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### Original article

## Preliminary survey of avifauna around wind farm of Jangi region, Kutch District, Gujarat, India

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#### ARTICLE INFO

#### ABSTRACT

##### Article history:

Received 20 August 2012

Accepted 27 August 2012

Available online 29 August 2012

##### Keywords:

Avifauna

India

Kutch

Migrants

Near threatened

Residents

Wind farm

A total of 139 species of birds belonging to 45 families were recorded in the study area from September 2011 to July 2012. 67 species of these were residents, 28 were residents with local migrants, 22 were residents with winter migrants, 17 were winter migrants with 5 species were winter migrants as well as passage migrants. The order Passeriformes was highest in dominance followed by Charadriiformes, Ciconiiformes, Coraciiformes and Anseriformes. Among the bird species recorded the Darter (*Anhinga melanogaster*), Painted Stork (*Mycteria leucocephala*), Oriental White Ibis (*Threskiornis melanocephalus*), Lesser Flamingo (*Phoenicopterus minor*), Black-tailed Godwit (*Limosa limosa*), Eurasian Curlew (*Numenius arquata*), Black-bellied Tern (*Sterna acuticauda*) and European Roller (*Coracias garrulous*) are *Near Threatened* species (IUCN 2011).

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### 1. Introduction

Wind energy is one of the fastest growing sectors of the energy industry (Pasqualetti *et al.* 2004), a relatively recent development that has led to unexpected environmental consequences (Morrison and Sinclair 2004; Kunz *et al.* 2007). Wind farms represent a new impact and disturbance source for birds (Orloff and Flannery 1992) that adds to the long list of disturbance factors caused by human activity, such as power lines (Ferrer *et al.* 1991), radio

and television towers (Smith 1985), highways (Fajardo *et al.* 1998), the practice of poisoning (Harmata *et al.* 1999), illegal hunting (Villafuerte *et al.* 1998) and overexploitation (BirdLife International 2004). The wind-energy was considered both direct and indirect impacts to birds. Direct impacts of wind-energy facilities refer to fatalities resulting from birds being killed directly by collisions with wind turbine rotors. Indirect impacts of wind-energy development refer to the disruptions of foraging behaviour, breeding activities and migratory patterns resulting from alterations in landscapes used by birds.

In India, several wind farms are already working or are under construction especially in those areas with wind resource is plentiful. Often, suitable areas tend to occur offshore or onshore in coastal areas, on ridges and mountains, in open agricultural areas and other open habitats. Many of these areas contain sensitive habitats and/or bird species, which heighten the importance of assessing the effects of wind energy projects. Nevertheless, the bird species composition and impact of wind farms on birds from the Indian context is very less studied with almost no scientific literature available on this topic. The aim of the present study is to analyse the avifaunal composition in and around wind turbine area of Jangi region, Kutch District, Gujarat, India.

## 2. Material and methods

### 2.1. Study area

The present field survey was conducted at 'Genting Power' wind turbine locations covering four villages namely, Vandhiya, Modpar, Lakhapar and Jangi about 20km to the south-east of Samakhiali, Bhachau Taluk, Kutch District, Gujarat, India (Fig. 1). During the study period September 2011 - July 2012, we regularly monitored the bird population present in and around wind farm locations. It is noticed that there is no any available previous report on the birds of this area. The wind farms are situated between 23°15'5.18 and 23° 11'21.72 N and 70° 30'8.68 and 70°38'24.68 E at 8 to 30m above msl. Total land area covered is about 127 acres and the wind turbines were located in different habitat types *viz.*, agricultural land, un-irrigated land and coastal line. Most of the turbines are located around open revenue lands used for agriculture traditionally by local communities.

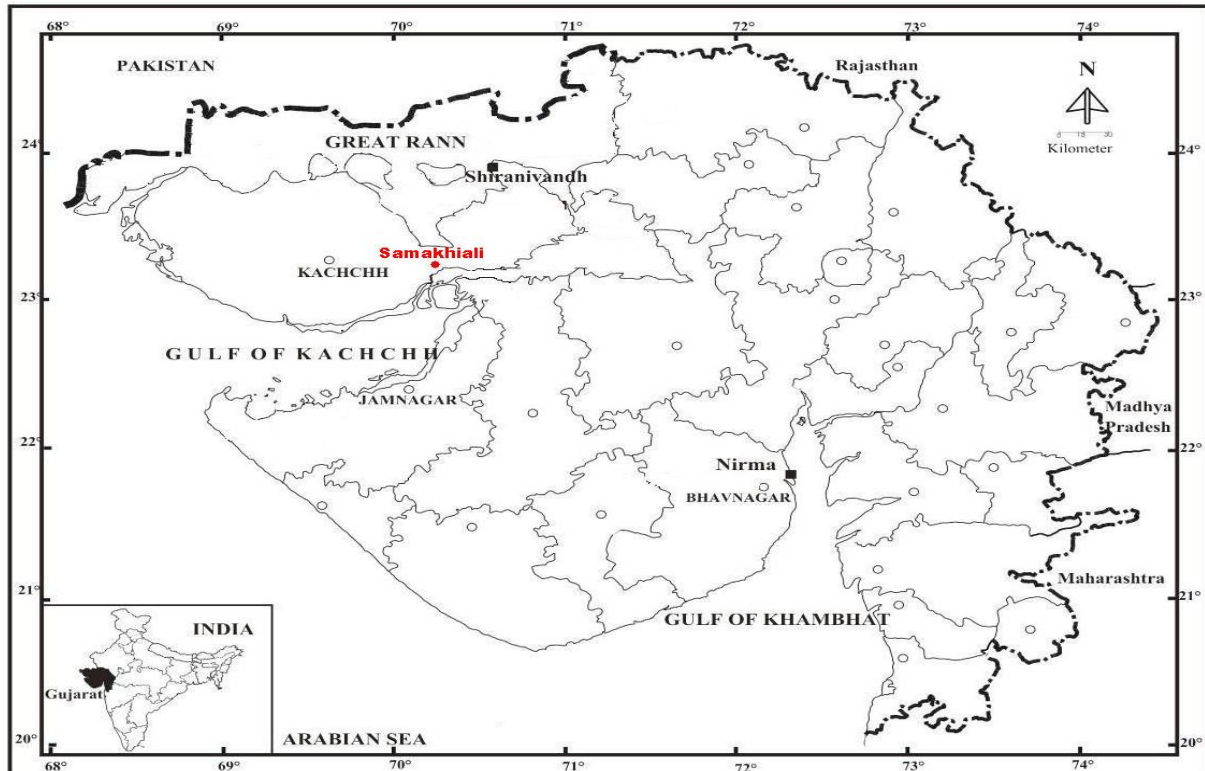


Fig. 1. Map showing the study area.

The study area is flat terrain with scanty vegetation, agricultural fields, human settlements, waste lands and several water-bodies of varying sizes. The study area is also close to the vast expanse of Little Rann of Kutch and the Wild Ass Sanctuary area situated towards its southern border. Bajra (*Pennisetum americanum*) is the major cultivated crop species in and around the study area followed by Ground nut (*Arachis hypogea*), Cotton (*Gossypium herbaceum*) and Sorghum (*Sorghum bicolor*). The study area has a characteristic dry and hot climate. The hot and humid climate occurs during July to September and cold and dry climate occurs between October and February. The average temperature during hot months ranges from 17.6 to 39.5 °C and the annual rainfall varies from a few mm to 900mm, the average being 400 mm.

A total of 273 plant species were recorded from 190 genera and 69 families. Of these, 126 species were herbs, 69 species were trees, 34 species shrubs, 22 species stragglers/climbers and 22 species were grasses. The predominant tree species found in the study area are *Acacia nilotica*, *A. leucophloa*, *Aegle marmelos*, *Annona squamosa*, *Azadirachta indica*, *Cassia fistula*, *C. siamea*, *Cordia myxa*, *C. sebastiana*, *Dalbergia sisoo*, *Phoenix sylvestris*, *Sterculia foetida*, *Phyllanthus emblica*, *Pongamia pinnata*, *Prosopis juliflora*, *Thespesia populnea* and *Ziziphus mauritiana*. Important herbaceous and shrub species are *Alysicarpus* spp., *Biophytum reinwardii*, *Cassia auriculata*, *C. tora*, *C. occidentalis*, *Calotropis procera*, *Cleome viscosa*, *Dichrostachys cinerea*, *Echinops echinatus*, *Clerodendrum phlomidis*, *Crotalaria* spp., *Indigofera* spp., *Bulbostylis barbata*, *Cyperus* spp., *Fimbristylis* spp., *Phyllanthus amarus*, *P. maderaspatensis*, *Polygala* sp. The grasses like, *Aristida* spp., *Bothriochloa pertusa*, *Andropogon pumilus*, *Brachiaria* spp., *Eremopogon foveolatus*, *Sehima nervosum*, *Cenchrus ciliaris*, *C. barbatus*, *C. setigera*, *Chloris barbata*, *C. tenella*, *Dactyloctenium aegyptium*, *Digitaria bicornis*, *Eragrostis* spp., *Paspalum* sp., *Paspalidium flavidum*, *Phragmites karka*, *Setaria verticillata*, *Typha angustifolia*, *Themeda triandra*, *T. quadrivalvis*, etc. are commonly seen in and around the study site.

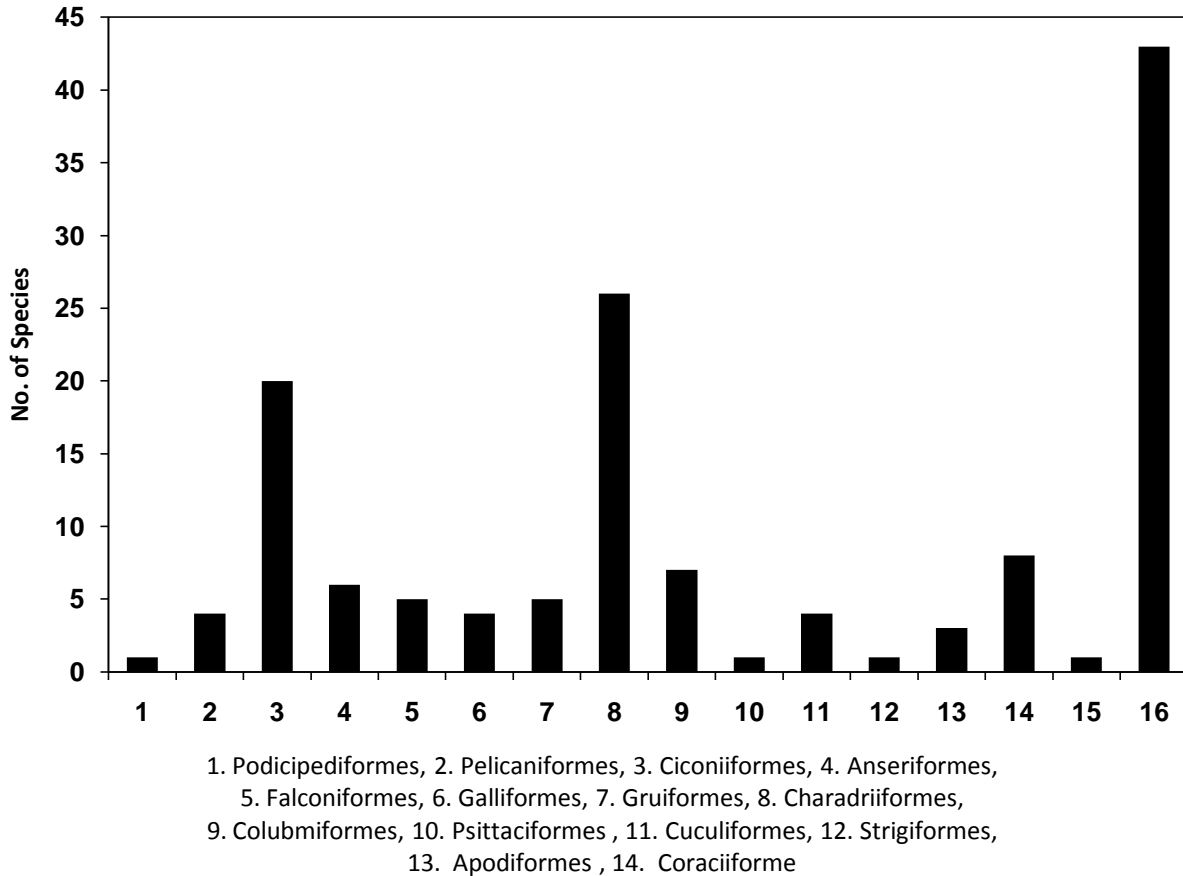
## 2.2. Methodology

The line transect method, point count method and total count method (Gaston 1975; Bibby *et al.* 2000) were employed to estimate the bird species composition. Data were collected from different habitat types representing agricultural crop fields, human habitations and wetlands (coast of Little Rann of Kutch, village ponds and streams) in and around wind farm area. The time schedule chosen for the bird survey was from 0600 to 0900hrs and 1600 to 1800hrs. The identification of birds and their occurrence were recorded using wide-range binoculars. Photography was done with using a Sony digital camera with zoom lenses. The birds were identified by their characteristic features in accordance with standard identification manuals and field guides by Ali and Ripley (1983), Kazmierczak (2000) and Grimmett *et al.* (2001). Birds were classified as resident or migratory species based on Kazmierczak (2000) and Arun Kumar *et al.* (2003). The checklist of species was prepared following the nomenclature of Manakadan and Pittie (2001)

## 3. Results and discussion

One-hundred-and -thirty nine taxa of birds were recorded in the study area, which belong to 45 families under 16 orders (Table 1). Out of these, 67 (48.2%) species were residents, 28 (20.1%) were residents with local movements, 22 (15.8%) were residents with winter influx, 17 (12.2%) were winter migrants and 5 (3.6%) species were winter migrants as well as passage migrants (Table 3). Most of the families represented either by one or two species (relative percentage of species 0-2, 13 families; 2-4, 17 families, 4-6, 10 families), while maximum relative percentage is from three families, Ardeidae (11 sps.), Scolopacidae (11 sps.) and Laridae (9 sps.) (Table 2). The order Passeriformes (43 species) was highest in dominance followed by Charadriiformes, Ciconiiformes, Coraciiformes and Anseriformes (Fig. 2).

Out of the 139 species of birds found in the study area, 8 species, namely, Darter (*Anhinga melanogaster*), Painted Stork (*Mycteria leucocephala*), Oriental White Ibis (*Threskiornis melanocephalus*), Lesser Flamingo (*Phoenicopterus minor*), Black-tailed Godwit (*Limosa limosa*), Eurasian Curlew (*Numenius arquata*), Black-bellied Tern (*Sterna acuticauda*) and European Roller (*Coracias garrulous*) were listed under *Near Threatened* category (IUCN 2011). The Eurasian Spoonbill (*Platalea leucorodia*), Black-shouldered Kite (*Elanus caeruleus*), Black Kite (*Milvus migrans*), Shikra (*Accipiter badius*), Eurasian Sparrow Hawk (*Accipiter nisus*), Western Marsh-Harrier (*Circus aeruginosus*) and Indian Peafowl (*Pavo cristatus*) are included in Schedule I of the Indian Wildlife (Protection) Act, 1972.



**Fig. 2.** Order wise distribution of birds in the study area.

In order to classify avifauna in terms of primary habitat use, we recorded 62 waterbird species, 12 wetland dependent species and 65 species characteristics of terrestrial habitat. This high waterbirds diversity is the result of the coastal location of the Little Rann of Kutch; the existence of mudflats, salt pans, village ponds and streams found in the study area is very important as a staging and wintering area for a wide variety of migratory waterbirds. The study area partly to fact that lies western migratory flyway in to the Indian subcontinent (Khacher 1996; Urfi 2002). The Great Bittern (*Botaurus stellaris*), Gargany (*Anas querquedula*), Northern Shoveller (*Anas clypeata*), Common Teal (*Anas crecca*), Western Marsh-Harrier (*Circus aeruginosus*), Little Ringed Plover (*Charadrius dubius*), Demoiselle Crane (*Grus virgo*), Black-tailed Godwit (*Limosa limosa*), Spotted Redshank (*Tringa erythropus*), Marsh Sandpiper (*Tringa stagnatilis*), Wood Sandpiper (*Tringa glorioles*), Eurasian Curlew (*Numenius arquata*), Little Stint (*Calidris minuta*), Pallas's Gull (*Larus ichthyæetus*), Ashy Drongo (*Dicrurus leucophaeus*), Rosy Starling (*Sturnus roseus*) and Grey Wagtail (*Motacilla cinerea*) are noteworthy winter visitors to the study area. Demoiselle Crane is an important regular winter visitor; a total of 1,170 birds were recorded in the Laliana village pond of the study site during December. Another winter migrant, Rosy Starling was found gregariously in and around the agricultural fields during September - October.

Some bird species viz., Common Quail (*Coturnix coturnix*), Terek Sandpiper (*Xenus cinereus*) Ruff (*Philomachus pugnax*), Black Tern (*Chlidonias niger*) and European Roller (*Coracias garrulous*) appear in just passage or in wintering periods. The dominant habitats from the wind farm located sites are agricultural lands, open land small herbs, isolated or grouping of small shrubs and thorny trees and bushes to determine the large number of terrestrial birds. A number of insectivores, granivores and carnivores bird species were seen in the agricultural crop fields to catch and eat insects, other animal foods and grains.

**Table 1**

List of bird species recorded in the study site during the study period.

S. No.	Family / English Name	Scientific Name	Status
	<b>Family: Podicipedidae</b>		
1	Little Grebe	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	R/LM
	<b>Family: Phalacrocoracidae</b>		
2	Little Cormorant	<i>Phalacrocorax niger</i> (Vieillot, 1817)	R/LM
3	Indian Shag	<i>Phalacrocorax fuscicollis</i> (Stephens, 1826)	R/LM
4	Great Cormorant	<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	R/WM
	<b>Family: Anhingidae</b>		
5	Darter	<i>Anhinga melanogaster</i> (Pennant, 1769)	R/LM
	<b>Family: Ardeidae</b>		
6	Little Egret	<i>Egretta garzetta</i> (Linnaeus, 1766)	R/LM
7	Western Reef-Egret	<i>Egretta gularis</i> (Bosc, 1792)	R/LM
8	Grey Heron	<i>Ardea cinerea</i> (Linnaeus, 1758)	R/WM
9	Purple Heron	<i>Ardea purpurea</i> (Linnaeus, 1766)	R/LM
10	Black-crowned Night Heron	<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	R/LM
11	Large Egret	<i>Casmerodius albus</i> (Linnaeus, 1758)	R/LM
12	Median Egret	<i>Mesophoyx intermedia</i> (Wagler, 1829)	R/LM
13	Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus, 1758)	R/LM
14	Indian Pond Heron	<i>Ardeola grayii</i> (Sykes, 1832)	R/LM
15	Little Green Heron	<i>Butorides striatus</i> (Linnaeus, 1758)	R
16	Great Bittern	<i>Botaurus stellaris</i> (Linnaeus, 1758)	WM
	<b>Family: Ciconiidae</b>		
17	Painted Stork	<i>Mycteria leucocephala</i> (Pennant, 1769)	R/LM
18	Asian Openbill-Stork	<i>Anastomus oscitans</i> (Boddaert, 1783)	R/LM
19	White-necked Stork	<i>Ciconia episcopus</i> (Boddaert, 1783)	R/LM
	<b>Family: Threskiornithidae</b>		
20	Oriental White Ibis	<i>Threskiornis melanocephalus</i> (Latham, 1790)	R/LM
21	Black Ibis	<i>Pseudibis papillosa</i> (Temminck, 1824)	R/LM
22	Glossy ibis	<i>Plegadis falcinellus</i> (Linnaeus, 1766)	R/WM
23	Eurasian Spoonbill	<i>Platalea leucorodia</i> (Linnaeus, 1758)	R
	<b>Family: Phoenicopteridae</b>		
24	Greater Flamingo	<i>Phoenicopterus ruber</i> (Linnaeus, 1758)	R/LM
25	Lesser Flamingo	<i>Phoenicopterus minor</i> (Geoffroy, 1798)	R/LM
	<b>Family: Anatidae</b>		
26	Comb Duck	<i>Sarkidiornis melanotos</i> (Pennant, 1769)	R/LM
27	Lesser Whistling Duck	<i>Dendrocygna javanica</i> (Horsfield, 1821)	R/LM
28	Gargany	<i>Anas querquedula</i> (Linnaeus, 1758)	WM
29	Spot-billed Duck	<i>Anas poecilorhyncha</i> (J.R. Forester, 1781)	R/LM
30	Northern Shoveller	<i>Anas clypeata</i> (Linnaeus, 1758)	WM
31	Common Teal	<i>Anas crecca</i> (Linnaeus, 1758)	WM
	<b>Family: Accipitridae</b>		
32	Shikra	<i>Accipiter badius</i> (Gmelin, 1788)	R
33	Eurasian Sparrowhawk	<i>Accipiter nisus</i> (Linnaeus, 1758)	R/WM
34	Western Marsh Harrier	<i>Circus aeruginosus</i> (Linnaeus, 1758)	WM
35	Black Kite	<i>Milvus migrans</i> (Boddaert, 1783)	R/WM
36	Black-shouldered Kite	<i>Elanus caeruleus</i> (Desfontaines, 1789)	R
	<b>Family: Phasianidae</b>		
37	Common Quail	<i>Coturnix coturnix</i> (Linnaeus, 1758)	WM/PM
38	Grey Francolin	<i>Francolinus pondicerianus</i> (Gmelin, 1789)	R

S. No.	Family / English Name	Scientific Name	Status
39	Jungle Bush Quail	<i>Perdica asiatica</i> (Latham, 1790)	R
40	Indian Peafowl	<i>Pavo cristatus</i> (Linnaeus, 1758)	R
	<b>Family: Gruidae</b>		
41	Demoiselle Crane	<i>Grus virgo</i> (Linnaeus, 1758)	WM
	<b>Family: Rallidae</b>		
42	Common Coot	<i>Fulica atra</i> (Linnaeus, 1758)	R/WM
43	Common Moorhen	<i>Gallinula chloropus</i> (Linnaeus, 1758)	R/WM
44	Purple Moorhen	<i>Porphyrio porphyrio</i> (Linnaeus, 1758)	R/LM
45	White-breasted Waterhen	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	R
	<b>Family: Charadriidae</b>		
46	Red-wattled Lapwing	<i>Vanellus indicus</i> (Boddaert, 1783)	R/LM
47	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i> (Boddaert, 1783)	R/LM
48	Little Ringed Plover	<i>Charadrius dubius</i> (Scopoli, 1786)	WM
49	Kentish Plover	<i>Charadrius alexandrinus</i> (Linnaeus, 1758)	R/WM
50	Black-winged Stilt	<i>Himantopus himantopus</i> (Linnaeus, 1758)	R/LM
	<b>Family: Burhinidae</b>		
51	Great Stone-Plover	<i>Esacus recurvirostris</i> (Cuvier, 1829)	R/LM
	<b>Family: Scolopacidae</b>		
52	Black-tailed Godwit	<i>Limosa limosa</i> (Linnaeus, 1758)	WM
53	Spotted Redshank	<i>Tringa erythropus</i> (Pallas, 1764)	WM
54	Common Redshank	<i>Tringa totanus</i> (Linnaeus, 1758)	R/WM
55	Marsh Sandpiper	<i>Tringa stagnatilis</i> (Bechstein, 1803)	WM
56	Common Sandpiper	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	R/WM
57	Green Sandpiper	<i>Tringa ochropus</i> (Linnaeus, 1758)	R /WM
58	Wood Sandpiper	<i>Tringa glorioles</i> (Linnaeus, 1758)	WM
59	Terek Sandpiper	<i>Xenus cinereus</i> (Guldenstadt, 1774)	WM/PM
60	Eurasian Curlew	<i>Numenius arquata</i> (Linnaeus, 1758)	WM
61	Ruff	<i>Philomachus pugnax</i> (Linnaeus, 1758)	WM/PM
62	Little Stint	<i>Calidris minuta</i> (Leisler, 1812)	WM
	<b>Family: Laridae</b>		
63	Pallas's Gull	<i>Larus ichthyaetus</i> (Pallas, 1773)	WM
64	Black-bellied Tern	<i>Sterna acuticauda</i> (J.E. Gray, 1831)	R
65	Black-naped Tern	<i>Sterna sumatrana</i> (Raffles, 1822)	R
66	Common Tern	<i>Sterna hirundo</i> (Linnaeus, 1758)	R/WM
67	River Tern	<i>Sterna aurantia</i> (J.E. Gray, 1831)	R/WM
68	Little Tern	<i>Sterna albifrons</i> (Pallas, 1764)	R/WM
69	Gull-billed Tern	<i>Gelochelidon ninotica</i> (Gmelin, 1789)	R/WM
70	Whiskered Tern	<i>Chlidonias hybridus</i> (Pallas, 1811)	R/WM
71	Black Tern	<i>Chlidonias niger</i> (Linnaeus, 1758)	WM/PM
	<b>Family: Pteroclididae</b>		
72	Chestnut-bellied Sandgrouse	<i>Pterocles exustus</i> (Temminck, 1825)	R
	<b>Family: Columbidae</b>		
73	Blue Rock Pigeon	<i>Columba livia</i> (Gmelin, 1789)	R
74	Little Brown Dove	<i>Streptopelia senegalensis</i> (Linnaeus, 1766)	R
75	Red Collared-Dove	<i>Streptopelia tranquebarica</i> (Hermann, 1804)	R
76	Spotted Dove	<i>Streptopelia chinensis</i> (Scopoli, 1786)	R
77	Eurasian Collared Dove	<i>Streptopelia decaocto</i> (Frisvaldszky, 1838)	R
78	Oriental Turtle Dove	<i>Streptopelia orientalis</i> (Latham, 1790)	R
	<b>Family: Psittacidae</b>		
79	Rose Ringed Parakeet	<i>Psittacula krameri</i> (Scopoli, 1769)	R
	<b>Family: Cuculidae</b>		
80	Brainfever Bird	<i>Hierococcyx varius</i> (Vahl, 1797)	R/WM



S. No.	Family / English Name	Scientific Name	Status
81	Pied Crested Cuckoo	<i>Clamator jacobinus</i> (Boddaert, 1783)	R/WM
82	Asian Koel	<i>Eudynamys scolopacea</i> (Linnaeus, 1758)	R
83	Greater Coucal	<i>Centropus sinensis</i> (Stephens, 1815)	R
	<b>Family: Strigidae</b>		
84	Spotted Owlet	<i>Athene brama</i> (Temminck, 1821)	R
	<b>Family: Apodidae</b>		
85	Asian Palm Swift	<i>Cypsiurus balasiensis</i> (J.E. Gray, 1829)	R
86	House Swift	<i>Apus affinis</i> (J.E. Gray, 1830)	R
	<b>Family: Hemiprocnidae</b>		
87	Crested Tree Swift	<i>Hemiprogne coronata</i> (Tickell, 1833)	R
	<b>Family: Alcedinidae</b>		
88	Lesser Pied Kingfisher	<i>Ceryle rudis</i> (Linnaeus, 1758)	R
89	White-breasted Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	R/LM
	<b>Family: Meropidae</b>		
90	Blue-tailed Bee-eater	<i>Merops philippinus</i> (Linnaeus, 1766)	R/WM
91	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i> (Vieillot, 1817)	R
92	Small Bee-eater	<i>Merops orientalis</i> (Latham, 1801)	R
	<b>Family: Coraciidae</b>		
93	Indian Roller	<i>Coracias benghalensis</i> (Linnaeus, 1758)	R
94	European Roller	<i>Coracias garrulous</i> (Linnaeus, 1758)	WM/PM
	<b>Family: Upupidae</b>		
95	Common Hoopoe	<i>Upupa epops</i> (Linnaeus, 1758)	R/WM
	<b>Family: Capitonidae</b>		
96	Coppersmith Barbet	<i>Megalaima haemacephala</i> (P.L.S. Müller, 1776)	R
	<b>Family: Alaudidae</b>		
97	Ashy-crowned Sparrow Lark	<i>Eremopterix grisea</i> (Scopoli, 1786)	R
98	Bengal Bush-Lark	<i>Mirafra assamica</i> (Horsfield, 1840)	R
99	Common Crested Lark	<i>Galerida cristata</i> (Linnaeus, 1758)	R
100	Rufous-tailed Finch-Lark	<i>Ammomanes phoenicurus</i> (Franklin, 1831)	R
101	Great Hoopoe-Lark	<i>Alaemon alaudipes</i> (Desfontaines, 1789)	R
	<b>Family: Hirundinidae</b>		
102	Red-rumped Swallow	<i>Hirundo daurica</i> (Linnaeus, 1771)	R/WM
103	Wire-tailed Swallow	<i>Hirundo smithii</i> (Leach, 1818)	R/WM
	<b>Family: Laniidae</b>		
104	Bay-backed Shrike	<i>Lanius vittatus</i> (Valenciennes, 1826)	R
105	Brown Shrike	<i>Lanius cristatus</i> (Linnaeus, 1758)	R
	<b>Family: Dicruridae</b>		
106	Ashy Drongo	<i>Dicrurus leucophaeus</i> (Vieillot, 1817)	WM
107	Black Drongo	<i>Dicrurus macrocercus</i> (Vieillot, 1817)	R
108	White-bellied Drongo	<i>Dicrurus caeruleus</i> (Linnaeus, 1758)	R
	<b>Family: Artamidae</b>		
109	Ashy Wood-swallow	<i>Artamus fuscus</i> (Vieillot, 1817)	R
	<b>Family: Sturnidae</b>		
110	Brahminy Starling	<i>Sturnus pagodarum</i> (Gmelin, 1789)	R
111	Rosy Starling	<i>Sturnus roseus</i> (Linnaeus, 1758)	WM
112	Bank Myna	<i>Acridotheres ginginianus</i> (Latham, 1790)	R
113	Common Myna	<i>Acridotheres tristis</i> (Linnaeus, 1766)	R
	<b>Family: Corvidae</b>		
114	House Crow	<i>Corvus splendens</i> (Vieillot, 1817)	R
115	Jungle Crow	<i>Corvus macrorhynchos</i> (Wagler, 1827)	R
116	Indian Treepie	<i>Dendrocitta vagabunda</i> (Latham, 1790)	R
	<b>Family: Pycnonotidae</b>		

S. No.	Family / English Name	Scientific Name	Status
117	Red-vented Bulbul	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	R
118	White-eared Bulbul	<i>Pycnonotus leucotis</i> (Gould, 1836)	R
	<b>Family: Timaliinae</b>		
119	Common Babbler	<i>Turdoides caudatus</i> (Dumont, 1823)	R
120	White-headed Babbler	<i>Turdoides affinis</i> (Jerdon, 1847)	R
	<b>Family: Turdinae</b>		
121	Pied Bushchat	<i>Saxicola caprata</i> (Linnaeus, 1766)	R
122	Indian Robin	<i>Saxicoloides fulicata</i> (Linnaeus, 1776)	R
123	Oriental Magpie Robin	<i>Copsychus saularis</i> (Linnaeus, 1758)	R
	<b>Family: Sylviinae</b>		
124	Common Tailorbird	<i>Orthotomus sutorius</i> (Pennant, 1769)	R
125	Ashy Prinia	<i>Prinia socialis</i> (Sykes, 1832)	R
126	Jungle Prinia	<i>Prinia sylvatica</i> (Jerdon, 1840)	R
127	Plain Prinia	<i>Prinia inornata</i> (Sykes, 1832)	R
	<b>Family: Motacillidae</b>		
128	Paddy-field Pipit	<i>Anthus rufulus</i> (Vieillot, 1818)	R
129	Grey Wagtail	<i>Motacilla cinerea</i> (Tunstall, 1771)	WM
130	Large Pied Wagtail	<i>Motacilla maderaspatensis</i> (Gmelin, 1789)	R
131	Yellow Wagtail	<i>Motacilla flava</i> (Linnaeus, 1758)	R
	<b>Family: Dicaeidae</b>		
132	Thick-billed Flowerpecker	<i>Dicaeum agile</i> (Tickell, 1833)	R
133	Tickell's Flowerpecker	<i>Dicaeum erythrorhynchos</i> (Latham, 1790)	R
	<b>Family: Nectariniidae</b>		
134	Purple Sunbird	<i>Nectarinia asiatica</i> (Latham, 1790)	R
135	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i> (Linnaeus, 1766)	R
	<b>Family: Passerinae</b>		
136	House Sparrow	<i>Passer domesticus</i> (Linnaeus, 1758)	R
	<b>Family: Ploceidae</b>		
137	Baya Weaver	<i>Ploceus philippinus</i> (Linnaeus, 1766)	R
	<b>Family: Estrildidae</b>		
138	Black-headed Munia	<i>Lonchura malacca</i> (Linnaeus, 1766)	R
139	White-throated Munia	<i>Lonchura malabarica</i> (Linnaeus, 1758)	R

R – Resident; WM – Winter Migrant; LM – Local Migrant; PM – Passage Migrant

#### 4. Conclusion

In conclusion, the study area supports a rich and diverse avifauna comprising both resident and migratory species as well as several species of conservational importance. Being an important area for a variety of avifauna it should receive immediate attention for conservation. The present study formed a part of our ongoing research project 'Impacts of Jangi wind power farm (91.8 MW) with special reference to birds and bats'. The operation of wind turbines do have some impact on some of the bird species in this region; we recorded mortality of six bird species, namely, Blue Rock Pigeon (*Columba livia*), House Crow (*Corvus splendens*) Spotted Dove (*Streptopelia chinensis*), Cattle Egret (*Bubulcus ibis*), Eurasian Collared Dove (*Streptopelia decaocto*) and an unidentified Egret sp., as a result of collisions with the wind turbines. Further investigations need to be conducted for a better understanding the density on bird populations and the impacts of wind turbines.

#### Acknowledgments

We thank the 'Genting Power Energy' to provide the fund to conduct the research work and for allowing us to use and publish the information contained in the present study.



**Table 2**

Relative percentage of number species in various families of birds in the study area

0-2	2-4	4-6	6-9	9 and above
Podicipedidae	Phalacrocoracidae	Threskiornithidae	Ardeidae	Anatidae
Anhingidae	Ciconiidae	Accipitridae	Scolopacidae	Columbidae
Gruidae	Phoenicopteridae	Phasianidae	Laridae	
Burhinidae	Apodidae	Rallidae		
Pteroclididae	Alcedinidae	Charadriidae		
Psittacidae	Meropidae	Cuculidae		
Strigidae	Coraciidae	Alaudidae		
Hemiprocridae	Hirundinidae	Sturnidae		
Upupidae	Laniidae	Sylviinae		
Capitonidae	Dicruridae	Motacillidae		
Artamidae	Corvidae			
Passerinae	Pycnonotidae			
Ploceidae	Timaliinae			
	Turdinae			
	Dicaeidae			
	Nectariniidae			
	Estrildidae			

**Table 3**

Order and status of birds recorded in the study area.

Order	R/LM	R/WM	R	WM	WM/PM	Total
Podicipediformes	1	--	--	--	--	1
Pelicaniformes	3	1	--	--	--	4
Ciconiiformes	15	2	2	1	--	20
Anseriformes	3	--	--	3	--	6
Falconiformes	--	2	2	1		5
Galliformes	--	--	3	--	1	4
Gruiformes	1	2	1	1	--	5
Charadriiformes	4	9	2	8	3	26
Columbiformes	--	--	7	--	--	7
Psittaciformes	--	--	1	--	--	1
Cuculiformes	--	2	2	--	--	4
Strigiformes	--	--	1	--	--	1
Apodiformes	--	--	3	--	--	3
Coraciiformes	1	2	4	--	1	8
Piciformes	--	--	1	--	--	1
Passeriformes	--	2	38	3	--	43
<b>Total</b>	<b>28</b>	<b>22</b>	<b>67</b>	<b>17</b>	<b>5</b>	<b>139</b>

R/LM – Resident with local movements; R/WM – Resident with winter influx; R – Resident; WM – Winter Migrant; WM/PM – Winter migrant as well as passage migrant

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