-
64	Marsh Sandpiper	*T. stagnatilis*	LC	Sch. IV	-
65	Common Greenshank	*T. nebularia*	LC	Sch. IV	-
66	Wood Sandpiper	*T. glareola*	LC	Sch. IV	-
67	Green Sandpiper	*T. ochropus*	LC	Sch. IV	-
68	Common Sandpiper	*Actitis hypoleucos*	LC	Sch. IV	-
15	**Family: Laridae**				
69	Pallas's Gull	*Larus ichtyaetus*	LC	Sch. IV	-

70	Brown-headed Gull	*L. brunnicephalus*	LC	Sch. IV	-
71	Black-headed Gull	*L. ridibundus*	LC	Sch. IV	-
72	River Tern	*Sterna aurantia*	LC	Sch. IV	-
73	Black-bellied Tern	*S. acuticauda*	NT	Sch. IV	-
16	**Family: Accipitridae**				
74	Brahminy Kite	*Haliastur Indus*	LC	Sch. I	-
75	Western Marsh-Harrier	*Circus aeruginosus*	LC	Sch. I	-
17	**Family: Alcedinidae**				
76	Small Blue Kingfisher	*Alcedo atthis*	LC	Sch. IV	-
77	White-breasted Kingfisher	*Halcyon smyrnensis*	LC	Sch. IV	-
78	Lesser Pied Kingfisher	*Ceryle rudis*	LC	Sch. IV	-

LC = Least Concern; NT = Near Threatened; Vu = Vulnerable

The maximum number of species (*n* =19*)* recorded from the study area belonged to the family Anatidae comprising of ducks and geese. This was followed by the families Scolopacidae (godwit, snipes, shanks and sandpipers) represented by nine species, and Ardeidae (herons, egrets and bitterns) represented by eight species respectively. Of the rest, seven families were represented by one to two species only (Figure 4).

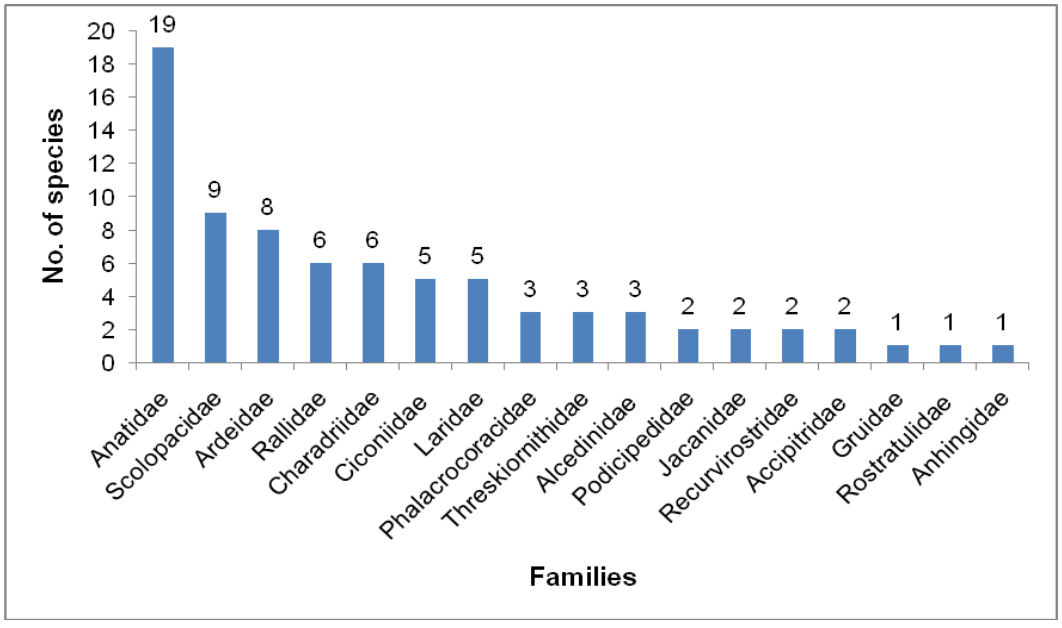

Figure 4. Family wise species richness

Rare and important sightings:

Some rare sightings included a solitary Bean Goose *Anser fabalis* recorded among a mixed flock of Bar-headed Goose and Brahminy Shelducks at Tumariya wetland in December 2011 (Bhattacharjee 2012). The Bean Goose is a strongly migratory bird breeding in the high Arctic regions whose range usually does not extend to India. The Bean Goose has its wintering ground in temperate and sub-tropical regions such as China, Japan, Europe, and so on. Although it was reported in India in 1921, that sighting was later disputed and the species was removed from the Indian list of birds. It was only in 2003 that the first convincing record of the Bean Goose was reported by a group of birdwatchers in Harike, Punjab who saw a solitary Bean Goose among a flock of Greylag Goose. Since then, there has been another record of a solitary Bean Goose sighting in Assam in 2007. This sighting by TCF wildlife division was the third conclusive sighting of the Bean Goose from India, and the first record of this species from the State of Uttarakhand.

Other interesting records included a single Baillon's Crake *Porzana pusilla* recorded from Tumariya wetland in February 2011 and a Little Crake *Porzana parva* recorded at Haripura wetland in April 2012. Both the species are uncommon passage migrants, with scattered individual records from the Indian mainland.

Wetland-wise Observations:

Tumariya Wetland

Sixty seven species of waterbirds and 5 species of wetland dependant birds belonging to a total of 17 families were recorded from Tumariya during the entire study period (Table 2). Of these, two species are categorized as 'Vulnerable' and five species are categorized as 'Near Threatened' in the IUCN red list of threatened species. All the above-mentioned seven species are listed under Schedule IV of the Wildlife (Protection) Act, 1972. Eurasian Spoonbill *Platalea leucorodia* and Comb Duck *Sarkidiornis melanotos* are listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2002) in Appendix I and II respectively.

Nine of the recorded species are residential species of birds, 25 are residents with local movements, one is a resident with local as well as summer movements, one a resident with altitudinal movements, 12 are residents with winter influx, one is a resident with winter influx as well as local movements, one is a resident with winter influx as well as passage movements, one is a resident with winter influx as well as summer movements, 18 are winter migrants, one is a largely winter migrant and partly resident, one is a restricted range species, and one is a vagrant with only two previous records from the country (Kumar et al. 2003).

Table 2. List of waterbirds and wetland dependant birds recorded at Tumariya wetland

S.No.	Common Name	Scientific Name	IUCN Status	Residential Status
1	**Family: Podicipedidae**			
1	Little Grebe	*Tachybaptus ruficollis*	LC	R/ LM
2	Great Crested Grebe	*Podiceps cristatus*	LC	R/ WM
2	**Family: Phalacrocoracidae**			
3	Great Cormorant	*Phalacrocorax carbo*	LC	R/ WM
4	Indian Shag	*P. fuscicollis*	LC	R/ LM
5	Little Cormorant	*P. niger*	LC	R/ LM
3	**Family: Anhingidae**			

6	Darter	*Anhinga melanogaster*	NT	R/ LM
4	**Family: Ardeidae**			
7	Indian Pond-Heron	*Ardeola grayii*	LC	R/ LM
8	Purple Heron	*Ardea purpurea*	LC	R/ LM
9	Grey Heron	*A. cinerea*	LC	R/ WM
10	Cattle Egret	*Bubulcus ibis*	LC	R/ AM
11	Little Egret	*Egretta garzetta*	LC	R/ LM
12	Median Egret	*Mesophoyx intermedia*	LC	R/ LM
13	Large Egret	*Casmerodius albus*	LC	R/ LM
14	Yellow Bittern	*Ixobrychus sinensis*	LC	R/ LM
5	**Family: Ciconiidae**			
15	Painted Stork	*Mycteria leucocephala*	NT	R/ LM
16	Asian Openbill-Stork	*Anastomus oscitans*	LC	R/ LM
17	White-necked Stork	*Ciconia episcopus*	LC	R
18	Black-necked Stork	*Ephippiorhynchus asiaticus*	NT	R
19	Lesser Adjutant-Stork	*Leptoptilos javanicus*	Vu	R/ LM
6	**Family:Threskiornithidae**			
20	Black Ibis	*Pseudibis papillosa*	LC	R
21	Glossy Ibis	*Plegadis falcinellus*	LC	R/ WM/ LM
22	Eurasian Spoonbill	*Platalea leucorodia*	LC	R
7	**Family: Anatidae**			
23	Lesser Whistling-Duck	*Dendrocygna javanica*	LC	R/ LM
24	Greylag Goose	*Anser anser*	LC	WM
25	Bar-headed Goose	*A. indicus*	LC	R/ WM
26	Bean Goose	*A. fabalis*	LC	Va
27	Brahminy Shelduck	*Tadorna ferruginea*	LC	R/ WM/ PM
28	Comb Duck	*Sarkidiornis melanotos*	LC	R/ LM
29	Cotton Teal	*Nettapus coromandelianus*	LC	R/ LM
30	Eurasian Wigeon	*Anas Penelope*	LC	WM
31	Gadwall	*A. strepera*	LC	WM
32	Common Teal	*A. crecca*	LC	WM
33	Mallard	*A. platyrhynchos*	LC	R/ WM
34	Spot-billed Duck	*A. poecilorhyncha*	LC	R/ LM
35	Northern Pintail	*A. acuta*	LC	WM
36	Garganey	*A. querquedula*	LC	WM
37	Northern Shoveller	*A. clypeata*	LC	WM
38	Red-crested Pochard	*Rhodonessa rufina*	LC	WM
39	Common Pochard	*Aythya ferina*	LC	WM
40	Ferruginous Pochard	*A. nyroca*	NT	R/ WM
41	Tufted Pochard	*A. fuligula*	LC	WM

8	**Family: Gruidae**			
42	Sarus Crane	*Grus antigone*	Vu	R/ LM
9	**Family: Rallidae**			
43	Baillon's Crake	*Porzana pusilla*	LC	R/ WM
44	White-breasted Waterhen	*Amaurornis phoenicurus*	LC	R
45	Common Moorhen	*Gallinula chloropus*	LC	R/ WM
46	Purple Moorhen	*Porphyrio porphyrio*	LC	R/ LM
47	Common Coot	*Fulica atra*	LC	R/ WM
10	**Family: Jacanidae**			
48	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	R/ LM/ SM
49	Bronze-winged Jacana	*Metopidius indicus*	LC	R
11	**Family: Rostratulidae**			
50	Greater Painted-Snipe	*Rostratula benghalensis*	LC	R/ LM
12	**Family: Recurvirostridae**			
51	Black-winged Stilt	*Himantopus himantopus*	LC	R/ LM
13	**Family: Charadriidae**			
52	River Lapwing	*Vanellus duvaucelii*	LC	R/ LM
53	White-tailed Lapwing	*V. leucurus*	LC	WM
54	Red-wattled Lapwing	*V. indicus*	LC	R/ LM
55	Little ringed plover	*Charadrius dubius*	LC	R/ WM
14	**Family: Scolopacidae**			
56	Pintail Snipe	*Gallinago stenura*	LC	WM
57	Common Redshank	*Tringa tetanus*	LC	R/ WM
58	Marsh Sandpiper	*T. stagnatilis*	LC	WM
59	Common Greenshank	*T. nebularia*	LC	WM
60	Wood Sandpiper	*T. glareola*	LC	WM
61	Green Sandpiper	*T. ochropus*	LC	WM/ R
62	Common Sandpiper	*Actitis hypoleucos*	LC	R/ WM
15	**Family: Laridae**			
63	Pallas's Gull	*Larus ichtyaetus*	LC	R
64	Brown-headed Gull	*L. brunnicephalus*	LC	RRS
65	Black-headed Gull	*L. ridibundus*	LC	WM
66	River Tern	*Sterna aurantia*	LC	WM
67	Black-bellied Tern	*S. acuticauda*	NT	R
16	**Family: Accipitridae**			
68	Brahminy Kite	*Haliastur Indus*	LC	R/ LM
69	Western Marsh-Harrier	*Circus aeruginosus*	LC	WM
17	**Family: Alcedinidae**			
70	Small Blue Kingfisher	*Alcedo atthis*	LC	R/WM/SM
71	White-breasted Kingfisher	*Halcyon smyrnensis*	LC	R/ LM

72	Lesser Pied Kingfisher	*Ceryle rudis*	LC	R

LC = Least Concern; NT = Near Threatened; Vu = Vulnerable

R = Resident; R/LM = Resident with local movement; R/LM/SM = Resident with local as well as summer movement; R/AM = Resident with altitudinal movements; R/WM = Resident with winter influx; R/WM/LM = Resident with winter influx as well as local movements; R/WM/PM = Resident with winter influx as well as passage movements; R/WM/SM = Resident with winter influx as well as summer movements; WM = Winter Migrant; WM/R = Largely Winter Migrant and partly resident; RRS = Restricted Range Species; Va = Vagrant

Species Richness, Diversity and Evenness:

Mean species richness, Shannon Wiener Diversity Index (H) and Evenness (E) were calculated for the years 2009-10, 2010-11, and 2011-12 (Table 3). The mean species richness at Tumariya wetland was observed to have increased over the years, and was recorded as highest during 2011-12. Diversity was also observed to have increased over the years with 2011-12 recording the highest diversity. Evenness was highest during 2009-10 (E = 0.524), and lowest during the subsequent year of 2010-11 (E = 0.505). However, the value of E was approximately 0.5 across all three years, thus indicating that the distribution of species was never uniform in any of the years.

Table 3. Mean Species Richness, Shannon Wiener Diversity Index (H) and Evenness (E) at Tumariya wetland across the study duration

Year	Mean Species Richness	Shannon Wiener Diversity Index (H)	Evenness (E)
2009-10	28.83 ± 2.76	2.02	0.524
2010-11	31.89 ± 2.43	2.05	0.505
2011-12	38.38 ± 1.95	2.19	0.517

One-way analysis of variance (ANOVA) was carried out between species richness at Tumariya in the years 2009-10, 2010-11 and 2011-12. Post Hoc tests of Tukey HSD were carried out to further investigate differences between the years. The species richness in the three years was found to be significantly different (one-way ANOVA; $F_{2,20} = 3.96$, $P < 0.05$). The summary is given in the below table. However, the results from the Tukey test showed that only the mean species richness in 2009-10 and 2011-12 were significantly different ($P < 0.05$).

Table 4. One way ANOVA between species richness at Tumariya over the years 2009-10, 2010-11 and 2011-12

Source	SS	Df	MS	F	P
Between Groups					
Treatment	343.62	2	171.81	3.96	0.036
Error	867.6	20	43.38		
Total	1211.22	22			

Abundance:

Mean abundance of observed birds was calculated for the years 2009-10, 2010-11 and 2011-12. The mean abundance at Tumariya wetland was observed to have increased over the years, and was recorded as highest during 2011-12 (Figure 5).

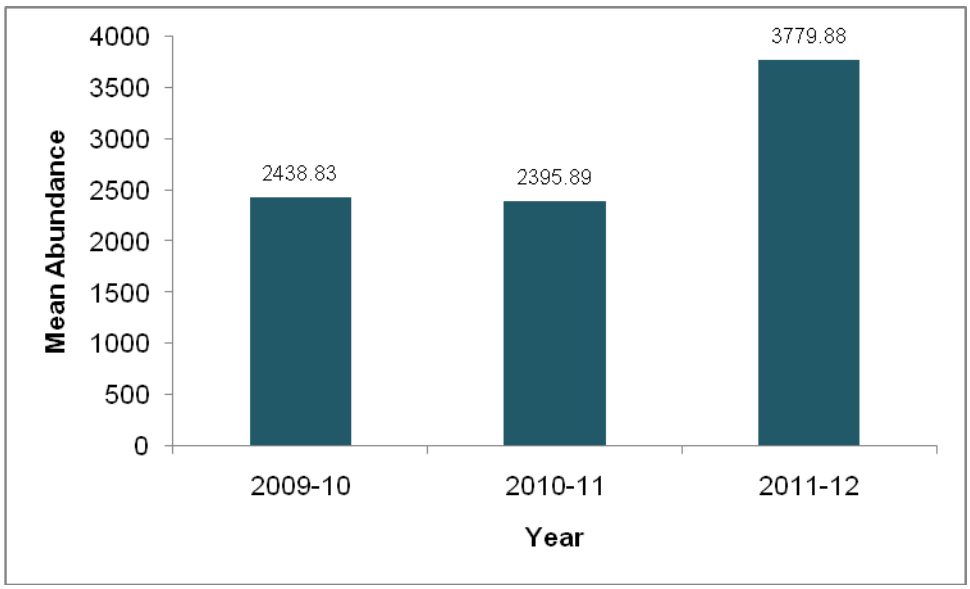

Figure 5. Mean abundance of birds at Tumariya wetland across the years

Common Coot *Fulica atra* was the dominant species recorded at Tumariya wetland in all three years. The relative abundance of all the species was calculated separately for the years 2009-10, 2010-11 and 2011-12. The top ten dominat species in each of the years was noted (Appendix I). The relative abundance of Common Coot was the highest during the year 2010-11 (0.5384) and lowest during 2011-12 (0.4920).

Rare Sightings:

Seven species of birds were seen only once during 2009-10 (Table 5). Of them, Glossy Ibis *Plegadis falcinellus*, Wood Sandpiper *Tringa glareola* and Western Marsh-Harrier *Circus aeruginosus* were considered as rare as only one bird of each species was recorded throughout the year.

Table 5. Species recorded only once at Tumariya wetland during 2009-10

S. No.	Common Name	Scientific Name	Month of Sighting
1	Glossy Ibis	*Plegadis falcinellus*	December 2009
2	Greylag Goose	*Anser anser*	November 2009
3	Garganey	*Anas querquedula*	February 2010
4	Greater Painted-Snipe	*Rostratula benghalensis*	February 2010
5	Common Greenshank	*Tringa nebularia*	February 2010
6	Wood Sandpiper	*Tringa glareola*	December 2009
7	Western Marsh-Harrier	*Circus aeruginosus*	January 2010

Ten species of birds were seen only once during 2010-11 (Table 6). Of them, Baillon's Crake *Porzana pusilla*, Western Marsh-Harrier *Circus aeruginosus*, and Small Blue Kingfisher *Alcedo atthis* were considered as rare as only one bird of each species was recorded throughout the year. Baillon's Crake is an uncommon passage migrant from the area, which had no previous record in the Corbett checklist of birds.

Table 6. Species recorded only once at Tumariya wetland during 2010-11

S. No.	Common Name	Scientific Name	Month of Sighting
1	Painted Stork	*Mycteria leucocephala*	March 2011
2	Asian Openbill-Stork	*Anastomus oscitans*	March 2011
3	Comb Duck	*Sarkidiornis melanotos*	March 2011
4	Cotton Teal	*Nettapus coromandelianus*	March 2011
5	Baillon's Crake	*Porzana pusilla*	February 2011
6	Greater Painted-Snipe	*Rostratula benghalensis*	February 2011
7	River Tern	*Sterna aurantia*	February 2011
8	Green Sandpiper	*Tringa ochropus*	March 2011

9	Western Marsh-Harrier	*Circus aeruginosus*	January 2011
10	Small Blue Kingfisher	*Alcedo atthis*	February 2011

Fifteen species of birds were seen only once during 2011-12 (Table 7). Of them, Yellow Bittern *Ixobrychus sinensis*, Black-necked Stork *Anastomus oscitans*, Lesser Adjutant-Stork *Leptoptilos javanicus*, Bean Goose *Anser fabalis*, White-tailed Lapwing *Vanellus leucurus*, Western Marsh-Harrier *Circus aeruginosus*, and Small Blue Kingfisher *Alcedo atthis* were considered as rare as only one bird of each species was recorded throughout the year. Bean Goose is a vagrant species with no previous record from the State of Uttarakhand. Previous to this sighting, there had been only two other individual records of this species from the entire country.

Table 7. Species recorded only once at Tumariya wetland during 2011-12

S. No.	Common Name	Scientific Name	Month of Sighting
1	Yellow Bittern	*Ixobrychus sinensis*	November 2011
2	Black-necked Stork	*Anastomus oscitans*	March 2012
3	Lesser Adjutant-Stork	*Leptoptilos javanicus*	March 2012
4	Eurasian Spoonbill	*Platalea leucorodia*	March 2012
5	Lesser Whistling-Duck	*Dendrocygna javanica*	November 2011
6	Bean Goose	*Anser fabalis*	December 2011
7	Comb Duck	*Sarkidiornis melanotos*	April 2012
8	Cotton Teal	*Nettapus coromandelianus*	February 2012
9	White-tailed Lapwing	*Vanellus leucurus*	November 2011
10	Pintail Snipe	*Gallinago stenura*	February 2012
11	Green Sandpiper	*Tringa ochropus*	April 2012
12	River Tern	*Sterna aurantia*	April 2012

13	Black-bellied Tern	*Sterna acuticauda*	April 2012
14	Western Marsh-Harrier	*Circus aeruginosus*	November 2011
15	Small Blue Kingfisher	*Alcedo atthis*	February 2012

Threats:

- Encroachment of habitat by local villagers for agriculture and developmental purposes
- Solid waste dumped from local villages
- Hunting
- Excessive grazing by livestock of local villagers and *Gujjars*
- Disturbance by local dogs
- Algal growth and spread of weeds and other invasive species
- Commercial fishing

Baur Wetland

Forty three species of waterbirds and 2 species of wetland dependant birds belonging to a total of 13 families were recorded from Baur during the entire study period (Table 8). Of these, two species are categorized as 'Near Threatened' in the IUCN red list of threatened species. Both the species are listed under Schedule IV of the Wildlife (Protection) Act, 1972.

Five of the recorded species are residential species of birds, 13 are residents with local movements, one is a resident with altitudinal movements, eight are residents with winter influx, one is a resident with winter influx as well as local movements, one is a resident with winter influx as well as passage movements, 14 are winter migrants, one is a largely winter migrant and partly resident, and one is a restricted range species (Kumar et al. 2003).

Table 8. List of waterbirds and wetland dependant birds recorded at Baur wetland

S. No.	Common Name	Scientific Name	IUCN Status	Residential Status
1	**Family: Podicipedidae**			
1	Little Grebe	*Tachybaptus ruficollis*	LC	R/ LM
2	Great Crested Grebe	*Podiceps cristatus*	LC	R/ WM
2	**Family: Phalacrocoracidae**			
3	Great Cormorant	*Phalacrocorax carbo*	LC	R/ WM
4	Little Cormorant	*P. niger*	LC	R/ LM
3	**Family: Ardeidae**			
5	Indian Pond-Heron	*Ardeola grayii*	LC	R/ LM
6	Purple Heron	*Ardea purpurea*	LC	R/ LM
7	Grey Heron	*A. cinerea*	LC	R/ WM
8	Cattle Egret	*Bubulcus ibis*	LC	R/ AM
9	Little Egret	*Egretta garzetta*	LC	R/ LM
10	Median Egret	*Mesophoyx intermedia*	LC	R/ LM
11	Large Egret	*Casmerodius albus*	LC	R/ LM
4	**Family: Ciconiidae**			
12	Asian Openbill-Stork	*Anastomus oscitans*	LC	R/ LM

13	White-necked Stork	*Ciconia episcopus*	LC	R
5	**Family:Threskiornithidae**			
14	Black Ibis	*Pseudibis papillosa*	LC	R
15	Glossy Ibis	*Plegadis falcinellus*	LC	R/ WM/ LM
6	**Family: Anatidae**			
16	Brahminy Shelduck	*Tadorna ferruginea*	LC	R/ WM/ PM
17	Eurasian Wigeon	*Anas Penelope*	LC	WM
18	Gadwall	*A. strepera*	LC	WM
19	Mallard	*A. platyrhynchos*	LC	R/ WM
20	Spot-billed Duck	*A. poecilorhyncha*	LC	R/ LM
21	Northern Pintail	*A. acuta*	LC	WM
22	Garganey	*A. querquedula*	LC	WM
23	Northern Shoveller	*A. clypeata*	LC	WM
24	Red-crested Pochard	*Rhodonessa rufina*	LC	WM
25	Common Pochard	*Aythya ferina*	LC	WM
26	Ferruginous Pochard	*A. nyroca*	NT	R/ WM
27	Tufted Pochard	*A. fuligula*	LC	WM
7	**Family: Rallidae**			
28	Common Moorhen	*Gallinula chloropus*	LC	R/ WM
29	Common Coot	*Fulica atra*	LC	R/ WM
8	**Family: Jacanidae**			
30	Bronze-winged Jacana	*Metopidius indicus*	LC	R
9	**Family: Recurvirostridae**			
31	Black-winged Stilt	*Himantopus himantopus*	LC	R/ LM
10	**Family: Charadriidae**			
32	River Lapwing	*Vanellus duvaucelii*	LC	R/ LM
33	White-tailed Lapwing	*V. leucurus*	LC	WM
34	Red-wattled Lapwing	*V. indicus*	LC	R/ LM
11	**Family: Scolopacidae**			
35	Black-tailed Godwit	*Limosa limosa*	NT	WM
36	Marsh Sandpiper	*Tringa stagnatilis*	LC	WM
37	Common Greenshank	*T. nebularia*	LC	WM
38	Green Sandpiper	*T. ochropus*	LC	WM/ R
39	Wood Sandpiper	*T. glareola*	LC	WM
40	Common Sandpiper	*Actitis hypoleucos*	LC	R/ WM
12	**Family: Laridae**			
41	Pallas's Gull	*Larus ichtyaetus*	LC	R
42	Brown-headed Gull	*L. brunnicephalus*	LC	RRS
43	Black-headed Gull	*L. ridibundus*	LC	WM
13	**Family: Alcedinidae**			
44	White-breasted Kingfisher	*Halcyon smyrnensis*	LC	R/ LM

45	Lesser Pied Kingfisher	*Ceryle rudis*	LC	R

LC = Least Concern; NT = Near Threatened; Vu = Vulnerable

R = Resident; R/LM = Resident with local movement; R/AM = Resident with altitudinal movements; R/WM = Resident with winter influx; R/WM/LM = Resident with winter influx as well as local movements; R/WM/PM = Resident with winter influx as well as passage movements; WM = Winter Migrant; WM/R = Largely Winter Migrant and partly resident; RRS = Restricted Range Species

Species Richness, Diversity and Evenness:

Mean species richness, Shannon Wiener Diversity Index (H) and Evenness (E) were calculated for the years 2009-10, 2010-11, and 2011-12 (Table 9). The mean species richness at Baur wetland was observed to have increased over the years, and was recorded as highest during 2011-12. Diversity (H) was observed as highest in the year 2010-11 (H = 2.47) and the lowest during the following year 2011-12 (H = 2.2). Similarly, the value of E was also highest during the year 2010-11 (E = 0.7) and lowest during the following year 2011-12 (E = 0.589). The value of E was greater than 0.5 across all three years, indicative that the distribution of species was more uniform in Baur in comparison to the other two wetlands. However, the mean species richness at Baur was drastically lower than that of Tumariya and Haripura wetlands during the entire duration of the study. Species distribution at Baur wetland was most uniform during the year 2010-11 (E = 0.7).

Table 9. Mean Species Richness, Shannon Wiener Diversity Index (H) and Evenness (E) at Baur wetland across the three years

Year	Mean Species Richness	Shannon Wiener Diversity Index (H)	Evenness (E)
2009-10	12.83 ± 1.72	2.24	0.664
2010-11	15 ± 1.7	2.47	0.700
2011-12	18.67 ± 2.29	2.2	0.589

One-way analysis of variance (ANOVA) was carried out between the recorded values of species richness at Baur in the years 2009-10, 2010-11 and 2011-12. The one-way ANOVA showed that there was no significant difference between the different values of species richness recorded at Baur over the three years (one-way ANOVA; $F_{2,21} = 2.06$, P= 0.15). The summary is given in the below table.

Table 10. One way ANOVA between species richness at Baur over the years 2009-10, 2010-11 and 2011-12

Source	SS	Df	MS	F	P
Between Groups					
Treatment	132.5	2	66.25	2.06	0.152439
Error	674.8333	21	32.1349		
Total	807.3333	23			

Abundance:

Mean abundance of observed birds was calculated for the years 2009-10, 2010-11 and 2011-12. The mean abundance at Baur wetland was observed to have increased over the years, and was recorded as highest during 2011-12 (Figure 6).

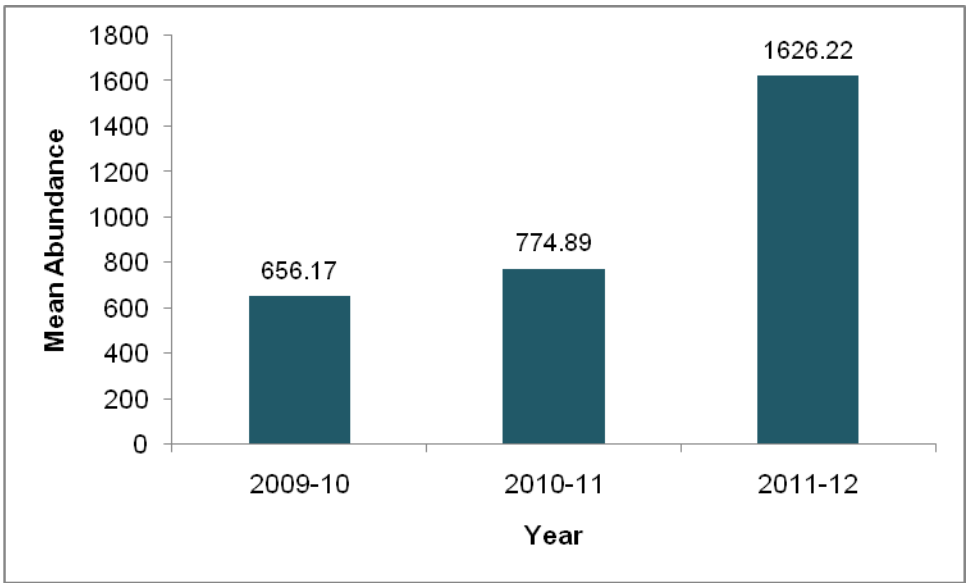

Figure 6. Mean abundance of birds at Baur wetland across the years

The relative abundance of all the species was calculated separately for the years 2009-10, 2010-11 and 2011-12. The top ten dominant species in each of the years was noted (Appendix II). Tufted Pochard *Aythya fuligula* was the dominant species recorded at Baur wetland in 2009-10 and 2010-11. However, in the year 2011-12 Common Coot *Fulica atra* was found to be the most common species with a relative abundance of 0.3021. The relative abundance of Tufted Pochard was highest during the year 2009-10 (0.2764) and lowest during 2011-12 (0.1033).

Rare Sightings:

Ten species of birds were seen only once during 2009-10 (Table 11). Of them, White-tailed Lapwing *Vanellus leucurus* and White-breasted Kingfisher *Halcyon smyrnensis* were considered as rare as only one bird of each species was recorded throughout the year.

Table 11. Species recorded only once at Baur wetland during 2009-10

S. No.	Common Name	Scientific Name	Month of Sighting
1	Indian Pond-Heron	*Ardeola grayii*	November 2009
2	Little Egret	*Egretta garzetta*	December 2009
3	Asian Openbill-Stork	*Anastomus oscitans*	December 2009
4	Eurasian Wigeon	*Anas Penelope*	January 2010
5	Mallard	*Anas platyrhynchos*	February 2010
6	Black-winged Stilt	*Himantopus himantopus*	January 2010
7	River Lapwing	*Vanellus duvaucelii*	November 2009
8	White-tailed Lapwing	*Vanellus leucurus*	December 2009
9	Brown-headed Gull	*Larus brunnicephalus*	November 2009
10	White-breasted Kingfisher	*Halcyon smyrnensis*	January 2010

Five species of birds were seen only once during 2010-11 (Table 12). Of them, White-tailed Lapwing *Vanellus leucurus* and Marsh Sandpiper *Tringa stagnatilis* were considered as rare as only one bird of each species was recorded throughout the year.

Table 12. Species recorded only once at Baur wetland during 2010-11

S. No.	Common Name	Scientific Name	Month of Sighting
1	Black-winged Stilt	*Himantopus himantopus*	January 2011
2	River Lapwing	*Vanellus duvaucelii*	November 2010

3	White-tailed Lapwing	*Vanellus leucurus*	December 2010
4	Marsh Sandpiper	*Tringa stagnatilis*	February 2011
5	Brown-headed Gull	*Larus brunnicephalus*	November 2010

Eight species of birds were seen only once during 2011-12 (Table 13). Of them, Grey Heron *Ardea cinerea* was considered as rare as only one bird of the species was recorded throughout the year.

Table 13. Species recorded only once at Baur wetland during 2011-12

S. No.	Common Name	Scientific Name	Month of Sighting
1	Purple Heron	*Ardea purpurea*	February 2012
2	Grey Heron	*Ardea cinerea*	April 2012
3	Northern Shoveller	*Anas clypeata*	February 2012
4	Bronze-winged Jacana	*Metopidius indicus*	March 2012
5	River Lapwing	*Vanellus duvaucelii*	January 2012
6	Black-tailed Godwit	*Limosa limosa*	April 2012
7	Common Greenshank	*Tringa nebularia*	February 2012
8	Wood Sandpiper	*Tringa glareola*	April 2012

Threats:

- Hunting
- Encroachment of habitat for agriculture and developmental purposes
- Solid waste dumped from local villages
- Commercial fishing
- Disturbance by local dogs

Haripura Wetland

Sixty one species of waterbirds and 4 species of wetland dependant birds belonging to a total of 15 families were recorded from Haripura during the entire study period (Table 14). Of these, one species is categorized as 'Vulnerable' and three species are categorized as 'Near Threatened' in the IUCN red list of threatened species. All the above-mentioned seven species are listed under Schedule IV of the Wildlife (Protection) Act, 1972.

Six of the recorded species are residential species of birds, 19 are residents with local movements, one is a resident with local as well as summer movements, one is a resident with altitudinal movements, 10 are residents with winter influx, one is a resident with winter influx as well as local movements, one is a resident with winter influx as well as passage movements, one is a resident with winter influx as well as summer movements, 22 are winter migrants, two are largely winter migrants and partly residents, and one is a restricted range species (Kumar et al. 2003).

Table 14. List of waterbirds and wetland dependant birds recorded at Haripura wetland

S. No.	Common Name	Scientific Name	IUCN Status	Residential Status
1	**Family: Podicipedidae**			
1	Little Grebe	*Tachybaptus ruficollis*	LC	R/ LM
2	Great Crested Grebe	*Podiceps cristatus*	LC	R/ WM
2	**Family: Phalacrocoracidae**			
3	Great Cormorant	*Phalacrocorax carbo*	LC	R/ WM
4	Indian Shag	*P. fuscicollis*	LC	R/ LM
5	Little Cormorant	*P. niger*	LC	R/ LM
3	**Family: Anhingidae**			
6	Darter	*Anhinga melanogaster*	NT	R/ LM
4	**Family: Ardeidae**			
7	Indian Pond-Heron	*Ardeola grayii*	LC	R/ LM
8	Purple Heron	*Ardea purpurea*	LC	R/ LM
9	Grey Heron	*A. cinerea*	LC	R/ WM
10	Cattle Egret	*Bubulcus ibis*	LC	R/ AM
11	Little Egret	*Egretta garzetta*	LC	R/ LM

12	Median Egret	*Mesophoyx intermedia*	LC	R/ LM
13	Large Egret	*Casmerodius albus*	LC	R/ LM
5	**Family: Ciconiidae**			
14	Asian Openbill-Stork	*Anastomus oscitans*	LC	R/ LM
15	White-necked Stork	*Ciconia episcopus*	LC	R
16	Lesser Adjutant-Stork	*Leptoptilos javanicus*	Vu	R/ LM
6	**Family:Threskiornithidae**			
17	Black Ibis	*Pseudibis papillosa*	LC	R
18	Glossy Ibis	*Plegadis falcinellus*	LC	R/ WM/ LM
7	**Family: Anatidae**			
19	Lesser Whistling-Duck	*Dendrocygna javanica*	LC	R/ LM
20	Greylag Goose	*Anser anser*	LC	WM
21	Brahminy Shelduck	*Tadorna ferruginea*	LC	R/ WM/ PM
22	Cotton Teal	*Nettapus coromandelianus*	LC	R/ LM
23	Eurasian Wigeon	*Anas Penelope*	LC	WM
24	Gadwall	*A. strepera*	LC	WM
25	Common Teal	*A. crecca*	LC	WM
26	Spot-billed Duck	*A. poecilorhyncha*	LC	R/ LM
27	Northern Pintail	*A. acuta*	LC	WM
28	Garganey	*A. querquedula*	LC	WM
29	Northern Shoveller	*A. clypeata*	LC	WM
30	Red-crested Pochard	*Rhodonessa rufina*	LC	WM
31	Common Pochard	*Aythya ferina*	LC	WM
32	Ferruginous Pochard	*A. nyroca*	NT	R/ WM
33	Tufted Pochard	*A. fuligula*	LC	WM
8	**Family: Rallidae**			
34	Little Crake	*Porzana parva*	LC	WM
35	White-breasted Waterhen	*Amaurornis phoenicurus*	LC	R
36	Common Moorhen	*Gallinula chloropus*	LC	R/ WM
37	Purple Moorhen	*Porphyrio porphyrio*	LC	R/ LM
38	Common Coot	*Fulica atra*	LC	R/ WM
9	**Family: Jacanidae**			
39	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	R/ LM/ SM
40	Bronze-winged Jacana	*Metopidius indicus*	LC	R
10	**Family: Recurvirostridae**			
41	Black-winged Stilt	*Himantopus himantopus*	LC	R/ LM
42	Pied Avocet	*Recurvirostra avosetta*	LC	WM/ R
11	**Family: Charadriidae**			
43	Northern Lapwing	*Vanellus vanellus*	LC	WM
44	River Lapwing	*V. duvaucelii*	LC	R/ LM
45	White-tailed Lapwing	*V. leucurus*	LC	WM

46	Grey-headed Lapwing	*V. cinereus*	LC	WM
47	Red-wattled Lapwing	*V. indicus*	LC	R/ LM
48	Little ringed plover	*Charadrius dubius*	LC	R/ WM
12	**Family: Scolopacidae**			
49	Black-tailed Godwit	*Limosa limosa*	NT	WM
50	Pintail Snipe	*Gallinago stenura*	LC	WM
51	Common Snipe	*G. gallinago*	LC	R/ WM
52	Common Redshank	*Tringa tetanus*	LC	R/ WM
53	Marsh Sandpiper	*T. stagnatilis*	LC	WM
54	Common Greenshank	*T. nebularia*	LC	WM
55	Wood Sandpiper	*T. glareola*	LC	WM
56	Green Sandpiper	*T. ochropus*	LC	WM/ R
57	Common Sandpiper	*Actitis hypoleucos*	LC	R/ WM
13	**Family: Laridae**			
58	Pallas's Gull	*Larus ichtyaetus*	LC	R
59	Brown-headed Gull	*L. brunnicephalus*	LC	RRS
60	Black-headed Gull	*L. ridibundus*	LC	WM
61	River Tern	*Sterna aurantia*	LC	WM
14	**Family: Accipitridae**			
62	Western Marsh-Harrier	*Circus aeruginosus*	LC	WM
15	**Family: Alcedinidae**			
63	Small Blue Kingfisher	*Alcedo atthis*	LC	R/ WM/ SM
64	White-breasted Kingfisher	*Halcyon smyrnensis*	LC	R/ LM
65	Lesser Pied Kingfisher	*Ceryle rudis*	LC	R

LC = Least Concern; NT = Near Threatened; Vu = Vulnerable

R = Resident; R/LM = Resident with local movement; R/LM/SM = Resident with local as well as summer movement; R/AM = Resident with altitudinal movements; R/WM = Resident with winter influx; R/WM/LM = Resident with winter influx as well as local movements; R/WM/PM = Resident with winter influx as well as passage movements; R/WM/SM = Resident with winter influx as well as summer movements; WM = Winter Migrant; WM/R = Largely Winter Migrant and partly resident; RRS = Restricted Range Species

Species Richness, Diversity and Evenness:

Mean species richness, Shannon Wiener Diversity Index (H) and Evenness (E) were calculated for the years 2009-10, 2010-11, and 2011-12 (Table 15). The mean species richness at Haripura wetland was observed to have increased over the years, and was recorded as highest during 2011-12. Diversity (H) and Evenness (E) were also observed to have increased over the years with 2011-12 recording the highest diversity (H = 2.47) and evenness (E = 0.595) of species. Evenness was lowest during the year 2009-10 (E = 0.533). However, the value of E was approximately 0.5 across all three years, thus indicating that the distribution of species was never completely uniform in any of the years.

Table 15. Mean Species Richness, Shannon Wiener Diversity Index (H) and Evenness (E) at Haripura wetland across the three years

Year	Mean Species Richness	Shannon Wiener Diversity Index (H)	Evenness (E)
2009-10	21.5 ± 1.88	1.95	0.533
2010-11	24.67 ± 2.2	2.29	0.586
2011-12	35.22 ± 2.54	2.47	0.595

One-way analysis of variance (ANOVA) was carried out between species richness at Haripura in the years 2009-10, 2010-11 and 2011-12. Post Hoc tests of Tukey HSD were carried out to further investigate differences between the years. The species richness in the three years was found to be significantly different (one-way ANOVA; $F_{2,21} = 9.39$, $P < 0.05$). The summary is given in the below table. The results of the Tukey test showed that the difference between the mean species richness recorded in the years 2009-10 and 2010-11 were non-significant. However, the results were significant between the years 2009-10 and 2011-12 ($P < 0.01$) as well as the years 2010-11 and 2011-12 ($P < 0.05$).

Table 16. One way ANOVA between species richness at Haripura over the years 2009-10, 2010-11 and 2011-12

Source	SS	Df	MS	F	P
Between Groups					
Treatment	822.2778	2	411.1389	9.39	0.001221
Error	919.0556	21	43.7646		
Total	1741.3333	23			

Abundance:

Mean abundance of observed birds was calculated for the years 2009-10, 2010-11 and 2011-12. The mean abundance at Haripura wetland was observed to have increased over the years, and was recorded as highest during 2011-12 (Figure 7).

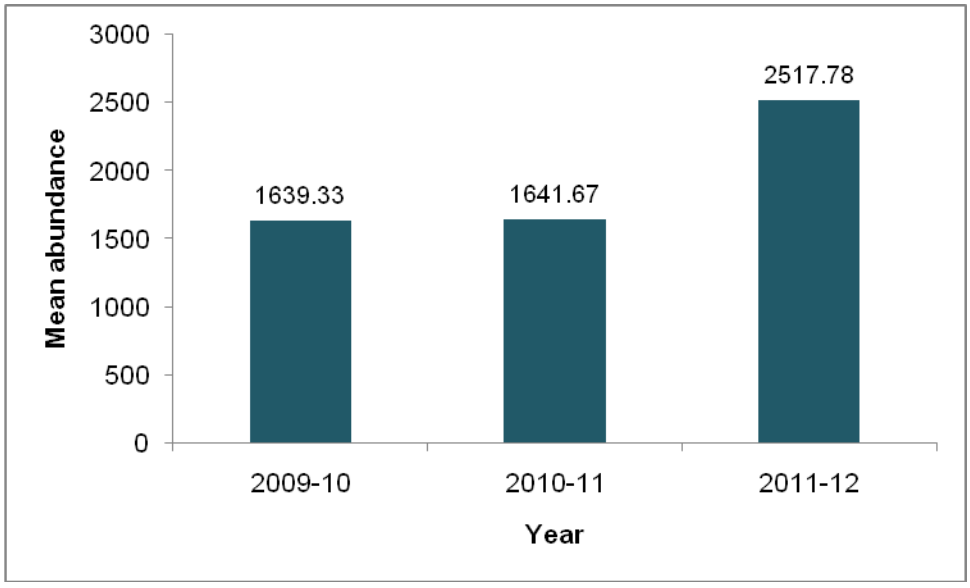

Figure 7. Mean abundance of birds at Haripura wetland across the years

Common Coot *Fulica atra* was the dominant species recorded at Haripura wetland in all three years. The relative abundance of all the species was calculated separately for the years 2009-10, 2010-11 and 2011-12. The top ten dominant species in each of the years was noted (Appendix III). The relative abundance of Common Coot was the highest during the year 2011-12 (0.3153) and lowest during 2010-11 (0.2871).

Rare Sightings:

Eight species of birds were seen only once during the year 2009-10 (Table 17). Of them, Darter *Anhinga melanogaster*, Northern Lapwing *Vanellus vanellus*, and Small Blue Kingfisher *Alcedo atthis* were considered as rare as only one bird of each species was recorded throughout the year.

Table 17. Species recorded only once at Haripura wetland during 2009-10

S. No.	Common Name	Scientific Name	Month of Sighting
1	Darter	*Anhinga melanogaster*	January 2010
2	Grey Heron	*Ardea cinerea*	December 2009
3	Large Egret	*Casmerodius albus*	February 2010
4	Northern Lapwing	*Vanellus vanellus*	December 2009
5	River Lapwing	*Vanellus duvaucelii*	November 2009
6	Common Greenshank	*Tringa nebularia*	November 2009
7	Small Blue Kingfisher	*Alcedo atthis*	January 2010
8	Lesser Pied Kingfisher	*Ceryle rudis*	November 2009

Ten species of birds were seen only once during 2010-11 (Table 18). Of them, Darter *Anhinga melanogaster*, Lesser Adjutant-Stork *Leptoptilos javanicus*, Northern Lapwing *Vanellus vanellus*, and Small Blue Kingfisher *Alcedo atthis* were considered as rare as only one bird of each species was recorded throughout the year.

Table 18. Species recorded only once at Haripura wetland during 2010-11

S. No.	Common Name	Scientific Name	Month of Sighting
1	Darter	*Anhinga melanogaster*	January 2011
2	Lesser Adjutant-Stork	*Leptoptilos javanicus*	March 2011
3	Greylag Goose	*Anser anser*	February 2011
4	Cotton Teal	*Nettapus coromandelianus*	February 2011
5	Common Teal	*Ana crecca*	February 2011
6	Bronze-winged Jacana	*Metopidius indicus*	March 2011
7	Northern Lapwing	*Vanellus vanellus*	December 2010
8	River Lapwing	*Vanellus duvaucelii*	November 2010
9	Grey-headed Lapwing	*Vanellus cinereus*	February 2011
10	Small Blue Kingfisher	*Alcedo atthis*	January 2011

Nine species of birds were seen only once during 2011-12 (Table 19). Of them, Indian Shag *Phalacrocorax fuscicollis*, Little Crake *Porzana parva*, Pied Avocet *Recurvirostra avosetta*, Black-tailed Godwit *Limosa limosa*, Common Snipe *Gallinago gallinago,* and Western Marsh-Harrier *Circus aeruginosus* were considered as rare as only one bird of each species was recorded throughout the year. Little Crake is an uncommon passage migrant from the area, which had no previous record in the Corbett checklist of birds.

Table 19. Species recorded only once at Haripura wetland during 2011-12

S. No.	Common Name	Scientific Name	Month of Sighting
1	Indian Shag	*Phalacrocorax fuscicollis*	January 2012
2	Greylag Goose	*Anser anser*	December 2011
3	Little Crake	*Porzana parva*	April 2012
4	Pied Avocet	*Recurvirostra avosetta*	April 2012
5	Black-tailed Godwit	*Limosa limosa*	March 2012
6	Pintail Snipe	*Gallinago stenura*	December 2011
7	Common Snipe	*Gallinago gallinago*	April 2012
8	River Tern	*Sterna aurantia*	April 2012
9	Western Marsh-Harrier	*Circus aeruginosus*	February 2012

Threats:

- Encroachment of habitat by local villagers for agriculture and developmental purposes
- Solid waste dumped from local villages
- Hunting
- Excessive grazing by livestock of local villagers and *Gujjars*
- Disturbance by local dogs
- Algal growth and spread of weeds and other invasive species
- Illegal quarrying of sand
- Commercial fishing

Comparison between wetlands:

Among all three wetlands, Tumariya had the highest species richness although it had the smallest area in comparison to Haripura and Baur. Baur being the largest wetland had the lowest species richness. However, bird diversity at Baur was the most evenly distributed in comparison to the other wetlands. The abundance of birds was highest at Tumariya and lowest at Baur. Common Coot *Fulica atra* was the most common species found at both Tumariya and Haripura wetlands. Tufted Pochard *Aythya fuligula* was the most common species at Baur during the years 2009-10 and 2010-11. However, during the year 2011-12, Common Coot *Fulica atra* was observed to be the most common species recorded at Baur wetland.

Tumariya wetland had the highest number of Globally Threatened (*n* = 2) and Near Threatened (n = 5) species of birds, followed by Haripura wetland with one Globally Threatened and three Near Threatened bird species being recorded. There were no Globally Threatened species recorded from Baur wetland, and only two species classified as Near Threatened. Tumariya was the only wetland from where bird species listed under CITES were recorded. Three species listed under Schedule I of the Wildlife (Protection) Act, 1972 were recorded from Tumariya, only one such species was recorded from Haripura and none were recorded from Baur wetland.

Jaccard's Similarity Index:

Jaccard's Index (JI) was calculated between the different wetlands to check for the degree of overlap of species between the wetlands. Tumariya and Haripura wetlands (JI = 0.76) had the highest degree of overlap of species, followed by Haripura and Baur wetlands (JI = 0.67). Tumariya and Baur wetlands had the least number of common species (JI = 0.6).

Recommendations

Recount of Threats

The most important threat to the waterbirds at all three wetlands is the loss of habitat due to human encroachment. The human pressure on the wetlands has increased over the years. The rapidly increasing human population settled around the wetlands has resulted in reclamation of wetland area for agriculture and development purposes. This has become a key threat to all the three wetlands. There is also dumping of solid waste from local villages into the wetlands, thereby polluting the water.

Agriculture on land encroached from wetland areas © Anushree Bhattacharjee

Majority of the villagers own livestock. Additionally, there are several *Gujjar* settlements near Tumariya wetland. These *Gujjars* own large herds of livestock. Increased grazing pressure from these animals is also degrading the wetlands.

Cattle grazing in wetlands © Anushree Bhattacharjee

Another key threat to waterbirds is hunting and direct physical damage to eggs and chicks. Local hunting of waterbirds is rampant at all three sites. Local children often destroy eggs and chicks. There is also the problem of feral dogs running rampant in the area and disturbing the birds.

Commercial fishing is carried out in all three wetlands under the jurisdiction of the Fisheries Department. Often the boats of the fishermen disturb the large congregations of waterbirds. Some of the fishermen also practice illegal hunting of the birds.

Illegal quarrying of sand is being carried out at Haripura wetland. This has also led to the degradation of the wetland area.

Commercial fishing © Anushree Bhattacharjee

Illegal sand quarrying © Anushree Bhattacharjee

Another major threat to the wetlands is the spread of algae and other invasive species such as *Ipomoea carnea*. These invasive species have been taking over the wetlands, and slowly choking the native plant species found at the sites. If not controlled in the coming years, these could cause major degradation of the wetlands as important habitats for waterbirds.

Invasive growth over wetland area © Anushree Bhattacharjee

Recommendations

The report makes the following recommendation for the conservation of waterbirds and the management of their habitats, the wetlands. The recommendations are general as well as site specific.

- The concerned Irrigation Departments, Forest Departments and Fisheries Departments need to work together to ensure that the waterbirds at the wetlands are not harmed by the commercial fishing being carried out at the sites.
- The concerned Irrigation Departments should consult the Forest Department and scientific experts regarding management of the water levels in the reservoirs.
- The concerned Irrigation Departmenest ts and Forest Departments need to work together in controlling the encroachment of wetland areas, intensive grazing pressures, and other illegal activities rampant at the sites. The cooperation of the local Police Department should be sought for ensuring preventive action in the area.
- All development work around the wetlands should be monitored and should have to obtain permission from the forest department. An advisory committee comprising of representatives from all concerned Government departments, scientific experts, and local community members could be constituted.
- The Irrigation Department should seek the support of the Forest Department and scientific experts to remove the various invasive species taking over the wetlands.
- Regular awareness programmes should be organized for the local villagers, *gujjars* and other stakeholders. Special awareness camps should be organized for the local children. NGOs such as The Corbett Foundation could play a role in designing the modules.
- Intensive studies should be carried out on the vegetation, water quality, and land use changes at the sites. Regular and sustained monitoring of waterbirds at the sites need to be ensured.

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Appendices

Appendix I: Relative abundance of top ten dominant species at Tumariya

Table I.1: Relative abundance of top ten dominant species at Tumariya in 2009-10

S. No.	Common Name	Scientific Name	Relative Abundance
1	Common Coot	*Fulica atra*	0.5264
2	Gadwall	*Anas strepera*	0.0589
3	Tufted Pochard	*Aythya fuligula*	0.0551
4	Common Pochard	*Aythya ferina*	0.0515
5	Great Crested Grebe	*Podiceps cristatus*	0.0510
6	Brahminy Shelduck	*Tadorna ferruginea*	0.0396
7	Bar-headed Goose	*Anser indicus*	0.0383
8	Common Moorhen	*Gallinula chloropus*	0.0282
9	Red-crested Pochard	*Rhodonessa rufina*	0.0273
10	Little Cormorant	*Phalacrocorax niger*	0.0253

Table I.2: Relative abundance of top ten dominant species at Tumariya in 2010-11

S. No.	Common Name	Scientific Name	Relative Abundance
1	Common Coot	*Fulica atra*	0.5384
2	Tufted Pochard	*Aythya fuligula*	0.0715
3	Great Crested Grebe	*Podiceps cristatus*	0.0475
4	Gadwall	*Anas strepera*	0.0439
5	Common Pochard	*Aythya ferina*	0.0407

6	Brahminy Shelduck	*Tadorna ferruginea*	0.0326
7	Red-crested Pochard	*Rhodonessa rufina*	0.0284
8	Common Moorhen	*Gallinula chloropus*	0.0269
9	Bar-headed Goose	*Anser indicus*	0.0260
10	Eurasian Wigeon	*Anas Penelope*	0.0224

Table I.3. Relative abundance of top ten dominant species at Tumariya in 2011-12

S. No.	Common Name	Scientific Name	Relative Abundance
1	Common Coot	*Fulica atra*	0.4920
2	Little Cormorant	*Phalacrocorax niger*	0.0865
3	Tufted Pochard	*Aythya fuligula*	0.0760
4	Common Pochard	*Aythya ferina*	0.0715
5	Gadwall	*Anas strepera*	0.0374
6	Northern Pintail	*Anas acuta*	0.0239
7	Great Crested Grebe	*Podiceps cristatus*	0.0235
8	Common Moorhen	*Gallinula chloropus*	0.0217
9	Red-crested Pochard	*Rhodonessa rufina*	0.0187
10	Eurasian Wigeon	*Anas Penelope*	0.0117

Appendix II: Relative abundance of top ten dominant species at Baur

Table II.1. Relative abundance of top ten dominant species at Baur in 2009-10

S. No.	Common Name	Scientific Name	Relative Abundance
1	Tufted Pochard	*Aythya fuligula*	0.2764
2	Common Coot	*Fulica atra*	0.1869
3	Common Pochard	*Aythya ferina*	0.1123
4	Northern Pintail	*Anas acuta*	0.1118
5	Great Crested Grebe	*Podiceps cristatus*	0.0813
6	Gadwall	*Anas strepera*	0.0566
7	Red-crested Pochard	*Rhodonessa rufina*	0.0500
8	Common Moorhen	*Gallinula chloropus*	0.0279
9	Black-headed Gull	*Larus ridibundus*	0.0261
10	Black Ibis	*Pseudibis papillosa*	0.0163

Table II.2. Relative abundance of top ten dominant species at Baur in 2010-11

S. No.	Common Name	Scientific Name	Relative Abundance
1	Tufted Pochard	*Aythya fuligula*	0.1871
2	Common Coot	*Fulica atra*	0.1744
3	Great Crested Grebe	*Podiceps cristatus*	0.1428
4	Red-crested Pochard	*Rhodonessa rufina*	0.1110

5	Gadwall	*Anas strepera*	0.0842
6	Common Pochard	*Aythya ferina*	0.0670
7	Northern Pintail	*Anas acuta*	0.0631
8	Asian Openbill-Stork	*Anastomus oscitans*	0.0196
9	Eurasian Wigeon	*Anas Penelope*	0.0194
10	Black-headed Gull	*Larus ridibundus*	0.0184

Table II.3. Relative abundance of top ten dominant species at Baur in 2011-12

S. No.	Common Name	Scientific Name	Relative Abundance
1	Common Coot	*Fulica atra*	0.3021
2	Red-crested Pochard	*Rhodonessa rufina*	0.2336
3	Tufted Pochard	*Aythya fuligula*	0.1033
4	Gadwall	*Anas strepera*	0.0779
5	Northern Pintail	*Anas acuta*	0.0755
6	Great Crested Grebe	*Podiceps cristatus*	0.0340
7	Little Cormorant	*Phalacrocorax niger*	0.0323
8	Cattle Egret	*Bubulcus ibis*	0.0318
9	Eurasian Wigeon	*Anas Penelope*	0.0242
10	Common Pochard	*Aythya ferina*	0.0157

Appendix III: Relative abundance of top ten dominant species at Haripura

Table III.1. Relative abundance of top ten dominant species at Haripura in 2009-10

S. No.	Common Name	Scientific Name	Relative Abundance
1	Common Coot	*Fulica atra*	0.3102
2	Red-crested Pochard	*Rhodonessa rufina*	0.3063
3	Common Pochard	*Aythya ferina*	0.0955
4	Gadwall	*Anas strepera*	0.0919
5	Tufted Pochard	*Aythya fuligula*	0.0576
6	Common Moorhen	*Gallinula chloropus*	0.0284
7	Northern Pintail	*Anas acuta*	0.0250
8	Ferruginous Pochard	*Aythya nyroca*	0.0243
9	Little Cormorant	*Phalacrocorax niger*	0.0143
10	Black-headed Gull	*Larus ridibundus*	0.0056

Table III.2. Relative abundance of top ten dominant species at Haripura in 2010-11

S. No.	Common Name	Scientific Name	Relative Abundance
1	Common Coot	*Fulica atra*	0.2871
2	Red-crested Pochard	*Rhodonessa rufina*	0.2449
3	Gadwall	*Anas strepera*	0.0983
4	Common Pochard	*Aythya ferina*	0.0847
5	Tufted Pochard	*Aythya fuligula*	0.0575

6	Northern Pintail	*Anas acuta*	0.0313
7	Little Cormorant	*Phalacrocorax niger*	0.0285
8	Ferruginous Pochard	*Aythya nyroca*	0.0273
9	Common Moorhen	*Gallinula chloropus*	0.0215
10	Asian Openbill-Stork	*Anastomus oscitans*	0.0171

Table III.3. Relative abundance of top ten dominant species at Haripura in 2011-12

S. No.	Common Name	Scientific Name	Relative Abundance
1	Common Coot	*Fulica atra*	0.3153
2	Gadwall	*Anas strepera*	0.0793
3	Little Cormorant	*Phalacrocorax niger*	0.0649
4	Ferruginous Pochard	*Aythya nyroca*	0.0377
5	Common Pochard	*Aythya ferina*	0.0348
6	Common Moorhen	*Gallinula chloropus*	0.0326
7	Tufted Pochard	*Aythya fuligula*	0.0314
8	Garganey	*Anas querquedula*	0.0222
9	Little Grebe	*Tachybaptus ruficollis*	0.0216
10	Red-crested Pochard	*Rhodonessa rufina*	0.0213

Common Coot © Anushree Bhattacharjee

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