

Study of avifauna around proposed nuclear power plant site at Jaitapur, Maharashtra, India

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ABSTRACT

Birds are very significant biological component of ecosystem which indicates the quality of environment. They are the easiest to survey and study. The importance of the avifaunal study is indicator of the status of the environment of the study area, and therefore, were selected for comprehensive assessment. Recently, ornithologists came with the first ultimate checklist of Indian birds, putting the number of species across the country at 1,263. This avifaunal study was carried out during the period 2014-2017, in and around proposed nuclear power plant site at Jaitapur, Maharashtra.

There are total 146 species of birds listed belonging to 18 orders and 55 families were recorded. From the 18 orders Passeriformes is the one of the largest order was observed with 57 bird's species and 28 families. Out of these 146 species 49 of water birds were recorded. These bird species are inhabiting in the water bodies and wetlands. There are 24 species recorded dominant. The most dominant species are Brahminy Kite, Rock Pigeon, White Throated Kingfisher, River Tern, Laughing Dove, Black Drongo, Indian Robin, Green Bee Eater, Ashy Prinia, Red Vented Bulbul, Red whiskered bulbul, white browed wagtail, common myna, coppersmith barbet, grey heron etc. The detailed results are discussed in the paper.

Keywords: Birds, Jaitapur, Dominant Species

INTRODUCTION

Birds are the very important biological component which is to indicate the quality of environment. They are the easiest to survey and study. Avifaunal study is important which indicates the status of the environment of the study area. Therefore, they were selected for comprehensive assessment. Recently, a group of ornithologists have come up with the first ultimate checklist of Indian birds, putting the number of species across the country at 1,263. Among this figure, India accounts for 12 % of the total number of bird species in the world, amounting to 10,135. The bird population in the nation is separated into 23 orders, 107 families and 498 genera (Prveen *et al.*, 2016).

Ecological surveys were carried out in and around the study area. Any specific bird's survey was not carried in the given study area. There is one biodiversity survey "Status of Biodiversity at the proposed site of the Nuclear Power Plant at Jaitapur", which was done by the College of Forestry, Dapoli from Ratnagiri district, Maharashtra (2007). This survey also included the checklist of 110 bird's species comprises of 41 families and 90 genera. Also earlier one survey was carried out by Pande *et al.*, (2003).

Avifaunal study is carried out at the proposed power plant site at Jaitapur, Maharashtra. The study area for the current proposed project is around 30 km radius of the nuclear power plant site. The area generally has dry or mildly humid climate with great variation in seasonal temperature. The study area is on the coastal region of Maharashtra state, India.

The present study avian diversity was recorded in the study area with IWPA (Indian Wildlife Protection Act, 1972) Schedules and their IUCN status. This study will help to keep the records of avifaunal diversity in and around the proposed nuclear plant Jaitapur, Maharashtra..

MATERIAL METHODS

Study Area:

The location of the proposed plant is at N 16° 36' 18.6" and E 73° 19' 18.8" and average elevation is 80 meters. The location is adjoining the sea coast and is typically a barren stretch of land with sparse savanna vegetation. Within 30 km radial area, various land uses like forests, mangroves, grasslands, agriculture, horticulture, creeks and beeches are found. No Sanctuary, Biodiversity Park or National Park is present in the 30 km radius of the proposed plant site.

Habitat Study and Survey:

The main study area was divided in to 3 zones namely 0 – 5 Km (Core zone), 5 – 15 Km (Buffer zone-I) and 15 – 30 Km (Buffer zone - II) as per BRNS guidelines. For the present investigation Core zone was selected for 100 % survey to record the biodiversity while Buffer zone I and Buffer zone II the area coverage was 10 % and 5 % respectively.

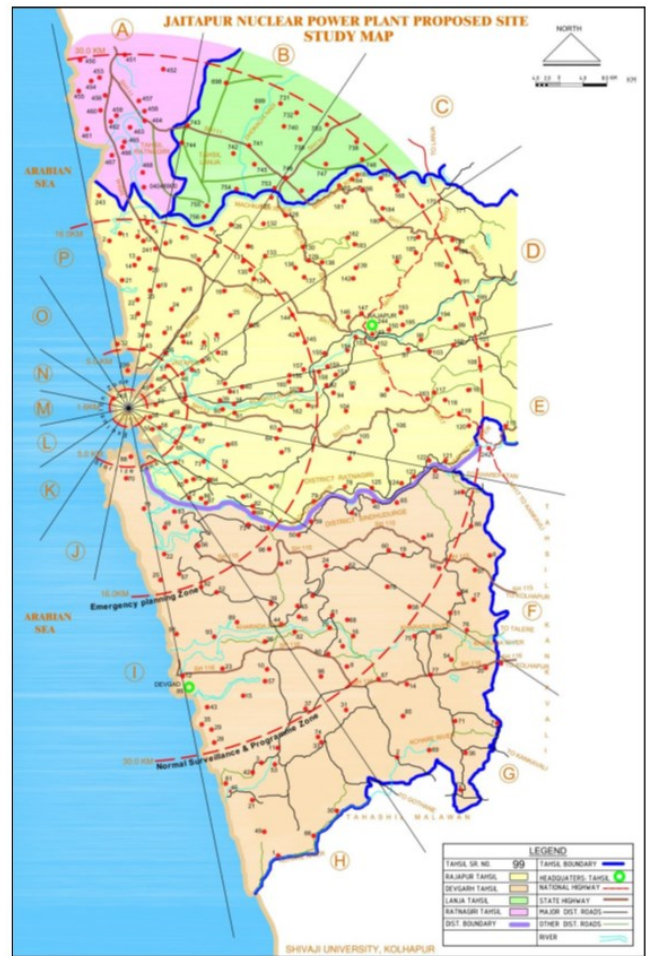


Fig.1 Study area showing different zones

Methodology:

There are a variety of options and the one chosen will depend upon the species or group of species being counted, the habitats concerned and the level of details required. For some species, it is necessary to develop specially tailored methods (Gilbert *et al.*, 1998; Steinkamp *et al.*, 2003). Birds are sampled by following two ways.

1. Line transect:

In this method, a straight line of 1 km or less if the habitat is small is laid. On this line, all birds seen or heard 25 m on either side of transect were recorded.

2. Point counts:

In this method, one point randomly chosen and birds seen or heard 50 m radius has to be recorded for 5 minutes. After a gap of 10 minutes be given and then repeat observation. Thus, in one hour there will be four observations per plot. Repeat this observation in another point which should at least 300 meters from the first point.

Identification:

The birds were identified using "A pictorial guide to the birds of the Indian Sub-Continent" by Gaston, (1973), Steward and Kantrud, (1972) Parasharya *et.al.*, (2003), Birds of Indian sub continent by Grimmet *et.al.*, (1998), The Book of Indian Birds Year by Salim Ali, (2003) and other updated taxonomical keys. Binocular Nikon A211 (12X50) was used for close observation of birds and for photography Nikon D7200 camera with the 80-400 mm (f/4.5-5.6D ED) lens.

RESULTS AND DISCUSSION:

The given study was carried out in three different zones as Core zone, Buffer zone I and Buffer zone II. Study area shows various land uses like forests, mangroves, grasslands, agriculture, and beeches. It has less pressure of population on the entire study area as compared to the Ratnagiri and Malvan. Therefore, many species of birds were recorded during the present study as listed below. Also, IUCN status and IPWA schedules were mentioned.

Table 1: Birds recorded in the study area with IPWA schedules and IUCN status

Sr.No.	Order	Family	Common Name	Scientific Name	IWPA	IUC
1.	Accipitriformes	Accipitridae	Black winged Kite	<i>Elanus caeruleus</i>	I	LC
2.			Brahminy Kite	<i>Haliastur indus</i>	I	LC
3.			Black-shouldered Kite	<i>Elanus caeruleus</i>	I	LC
4.			Black Kite	<i>Milvus migrans</i>	I	LC
5.			Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i>	I	LC
6.			White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	I	LC
7.			Crested Hawk-Eagle	<i>Hieraetus cirrhatus</i>	I	LC
8.			Short-toed Snake-Eagle	<i>Circaetus gallicus</i>	I	LC
9.			Crested Serpent-Eagle	<i>Spilornis cheela</i>	I	LC
10.			Western Marsh-Harrier	<i>Circus aeruginosus</i>	I	LC
11.			Pied Harrier	<i>Circus melanoleucos</i>	I	LC
12.			Montagu's Harrier	<i>Circus pygargus</i>	I	LC
13.			Shikra	<i>Accipiter badius</i>	I	LC
14.			Booted Eagle	<i>Hieraaetus pennatus</i>	I	LC
15.			Pandionidae	Osprey	<i>Pandion haliaetus</i>	I
16.	Anseriformes	Antidae	Indian spot billed duck	<i>Anas poecileorhyncha</i>	IV	LC
17.	Bucerotiformes	Upupidae	Common Hoopoe	<i>Upupa epops</i>	I	LC
18.		Bucerotidae	Malabar pied hornbill	<i>Anthracoceros coronatus</i>	I	NT
19.			Indian Grey Hornbill	<i>Ocyrceros birostris</i>	I	LC
20.	Ciconiiformes	ciconiidae	Painted Stork	<i>Mycteria leucocephala</i>	IV	NT
21.			Asian Openbill-Stork	<i>Anastomus oscitans</i>	IV	LC
22.			Wooly necked Stork	<i>Ciconia episcopus</i>	IV	VU
23.	Columbiformes	Columbidae	Rock Pigeon	<i>Columba livia</i>	IV	LC
24.			Laughing Dove	<i>Spilopelia senegalensis</i>	IV	LC
25.			Eurasian collard Dove	<i>Streptopelia decaocto</i>	IV	LC
26.			Spotted Dove	<i>Streptopelia chinensis</i>	IV	LC
27.			Oriental turtle Dove	<i>Streptopelia orientalis</i>	-	LC
28.			Yellow footed green pigeon	<i>Treron phoenicoptera</i>	-	LC
29.			Charadriiformes	Scolopacidae	Common Sandpiper	<i>Actitis hypoleucos</i>
30.	Eurasian Curlew	<i>Numenius arquata</i>			IV	NT
31.	Common Redshank	<i>Tringa totanus</i>			IV	LC
32.	Marsh Sandpiper	<i>Tringa stagnatilis</i>			IV	LC
33.	Little Stint	<i>Calidris minuta</i>			IV	LC
34.	Wood Sandpiper	<i>Tringa glareola</i>			IV	LC
35.	Common Snipe	<i>Gallinago gallinago</i>			IV	LC
36.	Whimbrel	<i>Numenius phaeopus</i>			IV	LC

Table 1: Continued...

Sr.No.	Order	Family	Common Name	Scientific Name	IWPA	IUC	
37.	Charadriiformes	Charadriidae	Red wattled Lapwing	<i>Vanellus Indicus</i>	IV	LC	
38.			Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	-	LC	
39.			Little Ringed Plover	<i>Charadrius dubius</i>	IV	LC	
40.			Lesser Sand Plover	<i>Charadrius mongolus</i>	IV	LC	
41.			Kentish Plover	<i>Charadrius alexandrinus</i>	IV	LC	
42.		Glariolidae	Small pratincole	<i>Glareola lateal</i>	-	LC	
43.		Laridae	Whiskered Tern	<i>Chlidonias hybridus</i>	IV	LC	
44.			Large Crested Tern	<i>Sterna bergii</i>	IV	LC	
45.			River tern	<i>Sterna aurantia</i>	---	NT	
46.		Recurvirostridae	Black winged stilt	<i>Himantopus himantopus</i>	IV	LC	
47.		Coraciiformes	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>	IV	LC
48.				White throated Kingfisher	<i>Halcyon smyrnensis</i>	IV	LC
49.				Pied Kingfisher	<i>Ceryle rudis</i>	-	LC
50.				Stork-billed Kingfisher	<i>Halcyon capensis</i>	IV	LC
51.	Coraciidae		Indian Roller	<i>Coracias benghalensis</i>	IV	LC	
52.	Meropidae		Green bee Eater	<i>Merops orientalis</i>	-	LC	
53.	Cuculiformes	Cuculidae	Southern Coucal	<i>Centropus (sinensis) parrotia</i>	IV	LC	
54.			Common Cuckoo	<i>Cuculus canorus</i>	IV	LC	
55.			Asian Koel	<i>Eudynamys scolopaceus</i>	IV	LC	
56.	Passeriformes	Corvidae	House Crow	<i>Corvus splendens</i>	V	LC	
57.			Indian/Rofous Treepie	<i>Dendrocitta vagabunda</i>	IV	LC	
58.			Jungle Crow	<i>Corvus macrorhynchos</i>	V	LC	
59.		Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>	IV	LC	
60.			Ashy Drongo	<i>Dicrurus leucophaeus</i>	IV	LC	
61.		Passeridae	House Sparrow	<i>Passer domesticus</i>	IV	LC	
62.		Cisticolidae	Plain Prinia	<i>Prinia inornata</i>	IV	LC	
63.			Jungle Prinia	<i>Prinia sylvatica</i>	IV	LC	
64.			Ashy Prinia	<i>Prinia socialis</i>	IV	LC	
65.			Grey-breasted Prinia	<i>Prinia hodgsonii</i>	IV	LC	
66.		Acrocephalidae	Blyth's Reed-Warbler	<i>Acrocephalus dumetorum</i>	IV	LC	
67.			Paddyfield Warbler	<i>Acrocephalus agricola</i>	IV	LC	
68.		Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i>	IV	LC	
69.			Indian Robin	<i>Saxicoloides fulicatus</i>	IV	LC	
70.			Bluethroat	<i>Luscinia svecica</i>	IV	LC	
71.			White rumped Shama	<i>Copsychus malabaricus</i>	IV	LC	
72.			Pied Bushchat	<i>Saxicola caprata</i>	IV	LC	
73.			Tickell's blue flycatcher	<i>Cyornis tickelliae</i>	IV	LC	
74.			Blue Rock Thrush	<i>Monticola solitarius</i>	IV	LC	
75.			Malbar Whistling thrush	<i>Myophonus horsfieldii</i>	-	LC	
76.			Pycnonotidae	Red vented Bulbul	<i>Pycnonotus cafer</i>	IV	LC
77.		Red whiskered bulbul		<i>Pycnonotus jocosus</i>	IV	LC	
78.		Motacillidae	White browed Wagtail	<i>Motacilla maderaspatensis</i>	IV	LC	
79.			Yellow Wagtail	<i>Motacilla flava</i>	IV	LC	
80.			White wagtail	<i>Motacilla alba</i>	IV	LC	
81.		Paridae	Great tit	<i>Parus major</i>	IV	LC	
82.		Nectariniidae	Purple Sunbird	<i>Cinnyris asiaticus</i>	IV	LC	
83.			Purple rumped Sunbird	<i>Leptocoma zeylonica</i>	IV	LC	

Table 1: Continued...

Sr.No.	Order	Family	Common Name	Scientific Name	IWPA	IUC
84.	Passeriformes	Sturnidae	Common Myna	<i>Acridotheres tristis</i>	IV	LC
85.			Jungle Myna	<i>Acridotheres fuscus</i>	IV	LC
86.		Estrildidae	brahminy starling	<i>Sturnia pagodarum</i>	IV	LC
87.			Indian Silverbill	<i>Euodice malabarica</i>	IV	LC
88.			White-rumped Munia	<i>Lonchura striata</i>	IV	LC
89.			Scaly breasted Munia	<i>lonchura punctulata</i>	IV	LC
90.			Tri-Coloured Munia	<i>Lonchura malacca</i>	IV	LC
91.			White-throated Munia	<i>Lonchura malabarica</i>	IV	LC
92.			Pittidae	Indian Pitta	<i>Pitta brachyura</i>	IV
93.		Ploceidae	Baya, Weaver	<i>Ploceus philippinus</i>	IV	LC
94.		Hirundinidae	Wire tailed Swallow	<i>Hirundo smithii</i>	IV	LC
95.			Common Swallow	<i>Hirundo rustica</i>	IV	LC
96.			Red Rumped Swallow	<i>Cecropis daurica</i>	IV	LC
97.		Leiothrichidae	Large grey Babbler	<i>Turdoides malcolmi</i>	IV	LC
98.		Laniidae	Bay Backed Shrike	<i>Lanius vittatus</i>	IV	LC
99.			Long Tailed Shrike	<i>Lanius schach</i>	IV	LC
100.		Rhipiduridae	White browed fantail	<i>Rhipidura aureola</i>	IV	LC
101.		Alaudidae	Crested Lark	<i>Galerida cristata</i>	IV	LC
102.			Bush Lark	<i>Mirafa cantillans</i>	-	LC
103.		Oriolidae	Golden oriole	<i>Oriolus kundoo</i>	-	LC
104.			Black Headed Oriole	<i>Oriolus larvatus</i>	-	LC
105.		Aegithinidae	Common Iora	<i>Aegithina tiphia</i>	-	LC
106.		Turdidae	Orange Headed Thrush	<i>Geokichla citrina</i>	-	LC
107.		Campephagidae	Small Minivet	<i>Pericrocotus cinnamomeus</i>	IV	LC
108.			Orange Minivet	<i>Pericrocotus flammeus</i>	IV	LC
109.		Dicaeidae	Tickell's flowerpecker	<i>Dicaeum erythrorhynchos</i>	-	LC
110.		Sylviidae	Yellow eyed Babbler	<i>Chrysomma sinense</i>	IV	LC
111.		Zosteropidae	Oriental white-eye	<i>Zosterops palpebrosus</i>	IV	LC
112.		Monarchidae	Indian Paradise Flycatcher	<i>Terpsiphone paradisi</i>	IV	LC
113.			Picidae	Lesser Golden Backed woodpecker	<i>Dinopium benghalense</i>	IV
114.	Megalaimidae		Coppersmith Barbet	<i>Megalaima haemacephala</i>	IV	LC
115.			White cheeked Barbet	<i>Psilopogon viridis</i>	-	LC
116.	Suliformes	Phalacrocoracidae	Little Cormorant	<i>Phalacrocorax niger</i>	IV	LC
117.		Anhingidae	Darter	<i>Anhinga melanogaster</i>	IV	LC
118.	Podicipediformes	Podicipedidae	Little Grebe	<i>Tachybaptus ruficollis</i>	IV	LC
119.	Falconiformes	Falconidae	Common kestrel	<i>Falco tinnunculus</i>	IV	LC
120.			Perigrine Falcon	<i>Falco peregrinus Irinus</i>	-	LC
121.	Pelecaniformes	Ardeidae	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	IV	LC
122.			Little Green Heron	<i>Butorides striatus</i>	IV	LC
123.			Indian pond Heron	<i>Ardeola grayii</i>	IV	LC
124.			Grey Heron	<i>Ardea cinerea</i>	IV	LC
125.			Purple Heron	<i>Ardea purpurea</i>	IV	LC
126.			Intermediate Egret	<i>Egretta intermedia</i>	IV	LC
127.			Black Bittern	<i>Dupetor flavicollis</i>	IV	LC
128.			Little Egret	<i>Egretta garzetta</i>	IV	LC
129.			Western Reef-Egret	<i>Egretta gularis</i>	IV	LC
130.			Large Egret	<i>Casmerodius albus</i>	IV	LC

Table 1: Continued...

Sr.No.	Order	Family	Common Name	Scientific Name	IWPA	IUC
131.	Psittaciformes	Psittacidae	Rose ringed Parakeet	<i>Psittacula krameri</i>	IV	LC
132.			Plum headed parakeet	<i>Psittacula cyanocephala</i>	IV	LC
133.	Galliformes	Phasianidae	Common Quail	<i>Coturnix coturnix</i>	IV	LC
134.			Jungle Bush Quail	<i>Perdica asitica</i>	-	LC
135.			Rain Quail	<i>Coturnix coromandelica</i>	IV	LC
136.			Painted Francoline	<i>Francolinus pictus</i>	-	LC
137.			Grey Francolin	<i>Francolinus pondicerianus</i>	IV	LC
138.			Indian Peafowl	<i>Pavo cristatus</i>	I	LC
139.	Gruiformes	Rallidae	White breasted waterhen	<i>Amaurornis phoenicurus</i>	-	LC
140.			Purple Swampphen	<i>Porphyrio porphyrio</i>	IV	LC
141.			Common Coot	<i>Pulica atra</i>	-	LC
142.			Common Moorhen	<i>Gallinula chloropus</i>	-	LC
143.	Strigiformes	Strigidae	Spotted owl	<i>Athene brama</i>	IV	LC
144.		Tytonidae	Barn Owl	<i>Tyto alba</i>	-	LC
145.	Caprimulgiformes	Caprimulgidae	Indian Jungle Nightjar	<i>Caprimulgus indicus</i>	IV	LC
146.			Grey Nightjar	<i>Caprimulgus jotaka</i>	-	LC

IUCN Status: LC-Least concern, NT- Near threatened and VU- Vulnerable.

Indian Wildlife Protection Act, 1972 (IPWA) Schedules: Schedule I, Schedule II, Schedule III and Schedule IV

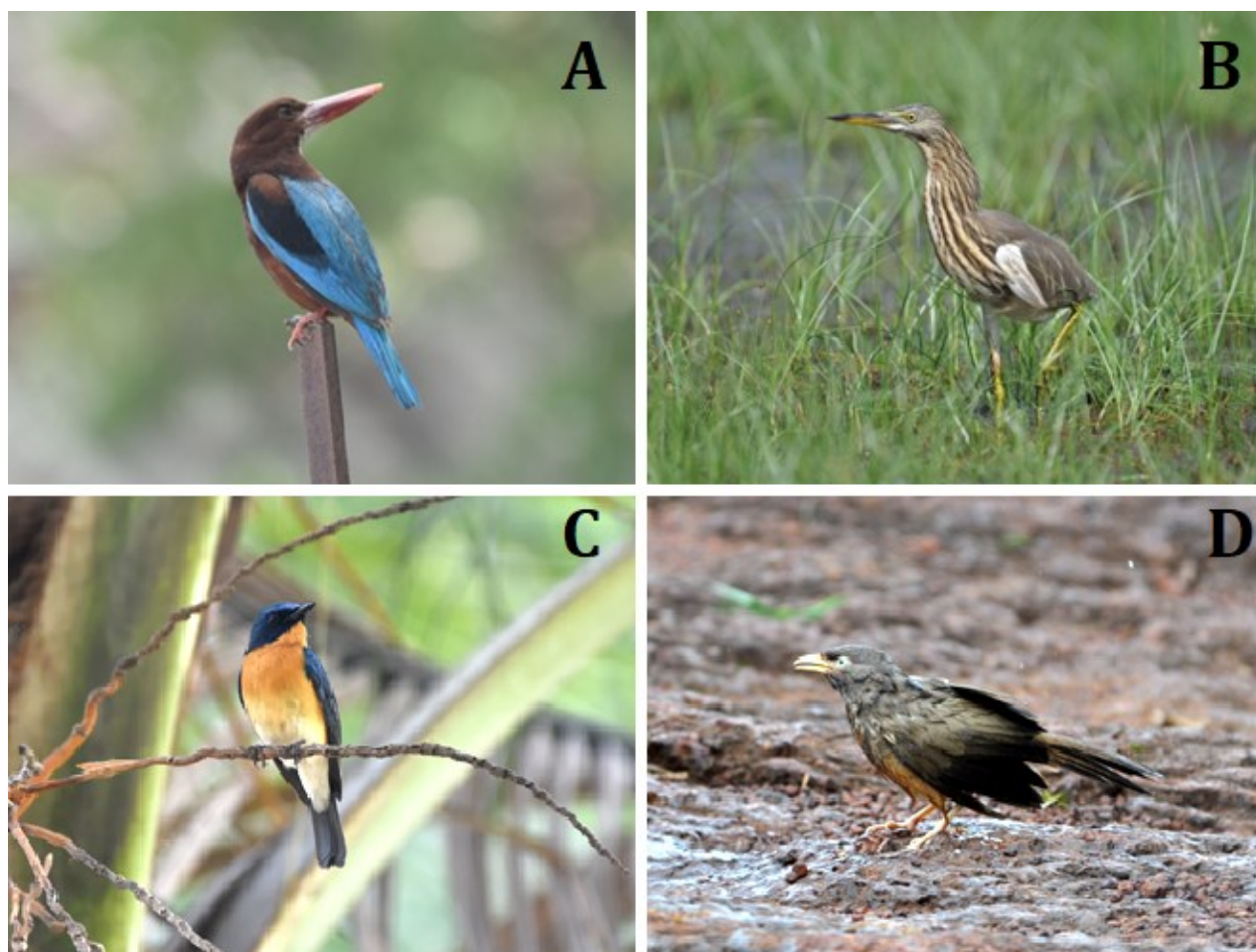


Plate 1: A: *Halcyon smyrnensis* , B: *Ardeola grayii*, C: *Cyornis tickelliae*, D : *Turdoides striata*



Plate 2: **E:** *Oriolus kundoo*, **F:** *Rhipidura aureola*, **G:** *Coracias benghalensis*, **H:** *Aegithina tiphia*

During the study there are total numbers of 146 species of birds were found belonging to 18 orders and 55 families. A checklist is given with their order, family, common name, and scientific name and also their IWPA (Indian Wildlife Protection Act) Schedules as well as IUCN conservation status. Order Accipitriformes having 2 families and 15 bird species in the given study area. Species like the Black-winged kite, Brahminy kite, Black kite, and Crested serpent eagle were recorded. Passeriformes is the one of the largest order was observed with 57 bird's species and 28 families. After Passeriformes second largest order was the Charadriiformes having 18 species and 5 families were recorded. Other orders of birds also recorded are as Anseriformes, Bucerotiformes, Ciconiiformes, Columbiformes, Coraciiformes, Cuculiformes, Suliformes, Podicipediformes, Falconiformes, Pelecaniformes, Psittaciformes, Galliformes, Gruiformes, Strigiformes and Caprimulgiformes with their families and common name and scientific names.

Throughout the avifaunal study 49 species of water birds were recorded in the present study. These bird's species are inhabiting in the water bodies and wetlands. Checklist of birds is showing some of the species of water birds like Indian pond heron, Purple heron, Intermediate egret, Little grebe, Large egret, etc. are local migratory species. Some of the species (e.g. Grey Heron) are winter migratory also recorded during the study. Species like Little cormorant, Little grebe, Indian Pond heron, Purple heron, Intermediate egret, Black bittern, Little egret, Western reef egret, and Large Egret these were recorded as resident/ local migratory birds. Grey heron is recorded as the resident/ winter migratory bird's species during the study. There are 24 species recorded dominant in the study area based on the diversity. The most dominant species are Brahminy kite, Rock pigeon, White throated kingfisher, River tern, Laughing dove, Black drongo, Indian robin, Green bee eater, Ashy prinia, Red vented bulbul, Red whiskered bulbul, White browed wagtail, Common myna,

Coppersmith barbet, Grey heron etc. Some of the species were recorded Near Threatened (NT) eg. Malbar pied hornbill, Eurassian curlew and Painted stork and Woolly necked stork is the Vulnerable (VU).

CONCLUSION

The present study reveals that the composition of birds presents in and around the proposed nuclear power plant, Jaitapur, Maharashtra. It shows good diversity of birds around proposed Jaitapur plant. All through the study total 146 species of the birds were observed of 18 orders and 55 families. Among the 18 orders Passeriformes order is having maximum number of bird species, which is 57 species of the 28 families. Also, water birds were observed of 49 different species. These bird species are inhabiting in the water bodies and wetlands. There are total 24 species recorded dominant in the Core Zone Buffer zone I and Buffer zone II. Species richness was observed higher at the Buffer zone II is 87 followed by Buffer zone I 79 and Core zone 76 respectively.

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