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# STATUS OF THE BIRDS RECORDED FROM THE WIND POWER PROJECT AREA IN COASTAL GHARO WIND CORRIDOR, DISTRICT THATTA, SINDH

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## ABSTRACT

The present paper deals with the record of 76 species of birds from Bhambhor area which is in close proximity to the Wind Power Project Site in the Gharo (Coastal) Wind Corridor in Taluka Mirpur Sakro, district Thatta, Sindh. More than 11 types of habitats are available in the area supporting at least 10 Threatened/ Near-threatened species, mostly of waterbirds. Potential impacts on birds due to the operation of wind turbines have been mentioned which need to be mitigated during the construction and operational phase. At present, there are no serious threats to birds due to the developmental activities with regard to Wind Power Projects (WPPs) but as an immediate and necessary conservation initiative such as monitoring of bird populations visiting the area particularly in the migratory season is recommended on long term basis.

**Keywords**: Gharo creek, wind power projects, coastal birds, impacts of WPPs.

## INTRODUCTION

Globally, wind energy is an important and a viable alternate source of environmental friendly energy. The coastal areas of Sindh and Balochistan provinces possess adequate wind resources. The province of Sindh, district Thatta, Karachi, Hyderabad and Badin Belt possess prospective sites for installation, and development of wind power projects. The first energy wind power project in Pakistan started working with a 50MW generation capacity in Jhimpir, Sindh in December 2012 (www.pakistantoday, 2013).

The Gharo Wind Corridor is located in the southern part of the Sindh province. It falls between 23° 48' to 25° 41' N and 67° 16"to 69° 25' E. It extends over parts of Thatta, Badin and Hyderabad districts.

The southern portion of this wind corridor mainly covers the coastal areas of the Indus Delta. The corridor also extends to cover parts of Jamshoro, Tando Muhammad Khan, Tando Allahyar, Mirpur Khas, Matiari, Sanghar, Umerkot and Karachi districts (Anon, 2009).

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The area mainly consists of creek area with well-developed mangrove swamps, extensive mudflats and marshes along a number of protected Wildlife areas and Protected Forests along the Indus. It also includes coastline, tidal creeks, lagoons, Riverine forest, agricultural areas and Indus cover up to the delta. Goth Karam Ali Baloch is the largest village of the area near Wind Power Projects another main part of this corridor is the inland Jhimpir which is mainly a dryland area lying in the Thatta district.

Data were collected in the Gharo Wind Corridor area (near Bhambhor) where five Wind Power Projects are located with a view to collate baseline information about the Birds of the impacted area.

The Gharo Wind Corridor area including Dhabeji, Gharo and Mirpur Sakro was surveyed for data collection in respect of birds. The following habitats were identified viz. creek areas, mangrove plantations/ forest, marshes, sandy, stony, rocky and muddy areas, open flat grounds, small ponds, roadside lowland wetland areas and built-up areas. This Gharo Wind Corridor has a number of Wind Power Plants in the study area (Table 1 and Figs. 1- 6).

Table 1. Wind Power Plants in Gharo.

| S. No. | Company | Location | Capacity (MW) | Status |
|---|---|---|---|---|
| 1 | Foundation Wind Energy I | Gharo | 50.0 | Operational |
| 2 | Foundation Wind Energy II | Gharo | 50.0 | Operational |
| 3 | Hydrochina Dawood Power (Pvt) Ltd. | Gharo | 49.5 | Operational |
| 4 | Tenega Genarsi Ltd. | Gharo | 49.5 | Operational |
| 5 | Zephyr Wind Power (Pvt) Ltd. | Gharo | 50 | Operational |

Fig. 1. Gharo Creek area.

Fig. 2. Creek area with mangroves.

Fig. 3. A view of the Creek area with mangroves.

Fig. 4. Mudflat area.

Fig. 5. Wind Turbines installation area.

Fig. 6. Dryland area with mangroves and WPP turbines in the background.

The published work related to the birds of the area includes: Ghalib *et al*. (2002, 2009, 2014, 2017, 2018), Ghalib and Nawaz (2008), Anon (2009). Anon (2009) has recorded 52 species of birds from the Gharo Wind Corridor area. The objective of the present study was to determine the status of birds in Gharo Wind Corridor area and compile an uptodate Checklist of the bird species with seasonal status and threats.

## MATERIALS AND METHODS

Literature was consulted with regard to the distribution of avifauna of the lower Sindh with particular reference to the study area. Field surveys were undertaken in the Gharo Coastal area as a part of various environmental studies undertaken in the area for IEE / EIA and Baseline studies during 2015- 2018.

### Survey Method

The potential habitat types in the study area for birds were identified. The species and numbers of birds of each species found in each habitat type were recorded with particular emphasis on the key species. The field surveys covered both the migratory and the breeding seasons.

Two types of transect methods most commonly used in birds surveys are the line transects and point transects/ point counts method. Both are based on observation of birds along a predefined route within a predefined survey design. In the line transects method birds recording occurs continually, whereas in point counts method, it occurs at regular intervals along the route and for a given duration at each point of the study area. Line and point transects are the preferred survey methods in many situations. These are efficient and are particularly suited to monitoring projects as both can be used to examine bird-habitat relationships, and both can be used to derive relative and absolute measures of bird abundance in different seasons.

Line transects are suitable for extensive, open and uniform habitats and for large and conspicuous species. Double counting of birds becomes a minor issue as the observer is continually on the move (Gregory *et al*., 2004).

Boat survey method was also used during bird surveys to record the birds roosting inside the mangrove forest and diving in the open sea water.

Each sample area was traversed and examined by two observers separately. Birds were searched on each side of the strip for 150 m so that each study strip was 300 wide. Binoculars and telescopes were used to identify bird species and count or assess bird numbers.

Counting of different waterbirds and terrestrial bird species gives information on the usage of habitats by those birds. This census (numbers of birds) also shows the

seasonal variation in numbers and species of bird visiting, passing or residing in the coastal water bodies of the study area.

**RESULTS**

Based on our several field surveys, 76 species of birds were recorded from the Gharo Wind Corridor area (Table 2).

Table 2. Checklist of the Birds recorded in the Study area.

| S. No. | Order | Family | Scientific name | Common name | Status |
|---|---|---|---|---|---|
| 1 | Pelecaniformes | Pelecanidae | *Pelecanus onocrotalus* | White Pelican | WV |
| 2 | Pelecaniformes | Sulidae | *Sula dactylatra* | Masked Booby | WV |
| 3 | Pelecaniformes | Phalacrocoracidae | *Phalacrocorax carbo* | Large Cormorant | WV |
| 4 | Pelecaniformes | Phalacrocoracidae | *Phalacrocorax niger* | Little Cormorant | R |
| 5 | Ciconiiformes | Ardeidae | *Ardea purpurea* | Purple Heron | WV |
| 6 | Ciconiiformes | Ardeidae | *Ardea cinerea* | Grey heron | WV |
| 7 | Ciconiiformes | Ardeidae | *Ardeola grayii* | Indian Pond Heron | R |
| 8 | Ciconiiformes | Ardeidae | *Egretta alba* | Large Egret | R |
| 9 | Ciconiiformes | Ardeidae | *Egretta garzetta* | Little Egret | R |
| 10 | Ciconiiformes | Ardeidae | *Egretta gularis* | Indian Reef Heron | R |
| 11 | Ciconiiformes | Ciconiidae | *Ibis leuoocephalus* | Painted Stork | R |
| 12 | Ciconiiformes | Threskiornithidae | *Platalea leucorodia* | Spoonbill | WV |
| 13 | Phoenicopteriformes | Phoenicopteridae | *Phoenicopterus roseus* | Greater Flamingo | WV |
| 14 | Anseriformes | Anatidae | *Tadorna tadorna* | Common Shelduck | WV |
| 15 | Anseriformes | Anatidae | *Aythya farina* | Common Pochard | WV |
| 16 | Falconiformes | Accipitridae | *Milvus migrans* | Black Kite | R |
| 17 | Falconiformes | Accipitridae | *Haliastur Indus* | Brahminy Kite | R |
| 18 | Falconiformes | Accipitridae | *Aquila nipalensis* | Steppe Eagle | WV |
| 19 | Falconiformes | Accipitridae | *Aquila clanga* | Greater Spotted Eagle | WV |
| 20 | Falconiformes | Accipitridae | *Aquila heliaca* | Imperial Eagle | WV |
| 21 | Falconiformes | Accipitridae | *Haliaeetus leucoryphus* | Pallas's Fishing Eagle | R |
| 22 | Falconiformes | Accipitridae | *Circus aeruginosus* | Marsh Harrier | WV |
| 23 | Falconiformes | Pandionidae | *Pandion haliaetus* | Osprey | WV |
| 24 | Falconiformes | Haematopodidae | *Haematopus ostralegus* | Eurasian Oyster catcher | WV |
| 25 | Charadriiformes | Charadriidae | *Vanellus indicus* | Red-wattled Lapwing | R |
| 26 | Charadriiformes | Charadriidae | *Pluvialis squatarola* | Grey Plover | WV |
| 27 | Charadriiformes | Charadriidae | *Pluvialis fulva* | Eastern Golden Plover | V |
| 28 | Charadriiformes | Charadriidae | *Charadrius hiaticula* | Ringed Plover | WV |
| 29 | Charadriiformes | Charadriidae | *Charadrius dubius* | Little-ringed Plover | WV |
| 30 | Charadriiformes | Charadriidae | *Charadrius alexandrines* | Kentish Plover | WV |
| 31 | Charadriiformes | Charadriidae | *Charadrius mongolus* | Lesser Sand Plover | WV |
| 32 | Charadriiformes | Scolopacidae | *Numenius phaeopus* | Whimbrel | WV |
| 33 | Charadriiformes | Scolopacidae | *Numenius arquata* | Eurasian Curlew | WV |
| 34 | Charadriiformes | Scolopacidae | *Limosa limosa* | Black-tailed Godwit | WV |
| 35 | Charadriiformes | Scolopacidae | *Limosa lapponica* | Bar-tailed Godwit | WV |

| | | | | | |
|---|---|---|---|---|---|
| 36 | Charadriiformes | Scolopacidae | *Tringa nebularia* | Green Shank | WV |
| 37 | Charadriiformes | Scolopacidae | *Tringa totanus* | Red Shank | WV |
| 38 | Charadriiformes | Scolopacidae | *Actitis hypoleucos* | Common Sandpiper | WV |
| 39 | Charadriiformes | Scolopacidae | *Tringa stagnatilis* | Marsh Sandpiper | WV |
| 40 | Charadriiformes | Scolopacidae | *Tringa glareola* | Wood or Spotted Sandpiper | WV |
| 41 | Charadriiformes | Scolopacidae | *Xenus cinereus* | Terek Sandpiper | WV |
| 42 | Charadriiformes | Scolopacidae | *Actitis hypoleucos* | Common Sandpiper | WV |
| 43 | Charadriiformes | Scolopacidae | *Calidris minutus* | Little Stint | WV |
| 44 | Charadriiformes | Scolopacidae | *Calidris temminckii* | Temminck's Stint | WV |
| 45 | Charadriiformes | Scolopacidae | *Calidris alpina* | Dunlin | WV |
| 46 | Charadriiformes | Scolopacidae | *Calidris testaceus* | Curlew-Sandpiper | WV |
| 47 | Charadriiformes | Scolopacidae | *Philomachus pugnax* | Ruff | WV |
| 48 | Charadriiformes | Recuvirostridae | *Himantopus himantopus* | Black-winged Stilt | R |
| 49 | Charadriiformes | Recuvirostridae | *Recurvirostra avosetta* | Pied Avocet | WV |
| 50 | Charadriiformes | Burhinidae | *Esacus recurvirostris* | Great Stone Plover | R |
| 51 | Charadriiformes | Laridae | *Larus argentatus* | Herring Gull | WV |
| 52 | Charadriiformes | Laridae | *Larus ichthyaetus* | Great Black-headed or Palla's Gull | WV |
| 53 | Charadriiformes | Laridae | *Larus genei* | Slender-billed Gull | WV |
| 54 | Charadriiformes | Sternidae | *Chidlonias hybridus* | Indian Whiskered Tern | M |
| 55 | Charadriiformes | Sternidae | *Gelochelidon nilotica* | Gull-billed Tern | WV |
| 56 | Charadriiformes | Sternidae | *Sterna caspia* | Caspian Tern | M |
| 57 | Charadriiformes | Sternidae | *Sterna acuticauda* | Black-bellied Tern | R |
| 58 | Charadriiformes | Sternidae | *Sterna albifrons* | Little Tern | R |
| 59 | Charadriiformes | Sternidae | *Sterna sandvicensis* | Sandwich Tern | M |
| 60 | Charadriiformes | Sternidae | *Sterna aurantia* | Indian River Tern | R |
| 61 | Columbiformes | Columbidae | *Columba livia* | Blue Rock Pigeon | R |
| 62 | Columbiformes | Columbidae | *Streptopelia senegalensis* | Little Brown Dove/Laughing Dove | R |
| 63 | Columbiformes | Columbidae | *Streptopelia decaocto* | Eurasian Collared Dove | R |
| 64 | Coraciiformes | Alcedinidae | *Ceryle rudis* | Pied Kingfisher | R |
| 65 | Coraciiformes | Alcedinidae | *Halcyon smyrnensis* | White-brested Kingfisher | R |
| 66 | Passeriformes | Alaudidae | *Galerida cristata* | Crested Lark | R |
| 67 | Passeriformes | Hirundinidae | *Hirundo daurica* | Redrumped Swallow | WV |
| 68 | Passeriformes | Dicruridae | *Dicrurus adsimilis* | Black Drongo | R |
| 69 | Passeriformes | Corvidae | *Corvus splendens* | Common Crow | R |
| 70 | Passeriformes | Pyconotidae | *Pycnonotus leucogenys* | White-cheeked Bulbul | R |
| 71 | Passeriformes | Sturnidae | *Acridotheres tristis* | Common Myna | R |

| | | | | | |
|---|---|---|---|---|---|
| 72 | Passeriformes | Turdidae | *Phoenicurus ochruros* | Black Redstart | WV |
| 73 | Passeriformes | Turdidae | *Oenanthe deserti* | Desert Wheatear | WV |
| 74 | Passeriformes | Motacillidae | *Motacilla alba* | White or Pied Wagtail | WV |
| 75 | Passeriformes | Nectariniidae | *Nectarinia asiatica* | Purple Sunbird | R |
| 76 | Passeriformes | Passeridae | *Passer domesticus* | House Sparrow | R |

**Seasonal Status of the Birds**

During the study, we recorded 36% resident and 64% migratory birds. The seasonal status of the birds has been classified (Table 3 and Fig. 7).

Table 3. Seasonal Status of the Birds recorded.

| S. No. | Status | Number of species |
|---|---|---|
| 1 | Residents (R) | 27 |
| 2 | Winter Visitors (WV) | 45 |
| 3 | Migrants/ Year-round Visitors (M) | 03 |
| 4 | Vagrant (V) | 01 |

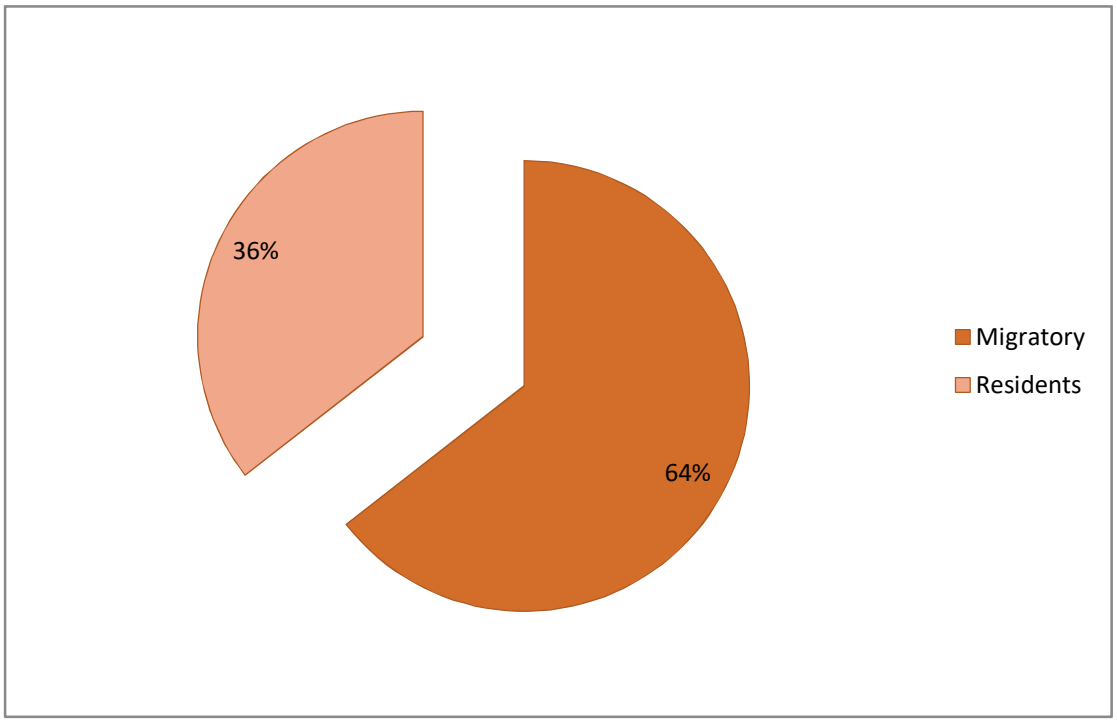


Fig. 7. Showing ratio of Resident and Migratory Birds.

**Threats**

There are no serious threats to the bird species due to WPPs developmental activities in the area. Disturbance is a minor threat. Other potential threat is the occasional poaching of water birds in some of the areas. Falcon trapping also takes place in the coastal areas. These activities need to be controlled particularly in the migratory season of the birds.

**Threatened / Near-threatened Species of Birds**

Ten species of Threatened/Near-threatened Birds have been recorded from the study area. Out of which one species is Endangered, three species are Vulnerable and six species are Near-threatened (Table 4).

Table 4. Threatened/near-threatened Bird Species (IUCN, 2018).

| S. No. | Common name | Scientific name | Status |
|---|---|---|---|
| 1 | Pallas's Fishing Eagle | *Haliaeetus leucoryphus* | EN |
| 2 | Imperial Eagle | *Aquila heliaca* | VU |
| 3 | Greater Spotted Eagle | *Aquila clanga* | VU |
| 4 | Common Pochard | *Aythya farina* | VU |
| 5 | Painted Stork | *Ibis leucocephala* | NT |
| 6 | Oystercatcher | *Haematopus ostralegus* | NT |
| 7 | Eurasian Curlew | *Numenius arquata* | NT |
| 8 | Black-tailed Godwit | *Limosa limosa* | NT |
| 9 | Bar-tailed Godwit | *Limosa lapponica* | NT |
| 10 | Curlew Sandpiper | *Calidris testaceus* | NT |

Legend: E= Endangered, VU= Vulnerable, NT= Near Threatened

**Protected Species of Birds**

The following species of birds recorded in the area are totally protected against hunting as per Sindh Wildlife Protection Ordinance, 1972 (SWD, 2003).

- White Pelican, Grey Heron, Purple Heron, Pond Heron, Reef Heron, Large Egret, Little Egret, Painted Stork, Spoonbill, Greater Flamingo and Common Shelduck.
- Black Kite, Brahminy Kite, Imperial Eagle, Steppe Eagle, Greater Spotted Eagle, Pallas's Fishing Eagle, Marsh Harrier and Osprey.
- Rosy Starling

Table 5. Common and Widespread Species of Birds recorded

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| Category | Common name |
|---|---|
| Birds of Prey | Brahminy Kite |
| | Common Kite |
| | Osprey |
| Waterbirds | Red-wattled Lapwing |
| | Grey Heron |
| | Spoonbill |
| | Curlew |
| | Avocet |
| | Little Ringed Plover |
| | Kentish Plover |
| | Lesser Sand Plover |
| | Little Stint |
| | Common Redshank |
| | Herring Gull |
| | Black Headed Gull |
| | River Tern |
| | Gull-billed Tern |
| Passerines | Black Drongo |
| | Common Crow |
| | House Sparrow |
| Others | Pied Kingfisher |

**Common and widespread species of birds recorded**

21 species of birds recorded from the area were found to be the common and widespread species of the study area and most of them are waterbirds. The waterbirds are generally available in large number during the migratory season from November to March (Table 5).

**Priority Species**

Ten species of birds have been identified as priority species due to their high conservation significance for being Threatened/ Near-threatened species. These include Pallas's Fishing Eagle, Imperial Eagle, Greater Spotted Eagle, Common Pochard, Oyster catcher, Painted Stork, Eurasian Curlew, Curlew Sandpiper, Black-tailed Godwit and Bar-tailed Godwit.

**Ramsar Sites**

In relation to the Ramsar Sites in Sindh, the Wind Power Project Area falls in the limits of Indus Delta Ramsar Site. The nearby creeks to the area are the Patiani Creek, Gharo Creek, Dhabeji Creek and Korangi Creek.

## DISCUSSION

As the dependence on fossil fuels is increasing day by day with the increasing power demand in the country, considerable efforts for development of energy resources are urgently required. To avoid the adverse effects of global warming and air pollution, concerted efforts are needed. Pakistan has undertaken a number of projects related to climatic change adaptation and mitigation measures. It is high time to strengthen and enhance government efforts for the promotion and development of Renewable Energy Technologies (RET's), specifically the Wind Energy in Pakistan, by creating an enabling environment for commercial scale projects in this sector.

**Potential Impacts of the WPPs**

There are a number of impacts of the wind farm on wildlife, particularly on Birds and Bats, depending on the number of factors such as:

- The characteristics and size of the Wind Farm.
- The topography of the Project Area with reference to favorable habitats for birds

- The nature and number of wildlife habitats likely to be affected by development
- The diversity and abundance of animal species particularly of the sensitive receptors

Based on the studies so far made, the following four main categories of potential impacts of the WPPs may be identified as:

- Habitat loss and disturbance which displaces most of the species from the active zone of the Wind Farms.
- Creation of barriers to the movement of wild species particularly birds and bats.
- Change in habitat structure making the area no longer viable for specific species.
- Collision risk by direct strikes of the avian/bat species against the rotating propellers of the wind turbines.

**Future Action Plan**

It is suggested that birds monitoring studies may be undertaken in the Wind Power Projects Area to identify their impacts and to suggest suitable mitigation measures for the safeguard of the species and their habitats.

Some Species of Coastal Gharo Wind Corridor area shown in Figures 8-15 .

Fig. 8. Collared Dove.

Fig. 10. Little Brown Dove.

Fig. 9. Crested Lark.

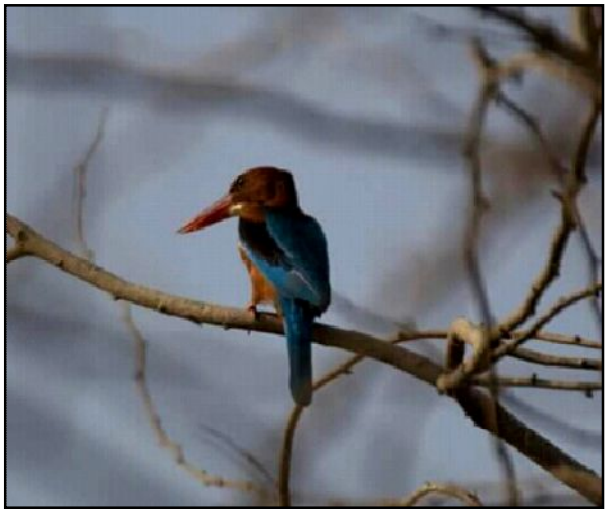

Fig. 11. White-breasted Kingfisher.

Ffig. 12. Red-wattled Lapwing.

Fig. 14. Brahminy Kite.

Fig. 13. Greater Flamingo.

Fig. 15. Cattle Egret.

## REFERENCES

Anon. 2009. Regional Environmental Assessment Study of the Gharo Wind Corridor in Pakistan. UNDP/GEF Wind Energy Project, Islamabad.

Gregory, RD., Gibbons, DW. and Donald, PF. 2004. Birds Census and Survey Techniques. pp55.

Ghalib, SA., Hasnain, SA., Parveen, S. and Khan, AR. 2002. Current Status of the Birds of Sindh. Journal of Natural Hoistory and Wildlife 33-55.

Ghalib, SA., Kanwal, R., Begum, A., Zehra, A., Yasmeen, G. and Manzoor, U. 2017. Population Distribution of Coastal Birds of Sindh. Canadian Journal of Pure and Applied Sciences. 11 (2):4223-4231.

Ghalib, SA., Kanwal, R., Zehra, A., Siddiqui, S., Hussain, B., Yasmeen, G., Ullah, U., Manzoor, U., Raza, N. and Begum, A. 2018. Review of the Distribution, Status and Conservation of the Wildlife of Sindh. Canadian Journal of Pure and Applied Sciences. 12 (2):4519- 4533.

Ghalib, SA., Rais, M., Abbas, D., Tabassum, F., Begum, A. and Jabeen, T. 2009. An Overview of the status of Shorebirds and Internationally Important Sites in Pakistan. Pakistan Journal of of Zoology. 41(3):165-172.

Ghalib, SA. and Nawaz, R. 2008. Quick Identification guide to the Birds of the Indus Ecoregion. Indus for All Programme, WWF-Pakistan, Karachi.

Ghalib, SA., Khan, MZ., Ahmed, SM., Hussain, B., Begum, A. and Ahmed, W. 2014. Study of the Wildlife of Jhimpir Wind Corridor, District Thatta, Sindh and Development of Birds Monitoring Strategy in the area. African Journal of Science and Research. 3(6):01- 09.

Grimmett, R., Roberts, TJ. and Inskipp, T. 2008. Birds of Pakistan, Christopher Helm, London.

IUCN 2018. IUCN Red List of Threatened Species. www.iucnredlist.org

Pakistan today. 2013. Coastal areas of Sindh, Balochistan suitable for wind energy. www.pakistantoday.com.pk/2013/07/04/coastal-areas-of-sindh-balochistan-suitable-for-wind-energy.

SWD, 2003. The Sindh Wildlife Protection Ordinance 1972, with Amendments up to June 01, 2001. Sindh Wildlife Department, Government of Sindh, Karachi.

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