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Birds in and around the Gidhhi and Pushpakarni Lake: An ideal bird watching site in Nalanda

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Abstract

Wetlands are considered amongst the most productive ecosystems in the world. They provide numerous beneficial services for organisms as well as to humans. The exploitation of ponds and lakes becomes a major problem nowadays. Nalanda comes under Gangetic floodplain and southern Chotanagpur plateau region. The Panchane river flow through the district of Nalanda which flows nearby the study sites. It is a rain-fed river and almost becomes dry in summer. Bihar has one Tiger reserve, one National park and 12 Wildlife Sanctuaries. The fertile Indo-Gangetic Plain which is rich in wetlands that attracts variety of birds. The Gidhhi and Pushpakarni lakes are two small non-protected water body situated in the Nalanda district situated vicinity of Rajgir Wildlife Sanctuary. These sites have emerged as the last refuge for winter visitors, as well as the most important "Pakshi vihar" (Bird watching site) in the Nalanda district. Gidhhi and Pushpakarni lakes are ideal and potential birding sites in Nalanda well deserve to be designated as an IBA (Important Bird Area) of India which attracts thousands of birds and birds watchers especially in winter but could not be added as an IBA due to lack of sufficient data at the time of listing of IBAs. Even though globally Near Threatened species such as Ferruginous duck *Aythya nyroca*, Painted Stork *Mycteria leucocephala* and Black-headed Ibis *Threskiornis melanocephalus* has been recorded from here (Photo plate 1). Overall, Our study finds 107 species of birds in both lakes during the survey belonging to 47 families (table 1) which includes migratory birds like Northern Shoveler *Spatula clypeata*, Northern Pintail *Anas acuta*, Common Teal *Anas crecca*, Red-Crested Pochard *Netta rufina*, Gadwall *Mareca strepera*, Garganey *Spatula querquedula* and resident Lesser Whistling-duck *Dendrocygna javanica*, Pheasant-tailed Jacana *Hydrophasianus chirurgus*, Purple Swampphen *Porphyrio porphyria*. The major threats to the wetland are fishing lease, encroachment, water pollution, poaching and opportunistic feral dogs who roam around the wetland (photo plate 2). Birds are also feel threaten due to human activities like grazing livestock and Bathing.

Keywords: Avian diversity, conservation, ecotourism, gangetic plain

Introduction

Wetlands are an important ecosystem that holds a variety of flora and fauna such as zoo and phytoplankton, submerged and free-floating aquatic vegetation, number of insects species, fishes, amphibians, reptiles, birds, and mammals. It considered as the most productive ecosystems in the world, comparable to rain forests and coral reefs. It supports faunal diversity by providing variety of niche and food. The topography, climate, movement and abundance of water determine the diversity in the wetland. The arrival of these birds in Nalanda starts from November and they start return back in the end of March. Lake is dried by fisher folks for fishing which threatens water birds especially in peak migration season i.e March. This is the first detailed report on avian diversity in and around Gidhhi and Pushpakarni Lake in Nalanda. These small water bodies are also used for grazing livestock. Local poachers use to hunt birds for meat. The Gidhhi and Pushpakarni lake is surrounded by Begampur and Surajpur villages respectively (Figure 1). Coordinates of Gidhhi lake; Latitude: 25° 9' 3.4878" Longitude: 85° 27' 12.8154 and Pushpakarni lake is Latitude: 25° 8' 39.285" Longitude: 85° 27' 8.8662". Peak summer temperatures range from 8 to 48 °C with months, and it receive maximum precipitation in the month of August. Villagers are dependent on agriculture and use lake water for irrigation. Around 500 Pintail *Anas acuta* were seen in 2009 (Verbally, Navin Kumar) but during our bird census in 2018 and 2019, only 30 to 45 Northern Pintail *Anas acuta* were observed. In May 2019, we have seen two pair of Painted Storks for the first time. We observed congregation of Lesser Whistling-duck *Dendrocygna javanicas* throughout the year in a flock of 1500 to 2000.

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Hovering and chasing the prey by the birds of prey such as Shikra *Accipiter badius*, Black kite *Milvus migrans*, winter visitor Oriental Honey-Buzzard *Pernis ptilorhynchus* and Black-winged Kite *Elanus caeruleus* commonly is frequently observed nearby. Black-crowned night- Herons *Nycticorax nycticorax*, Cattle egret *Bubulcus ibis*, Great egret *Ardea alba* and Asian openbill *Anastomus oscitans* prefer this site for nesting due to the pushpakarni lake has abundance of tree species. Pushpakarni Lake is surrounded predominantly by *Albizia lebbek*, *Senna siamea*, *Neolamarckia cadamba*, *Mangifera indica*, *Dalbergia sissoo*, *Ficus religiosa* and *Eucalyptus* trees which provides nesting and perching ground for birds where few *Dalbergia sissoo* were observed near Gidhhi Lake. Diving birds relatively infrequent while Jacana, Moorhen, Waterhen, and Swampphen are usually seen in Pushpakarni. Birds play a important role towards the stability of the food chain by feeding aquatic vegetation, fishes, crustaceans, snails, frogs, and snakes.

Periodically, fisher men clean out aquatic vegetation from the lake once every year for fishing purpose. The study site is situated about 10 kilo metres from Bihar Sharif, the district headquarter of Nalanda district and about 500 m from each other. The government should provide tourist facilities and develop such infrastructure so that people can get involved in bird conservation through ecotourism and various educational activities. There is a lot of tourism potential here as the both water body has religious and historical importance. Both sites are situated close to the Kundalpur jain temple which is one of the most important Jain pilgrimages and is believed to birthplace of Mahavira and Nalanda university ruins both attracts good number of tourist.

Materials and Methods

We studied the diversity of birds in these two water bodies between November 2018 to May 2019 twice in a month using primarily the Point Count method for sampling birds and with the help of Nikon Binocular, monocular (40×60) and Canon EOS 1300D camera. Standard field guide books were used to identify the birds (Ali and Ripley, 1983) ^[1]. On a regular basis, observations were made in the morning and sometimes before dusk. With the support of local people and some college students, we surveyed both sites twice in a month. Total 15 sites were selected for the observation of bird (table 4). Volunteers helped us in monitoring work, bird count as well as in awareness campaign. We had conducted education and awareness campaign along with our survey among community peoples.

Results and Discussion

The Rajgir Wildlife Sanctuary, Gidhhi Lake, Pushpakarni Lake, Panchane River and Pawapuri Watertank are important bird-watching spots in the Nalanda district, and they should

be protected. The flow of the drain in the lake has to be stopped and feral dogs that roam around lake are major concern to birds which needs to be addressed. Poachers hunts both migratory and resident birds by using traps and fishing nets. (Photo plate 2). We interviewed number of people who showed their concerns to the birds. In 2014, the Chief Minister of Bihar Sri Nitish Kumar had visited Gidhhi Lake during his Nalanda tour and at that time he was delighted to see the abundant flora and fauna in and around the lake. After assessing the numerous lotus in the lake, the chief minister named it "Kamal Sarobar." But while later on all the lotus in the Gidhhi Lake vanished spraying of weedicide. It is difficult to control the rapid growth of the weed Water Hyacinth *Eichhornia crassipes* in these wetlands. There is insufficient information available about the birds of Nalanda. There are only a few records and notes available with the respect to Gidhhi and Pushpakarni Lake. Arvind Mishra surveyed the site while collecting data on potential IBAs in Bihar for a Bombay Natural History Society's small grant project (2013-14) for exploring birds in the area. Arvind Mishra, an avian expert who had recorded a total of 26 species of birds from Gidhhi Lake which includes Bar-headed Goose *Anser indicus*, Ruddy Shelduck *Tadorna ferruginea* and Eurasian Wigeon *Mareca penelope* (Table 3). We did not seen a single Bar-headed Goose *Anser indicus* and Ruddy Shelduck *Tadorna ferruginea* during our survey, but observed about 14 Red-crested Pochard *Netta rufina* in December 2017. Due to the abundance of fishes in the Lakes, large flocks of piscivore birds like Cormorants, Herons and Egrets can be seen throughout the year. Birds are an indicator of the health of an ecosystem, though study and conservation of birds and their habitats is crucial. We have found a rich variety of birds in and around these lakes. This study finds 107 species of birds referable to 47 families (table 1). We found 46 species of waterbirds in Gidhhi and Pushpakarni Lake belonging to 15 families (table 2 and Figure 2). Out of 46 species of water and water dependent bird, 16 were winter visitors and 26 Resident and rest are occasional visitor and local migrants. Winter visitors were observed in maximum number from November to end of February. Grey-headed Lapwing *Vanellus cinereus*, Comb Duck *Sarkidiornis melanotos*, Ferruginous Duck *Aythya nyroca* Yellow-bellied Prinia *Prinia flaviventris* were new records for Nalanda district. If anthropogenic pressure is reduce, appropriate action will take against poachers, and fishing activities will restrict during the migration periods, the birds will have a chance to thrive here. Birds need safe places to rest and feed and breed. Small wetlands like Gidhhi and Pushpakarni require a well-planned strategy for conservation of birds and its habitats. There is a critical need to spread awareness and carry out further study for the conservation of such important habitat.

Table 1: Checklist of birds recorded in and around the Gidhhi and Pushpakarni Lake, Nalanda, Bihar

SI. No.	Common Name	Scientific Name	Family	Status of occurrence
1.	Shikra	<i>Accipiter badius</i>	Accipitridae	R, Common
2.	Black-winged Kite	<i>Elanus caeruleus</i>	Accipitridae	R, Common
3.	Black Kite	<i>Milvus migrans</i>	Accipitridae	R, Common
4.	Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i>	Accipitridae	R, Common
5.	Blyth's reed Warbler	<i>Acrocephalus dumetorum</i>	Acrocephalidae	M, Common
6.	Common Iora	<i>Aegithina tiphia</i>	Aegithinidae	R, Common
7.	Sand Lark	<i>Alaudala raytal</i>	Alaudidae	R, Uncommon
8.	Pied Kingfisher	<i>Ceryle rudis</i>	Alcedinidae	R, Common
9.	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae	R, Common
10.	Northern Pintail	<i>Anas acuta</i>	Anatidae	M, Common

11.	Common Teal	<i>Anas crecca</i>	Anatidae	M, Common
12.	Ferruginous Duck	<i>Aythya nyroca</i>	Anatidae	M, Uncommon
13.	Lesser Whistling-Duck	<i>Dendrocygna javanica</i>	Anatidae	R, Abundant
14.	Gadwall	<i>Mareca strepera</i>	Anatidae	M, Common
15.	Red-crested Pochard	<i>Netta rufina</i>	Anatidae	M, Uncommon
16.	Cotton Pygmy-Goose	<i>Nettapus coromandelianus</i>	Anatidae	R, Common
17.	Comb Duck	<i>Sarkidiornis melanotos</i>	Anatidae	LM, Uncommon
18.	Northern Shoveler	<i>Spatula clypeata</i>	Anatidae	M, Common
19.	Garganey	<i>Spatula querquedula</i>	Anatidae	M, Uncommon
20.	Asian Palm-Swift	<i>Cypsiurus balasiensis</i>	Apodidae	R, Abundant
21.	Intermediate Egret	<i>Ardea intermedia</i>	Ardeidae	R, Common
22.	Grey Heron	<i>Ardea cinerea</i>	Ardeidae	R, Common
23.	Purple Heron	<i>Ardea purpurea</i>	Ardeidae	R, Common
24.	Indian Pond-Heron	<i>Ardeola grayii</i>	Ardeidae	R, Abundant
25.	Great Egret	<i>Ardea alba Ardea alba</i>	Ardeidae	R, Common
26.	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae	R, Abundant
27.	Little Egret	<i>Egretta garzetta</i>	Ardeidae	R, Common
28.	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	Ardeidae	R, Common
29.	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	Bucerotidae	R, Common
30.	Little Ringed Plover	<i>Charadrius dubius</i>	Charadriidae	R, Common
31.	Grey-headed Lapwing	<i>Vanellus cinereus</i>	Charadriidae	M, Occasional
32.	Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae	R, Abundant
33.	Asian Openbill	<i>Anastomus oscitans</i>	Ciconiidae	R, Common
34.	Painted Stork	<i>Mycteria leucocephala</i>	Ciconiidae	LM, Uncommon
35.	Common Tailorbird	<i>Orthotomus sutorius</i>	Cisticolidae	R, Common
36.	Yellow-bellied Prinia	<i>Prinia flaviventris</i>	Cisticolidae	R, Uncommon
37.	Plain Prinia	<i>Prinia inornata</i>	Cisticolidae	R, Common
38.	Rock Pigeon	<i>Columba livia</i>	Columbidae	R, Abundant
39.	Spotted Dove	<i>Spilopelia suratensis</i>	Columbidae	R, Abundant
40.	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	Columbidae	R, Abundant
41.	Yellow-footed Green-Pigeon	<i>Treron phoenicopterus</i>	Columbidae	R, Common
42.	Indian Roller	<i>Coracias benghalensis</i>	Coraciidae	R, Abundant
43.	Large-billed Crow	<i>Corvus macrorhynchos</i>	Corvidae	R, Common
44.	House Crow	<i>Corvus splendens</i>	Corvidae	R, Abundant
45.	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Corvidae	R, Common
46.	Greater Coucal	<i>Centropus sinensis</i>	Cuculidae	R, Abundant
47.	Jacobin Cuckoo	<i>Clamator jacobinus</i>	Cuculidae	M, Common
48.	Asian Koel	<i>Eudynamis scolopaceus</i>	Cuculidae	R, Common
49.	Common Hawk-Cuckoo	<i>Hierococcyx varius</i>	Cuculidae	R, Abundant
50.	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	Dicaeidae	R, Common
51.	Black Drongo	<i>Dicrurus macrochercus</i>	Dicruridae	R, Abundant
52.	Indian Silverbill	<i>Euodice macularica</i>	Estrildidae	R, Common
53.	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Estrildidae	R, Common
54.	Common Kestrel	<i>Falco tinnunculus</i>	Falconidae	R, Common
55.	Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	M, Common
56.	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	Jacanidae	R, Common
57.	Bronze-winged Jacana	<i>Metopidius indicus</i>	Jacanidae	R, Common
58.	Brown Shrike	<i>Lanius cristatus</i>	Laniidae	M, Common
59.	Long-tailed Shrike	<i>Lanius schach</i>	Laniidae	M, Common
60.	Jungle Babbler	<i>Turdoides striata</i>	Leiotherichidae	R, Common
61.	Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	Megalaimidae	R, Common
62.	Brown-headed Barbet	<i>Psilopogon zeylanicus</i>	Megalaimidae	R, Common
63.	Asian Green Bee-Eater	<i>Merops orientalis</i>	Meropidae	R, Common
64.	Olive-backed Pipit	<i>Anthus hodgsoni</i>	Motacillidae	M, Common
65.	Paddyfield Pipit	<i>Anthus rufulus</i>	Motacillidae	R, Common
66.	White Wagtail	<i>Motacilla alba</i>	Motacillidae	M, Common
67.	Citrine Wagtail	<i>Motacilla citreola</i>	Motacillidae	M, Common
68.	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Motacillidae	R, Common
69.	Oriental Magpie-Robin	<i>Copsychus saularis</i>	Muscicapidae	R, Common
70.	Taiga Flycatcher	<i>Ficedula albicilla</i>	Muscicapidae	M, Common
71.	Bluethroat	<i>Luscinia svecica</i>	Muscicapidae	M, Common
72.	Brown Rockchat	<i>Oenanthe fusca</i>	Muscicapidae	R, Abundant
73.	Black Redstart	<i>Phoenicurus ochruros</i>	Muscicapidae	R, Common
74.	Common Stonechat	<i>Saxicola torquata</i>	Muscicapidae	M, Common
75.	Purple Sunbird	<i>Cinnyris asiaticus</i>	Nectariniidae	R, Abundant
76.	Indian Golden Oriole	<i>Oriolus kundoo</i>	Oriolidae	LM, Abundant
77.	Black-hooded Oriole	<i>Oriolus xanthornus</i>	Oriolidae	R, Abundant
78.	House Sparrow	<i>Passer domesticus</i>	Passeridae	R, Common

79.	Little Cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae	R, Abundant
80.	Great Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	LM, Common
81.	Grey Francolin	<i>Francolinus pondicerianus</i>	Phasianidae	R, Abundant
82.	Common chiffchaff	<i>Phylloscopus collybita</i>	Phylloscopidae	R, Common
83.	Black-rumped Flameback	<i>Dinopium benghalense</i>	Picidae	R, Common
84.	Little Grebe	<i>Tachybaptus ruficollis</i>	Podicipedidae	R, Common
85.	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	Psittacidae	R, Common
86.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	Psittacidae	R, Common
87.	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	R, Common
88.	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	R, Common
89.	Common Coot	<i>Fulica atra</i>	Rallidae	M, Common
90.	Common Moorhen	<i>Gallinula chloropus</i>	Rallidae	R, Common
91.	Purple Swamphen	<i>Porphyrio porphyrio</i>	Rallidae	R, Common
92.	Black-winged Stilt	<i>Himantopus himantopus</i>	Recurvirostridae	R, Common
93.	Common Sandpiper	<i>Actitis hypoleucos</i>	Scolopacidae	M, Common
94.	Little Stint	<i>Calidris minuta</i>	Scolopacidae	R, Common
95.	Common Snipe	<i>Gallinago gallinago</i>	Scolopacidae	M, Uncommon
96.	Wood Sandpiper	<i>Tringa glareola</i>	Scolopacidae	M, Uncommon
97.	Spotted Owllet	<i>Athene brama</i>	Strigidae	R, Common
98.	Bank Myna	<i>Acridotheres ginginianus</i>	Sturnidae	R, Abundant
99.	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	R, Abundant
100.	Asian Pied Starling	<i>Gracupica contra</i>	Sturnidae	R, Abundant
101.	Chestnut-tailed Starling	<i>Sturnia malabarica</i>	Sturnidae	R, Common
102.	Brahminy Starling	<i>Sturnia pagodarum</i>	Sturnidae	R, Common
103.	Red-naped Ibis	<i>Pseudibis papillosa</i>	Threskiornithidae	R, Common
104.	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae	LM, Rare
105.	Orange-headed Thrush	<i>Geokichla citrina</i>	Turdidae	R, Common
106.	Barn Owl	<i>Tyto alba</i>	Tytonidae	R, Common
107.	Common Hoopoe	<i>Upupa epops</i>	Upupidae	R, Common

Table 2: Water Birds or Wetland Dependent Birds of Gidhhi and Pushpakarni Lake, Nalanda, Bihar

Sl. No.	Common Name	Scientific Name	Family	Residential status & Abundances
1.	Pied Kingfisher	<i>Ceryle rudis</i>	Alcedinidae	R, Common
2.	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae	R, Common
3.	Northern Pintail	<i>Anas acuta</i>	Anatidae	M, Common
4.	Common Teal	<i>Anas crecca</i>	Anatidae	M, Common
5.	Ferruginous Duck	<i>Aythya nyroca</i>	Anatidae	M, Uncommon
6.	Lesser Whistling-duck	<i>Dendrocygna javanica</i>	Anatidae	R, Abundant
7.	Gadwall	<i>Mareca strepera</i>	Anatidae	M, Common
8.	Red-Crested Pochard	<i>Netta rufina</i>	Anatidae	M, Uncommon
9.	Cotton Pygmy-goose	<i>Nettapus coromandelianus</i>	Anatidae	LM, Common
10.	Comb Duck	<i>Sarkidiornis melanotos</i>	Anatidae	M, Uncommon
11.	Northern Shoveler	<i>Spatula clypeata</i>	Anatidae	M, Common
12.	Garganey	<i>Spatula querquedula</i>	Anatidae	M, Occasional
13.	Grey Heron	<i>Ardea cinerea</i>	Ardeidae	R, Common
14.	Intermediate Egret	<i>Ardea intermedia</i>	Ardeidae	R, Common
15.	Purple Heron	<i>Ardea purpurea</i>	Ardeidae	R, Uncommon
16.	Indian Pond-heron	<i>Ardeola grayii</i>	Ardeidae	R, Common
17.	Great Egret	<i>Ardea alba</i> <i>Ardea alba</i>	Ardeidae	R, Common
18.	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae	R, Abundant
19.	Little Egret	<i>Egretta garzetta</i>	Ardeidae	R, Abundant
20.	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Ardeidae	R, Common
21.	Little Ringed Plover	<i>Charadrius dubius</i>	Charadriidae	R, Common
22.	Grey-headed Lapwing	<i>Vanellus cinereus</i>	Charadriidae	M, Rare
23.	Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae	R, Abundant
24.	Asian Openbill	<i>Anastomus oscitans</i>	Ciconidae	R, Common
25.	Painted Stork	<i>Mycteria leucocephala</i>	Ciconidae	LM, Uncommon
26.	Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	R, Common
27.	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	Jacaniidae	R, Common
28.	Bronze-winged Jacana	<i>Metopidius indicus</i>	Jacaniidae	R, Common
29.	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Motacillidae	R, Common
30.	White Wagtail	<i>Motacilla alba</i>	Motacillidae	M, Common
31.	Citrine Wagtail	<i>Motacilla citreola</i>	Motacillidae	M, Common
32.	Bluethroat	<i>Luscinia svecica</i>	Muscicapidae	M, Common
33.	Little Cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae	R, Abundant
34.	Great Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	LM, Common
35.	Little Grebe	<i>Tachybaptus ruficollis</i>	Podicipedidae	R, Common

36.	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	R, Common
37.	Common Coot	<i>Fulica atra</i>	Rallidae	M, Common
38.	Common Moorhen	<i>Gallinula chloropus</i>	Rallidae	R, Common
39.	Purple Swampphen	<i>Porphyrio porphyrio</i>	Rallidae	R, Common
40.	Black-winged Stilt	<i>Himantopus</i>	Recurvirostridae	R, Common
41.	Common Sandpiper	<i>Actitis hypoleucos</i>	Scolopacidae	M, Common
42.	Common Snipe	<i>Gallinago gallinago</i>	Scolopacidae	M, Common
43.	Wood Sandpiper	<i>Tringa glareola</i>	Scolopacidae	M, Uncommon
44.	Little stint	<i>Calidris minuta</i>	Threskiornithidae	R, Common
45.	Red-naped Ibis	<i>Pseudibis papillosa</i>	Threskiornithidae	R, Common
46.	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae	LM, Uncommon

Table 3: Birds observed by Arvind Mishra, State Coordinator IBCN, while surveying the Potential IBAs sites of Bihar (2013-14)

Sl. No.	Common Name	Scientific Name
1.	Northern Pintail	<i>Anas acuta</i>
2.	Northern Shoveller	<i>Spatula clypeata</i>
3.	Eurasian Wigeon	<i>Mareca penelope</i>
4.	Gadwall	<i>Anas strepera</i>
5.	Asian Openbill	<i>Anastomus oscitans</i>
6.	Bar Headed Goose	<i>Anser indicus</i>
7.	Great Egret	<i>Ardea alba</i>
8.	Pond Heron	<i>Ardeola grayii</i>
9.	Cattle Egret	<i>Bubulcus ibis</i>
10.	Greater Coucal	<i>Centropus sinensis</i>
11.	Lesser Whistling Duck	<i>Dendrocygna javanica</i>
12.	Little Egret	<i>Egretta garzetta</i>
13.	Intermediate Egret	<i>Egretta intermedia</i>
14.	Common Coot	<i>Fulica atra</i>
15.	Common Snipe	<i>Gallinago gallinago</i>
16.	Indian Moorhen	<i>Gallinula chloropus</i>
17.	Black-winged Stilt	<i>Himantopus himantopus</i>
18.	Bronze-winged Jacana	<i>Metopidius indicus</i>
19.	Red-Crested Pochard	<i>Netta rufina</i>
20.	Little Cormorant	<i>Phalacrocorax niger</i>
21.	Purple Swampphen	<i>Porphyrio porphyrio</i>
22.	Black Ibis	<i>Pseudoibis papillosa</i>
23.	Little Grebe	<i>Tachybaptus ruficollis</i>
24.	Ruddy Shelduck	<i>Tadorna ferruginea</i>
25.	Wood sandpiper	<i>Tringa glareola</i>
26.	Red-wattled Lapwing	<i>Vanellus indicus</i>

Table 4: GPS coordinates of selected sites for point count and Habitat

	Pushpakarni Lake	Habitat	Gidhhi Lake	Habitat
Site 1	N 25° 08.466', E 085° 27.132'	Tree cover and Open area	N 25° 09.097', E 085° 27.551'	Open area, Agriculture field
Site 2	N 25° 08.675', E 085° 27.182'	Hiuen tsang memorial hall, Tree cover	N 25° 09.132', E 085° 27.310'	Open area, Human habitation, Agriculture field
Site 3	N 25° 08.860', E 085° 27.065'	Road and open area	N 25° 08.986', E 085° 27.428'	Open area, Agriculture field
Site 4	N 25° 08.919', E 085° 27.116'	Road	N 25° 08.974', E 085° 27.141'	Open area, Agriculture field, Human habitation
Site 5	N 25° 08.848', E 085° 27.179'	Tree cover	N 25° 08.991', E 085° 26.921'	Open area, Human habitation, Agriculture field
Site 6	N 25° 08.835', E 085° 27.184'	Tree cover		
Site 7	N 25° 08.852', E 085° 27.199'	Tree cover		
Site 8	N 25° 08.807', E 085° 27.215'	Tree cover, Road		
Site 9	N 25° 08.696', E 085° 27.183'	Open area		
Site 10	N 25° 08.779', E 085° 27.182'	Open Area		



Fig 1: Comb Duck *Sarkidiornis melanotos*



Fig 2: Northern Pintail *Anas acuta*



Fig 3: Lesser Whistling-Duck *Dendrocygna javanica*



Fig 4: Purple Heron *Ardea purpurea*



Fig 5: Northern Shoveler *Spatula clypeata*



Fig 6: Grey Heron *Ardea cinerea*



Fig 7: Grey-headed swamphean *Porphyrio porphyria*



Fig 8: Great Cormorant *Phalacrocorax carbo* taking rest on *eucalyptus* near Pushpakarni Lake



Fig 9: Painted stork and Black-headed Ibis.



Fig 10: Little Egret *Egretta garzetta*



Fig 11: A mixed flock of Water birds (Lesser whistling duck, Grey heron, Egrets, cormorants) in Pushpakarni Lake.



Fig 12: Pheasant-tailed Jacana *Hydrophasianus chirurgus*



Fig 13: Brown Shrike *Lanius cristatus*

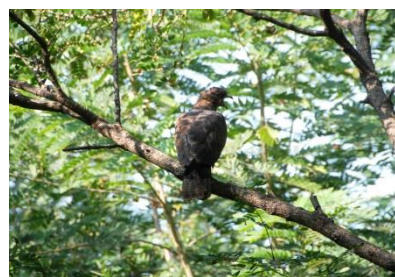


Fig 14: Oriental Honey Buzzard *Pernis ptilorhynchus*

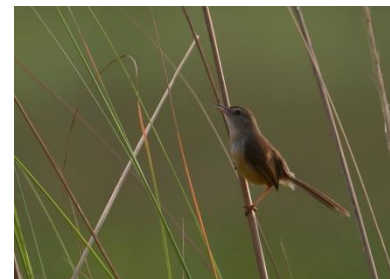


Fig 15: Yellow-bellied Prinia *Prinia flaviventris*



Fig 16: Painted Stork in Gidhhi lake



Fig 17: Pushpakarni Lake observed infested with water hyacinth



FIG 18: Gidhhi lake in winter season

Plate 1: Photographs of birds which were taken in Gidhhi and Pushkarni lake in Nalanda, Bihar.



Fig 1: Lake is dried for fishing which threatens water birds.



Fig 2: Locals Hunt both resident and migratory birds for Food.



Fig 3: Wallowing of pigs in the lake



Fig 4: Free-ranging dogs roam around the lakes to prey upon the birds, eggs and their fledges.



Fig 5: Gidhhi lake dried in April 2019



Fig 6: Birds disturbed due human activities such as Fishing, Irrigation, Poaching and Grazing livestock

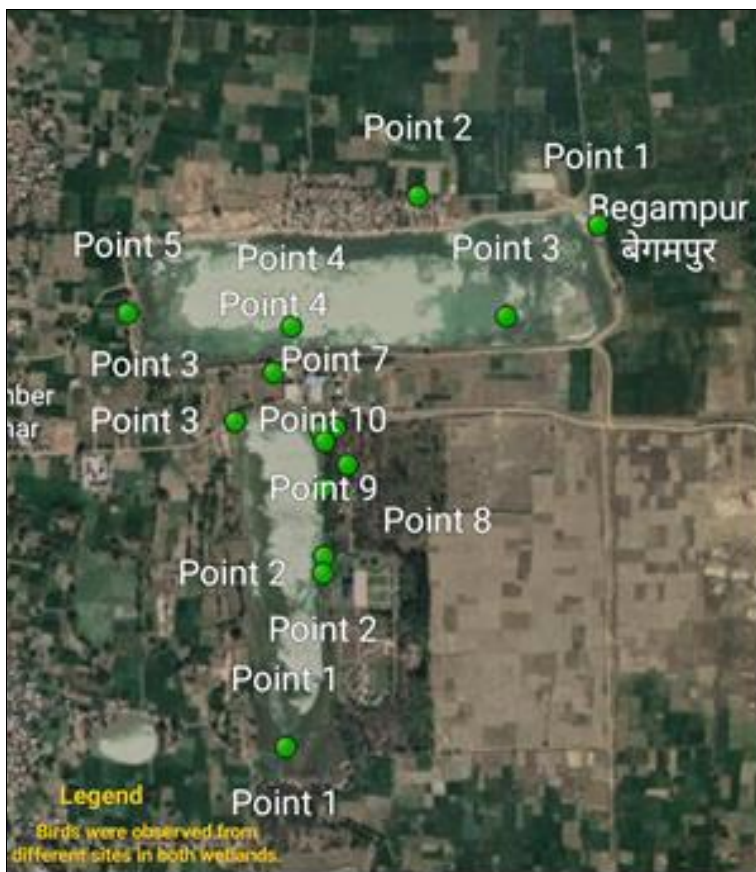


Fig 6: Map of Gidhhi and Pushpakarni lake showing the study sites

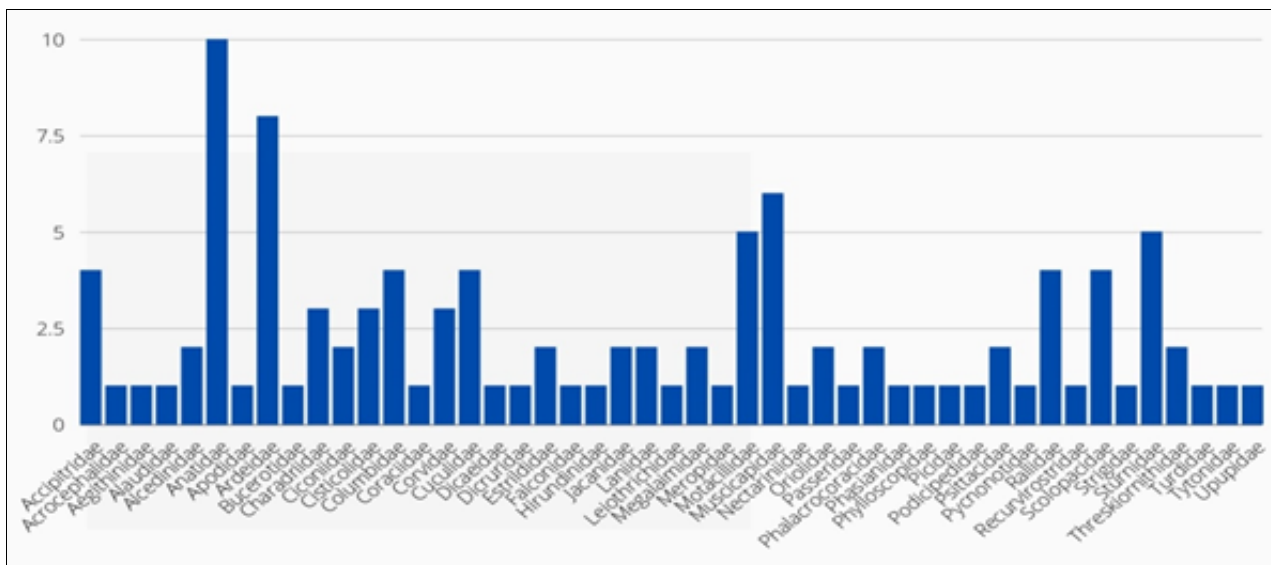


Fig 8: Graph showing number of species observed in each family

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